California High-Speed Rail Authority

San Jose to Merced Project Section

Draft Environmental Impact Report/ Environmental Impact Statement

Section 3.3 Air Quality and Greenhouse Gases

April 2020

CALIFORNIA
High-Speed Rail Authority

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being or have been carried out by the State of California pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated July 23, 2019, and executed by the Federal Railroad Administration and the State of California.

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ACRONYMS AND ABBREVIATIONS

$\mu g/m^3$	micrograms per cubic meter
AAQA	ambient air quality analysis
AB	(California) Assembly Bill
Authority	California High-Speed Rail Authority
BAAQMD	Bay Area Air Quality Management District
Bay Area	San Francisco Bay Area
BMP	best management practice
C.F.R.	Code of Federal Regulations
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CalEEMod	California Emissions Estimator Model
CARB	California Air Resources Board
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CH_4	methane
CMP	congestion management program
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CPAD	California Protected Areas Data
DPM	diesel particulate matter
EIR	environmental impact report
EIS	environmental impact statement
EMU	electric multiple-unit train
EO	California Executive Order
Fed. Reg.	*Federal Register*
FHWA	Federal Highway Administration
Foundation	Bay Area Clean Air Foundation
FRA	Federal Railroad Administration
GHG	greenhouse gas
HAP	hazardous air pollutants
HRA	health risk assessment
HSR	high-speed rail
I-	Interstate
IAMF	impact avoidance and minimization feature

LBP	lead-based paint
LOS	level-of-service
MBARD	Monterey Bay Air Resources District
MCAG	Merced County Association of Governments
mg/m^3	milligrams per cubic meter
MOWS	maintenance of way siding
MOU	memorandum of understanding
MOWF	maintenance of way facility
MSAT	mobile source air toxics
MTC	Metropolitan Transportation Commission
N_2O	nitrous oxide
NAAQS	national ambient air quality standards
NCCAB	North Central Coast Air Basin
NEPA	National Environmental Policy Act
NHTSA	National Highway Transportation Safety Administration
NO	nitric oxide
NO_2	nitrogen dioxide
NOA	naturally occurring asbestos
NO_X	nitrogen oxides
NSR	New Source Review
O_3	ozone
OEHHA	Office of Environmental Health Hazard Assessment
Pb	lead
PG&E	Pacific Gas and Electric Company
PM	particulate matter
$PM_{2.5}$	particulate matter smaller than or equal than 2.5 microns in diameter
PM_{10}	particulate matter smaller than or equal to 10 microns in diameter
project or project extent	San Jose to Central Valley Wye Project Extent
RSA	resource study area
RTP	regional transportation plan
SAFE	Safer Affordable Fuel-Efficient
SB	(California) Senate Bill
SCAQMD	South Coast Air Quality Management District
SF_6	sulfur hexafluoride
SFBAAB	San Francisco Bay Area Air Basin
SIL	significant impact levels

SIP	state implementation plan
SJVAB	San Joaquin Valley Air Basin
SJVAPCD	San Joaquin Valley Air Pollution Control District
SLOAPCD	San Luis Obispo Air Pollution Control District
SO_2	sulfur dioxide
SO_X	sulfur oxides
SR	State Route
TAC	toxic air contaminant
UPRR	Union Pacific Railroad
US	U.S. Highway
USEO	U.S. Presidential Executive Order
USEPA	U.S. Environmental Protection Agency
VERA	voluntary emission reduction agreement
VMT	vehicle miles traveled
VOC	volatile organic compound
VTA	Santa Clara Valley Transportation Authority

3.3 Air Quality and Greenhouse Gases

3.3.1 Introduction

Primary Air Quality and Greenhouse Gas Impacts

- Short-term construction emissions in excess of air district and federal *de minimis* thresholds
- Short-term construction emission concentrations in excess of ambient air quality standards
- Short-term conflict with air quality plans associated with construction-generated emissions
- Long-term criteria pollutant and greenhouse gas emissions reduction from removal of passenger vehicle and aircraft trips

This section describes ambient air quality conditions, including existing pollutant concentrations, meteorology, and locations of sensitive receptors in the San Jose to Central Valley Wye Project Extent (project or project extent) resource study area (RSA). This section also discusses applicable criteria pollutant and greenhouse gas (GHG) regulations. Critical air quality issues along the construction footprint include short-term construction-related emissions, which could exceed local air district and federal General Conformity thresholds designed to achieve regional attainment with federal and state ambient air quality standards. Sensitive receptors adjacent to the construction footprint may also be exposed to increased health risks from construction activities. Long-term operations of the project would increase emissions from electrified passenger rail service, as well as attract additional motor vehicles to existing and new transit stations. However, the project would expand transit ridership, which would remove single-occupancy vehicles from the transportation network and reduce aviation demand. This analysis considers the net effect of the project on air quality and GHG conditions as a result of long-term operations.

The following appendices in Volume 2 of this Draft Environmental Impact Report (EIR)/Environmental Impact Statement (EIS) provide additional details on air quality and global climate change.

- Appendix 2-D, Applicable Design Standards, describes the relevant design standards for the project.
- Appendix 2-E, Project Impact Avoidance and Minimization Features, provides the list of all impact avoidance and minimization features (IAMF) incorporated into the project.
- Appendix 2-J, Regional and Local Plans and Policies, provides a list by resource of all applicable regional and local plans and policies.
- Appendix 2-K, Policy Consistency Analysis, provides a summary by resource of project inconsistencies and reconciliations with local plans and policies.
- Appendix 3.2-B, Vehicle Miles Traveled Forecasting provides a summary memorandum from the Authority and a technical paper written by Cambridge Systematics describing the methodology used for forecasting the reduction in vehicle miles traveled (VMT).
- Appendix 3.3-A, San Jose to Merced Project Section Air Quality and Greenhouse Gases Technical Report (Air Quality and Greenhouse Gases Technical Report), provides additional technical details on the air quality and GHG analysis.
- Appendix 3.3-B, Federal General Conformity Determination, provides a discussion of the federal General Conformity requirements and the information shared by the Authority with the FRA.
- Appendix 3.3-C, Changes to Project Benefits Based on 2018 Business Plan, describes how long-term operational benefits of the high-speed rail (HSR) project may change based on the ridership assumptions under the 2018 Business Plan.

Air quality and GHG are important considerations for development of the project alternatives because of their effect on human health and global climate change and current regional air quality conditions, which commonly exceed federal and state ambient air quality standards along portions of the project. Air quality conditions tend to be worse along the eastern portion of the RSA in the San Joaquin Valley and improve westward. The following Draft EIR/EIS resource sections provide additional information related to air quality and global climate change:

- Section 3.10, Hazardous Materials and Wastes—Describes compliance with asbestos regulations and disposal of lead-based paint (LBP) during construction of the project.
- Section 3.18, Regional Growth—Evaluates impacts of constructing the project alternatives on land consumption, and growth-inducing impacts on air quality and global climate change.

The following are key definitions for air quality and global climate change analyzed in this Draft EIR/EIS.

- **Air quality**—Describes the amount of air pollution to which the public is exposed.
- **Air pollution**—General term that refers to one or more chemical substances that degrade the quality of the atmosphere. Air pollutants degrade the atmosphere by reducing visibility, damaging property, and combining to form smog. Air pollutants affect humans by reducing the productivity or vigor of crops or natural vegetation, and by reducing human or animal health. Three general classes of air pollutants are of concern for the project: criteria pollutants, toxic air contaminants (TAC), and GHG. These pollutants are defined in detail in the Air Quality and Greenhouse Gases Technical Report, Chapter 4 (Volume 2, Appendix 3.3-A).
  - **Criteria pollutants**—Pollutants for which the U.S. Environmental Protection Agency (USEPA) and the State of California have set ambient air quality standards or that are chemical precursors to compounds for which ambient standards have been set. The six major criteria pollutants include ozone (O_3), particulate matter (PM) (PM_{10} is PM smaller than or equal to 10 microns in diameter and $PM_{2.5}$ is PM smaller than or equal than 2.5 microns in diameter), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead (Pb).[1] Ozone is considered a regional pollutant because its precursors affect air quality on a regional scale. Pollutants such as CO, NO_2, SO_2, and Pb are considered local pollutants that tend to accumulate in the air locally. PM is both a local and a regional pollutant. The primary criteria pollutants of concern generated by the project are ozone precursors (volatile organic compounds [VOC] and nitrogen oxides [NO_X]), CO, PM, and SO_2.[2]
  - **TACs**—Nine mobile source air toxics (MSAT) identified by USEPA as having significant contributions from mobile sources: acrolein, benzene, 1,3-butadiene, acetaldehyde, diesel particulate matter (DPM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. These pollutants are known or suspected to cause cancer or other serious health and environmental effects.
  - **GHGs**—Gaseous compounds that limit the transmission of Earth's radiated heat out to space. GHGs include O_3, water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases (e.g., chlorofluorocarbons and hydrochlorofluorocarbons).
- **Global climate change**—Long-term changes in the Earth's climate, usually associated with recent global warming trends, as well as regional changes in weather and precipitation patterns, attributed to increasing concentrations of GHGs in the atmosphere.

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[1] The statewide standards established for California also incorporate standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles.

[2] As noted, there are also ambient air quality standards for Pb, sulfates, hydrogen sulfide, vinyl chloride, and visibility particulates. However, these pollutants are typically associated with industrial sources, which are not included as part of the project. Accordingly, they are not discussed further within the context of project-generated emissions.

3.3.2 Laws, Regulations, and Orders

This section presents federal, state, and regional and local laws, regulations, orders, and plans applicable to air quality and GHGs. The California High-Speed Rail Authority (Authority) would implement the HSR system, including the project, in compliance with all applicable regulations. Refer to the Air Quality and Greenhouse Gases Technical Report (Volume 2, Appendix 3.3-A) for more detailed information on laws, regulations, and orders.

3.3.2.1 Federal

Clean Air Act (42 United States Code § 7401) and National Ambient Air Quality Standards

The federal Clean Air Act (CAA), promulgated in 1963 and amended several times thereafter, including the 1990 CAA amendments, establishes the framework for modern air pollution control in the United States. The CAA directs the USEPA to establish federal air quality standards, known as national ambient air quality standards (NAAQS), and specifies future dates for achieving compliance. The six major criteria pollutants subject to the NAAQS are O_3, PM (PM_{10} and $PM_{2.5}$), CO, NO_2, SO_2, and Pb. NAAQS are divided into primary and secondary standards; the former are set to protect human health with an adequate margin of safety, the latter to protect environmental values, such as plant and animal life. Table 3.3-1 summarizes NAAQS currently in effect for each criteria pollutant. The table also provides California Ambient Air Quality Standards (CAAQS) (discussed in Section 3.3.2.2, State) for reference.

The CAA requires that a state implementation plan (SIP) be prepared for local areas that do not meet the NAAQS, referred to as nonattainment areas. The SIP must include pollution control measures that demonstrate how the standards will be met by the dates specified in the CAA. Section 176(c) of the CAA provides that federal agencies cannot engage, support, or provide financial assistance for licensing, permitting, or approving any project unless the project conforms to the applicable SIP. This process is known as “conformity” and is discussed in the following section. The goal of the SIP is to eliminate or reduce the severity and number of violations of the NAAQS and to achieve expeditious attainment of the standards.

Conformity Rule

Pursuant to CAA Section 176(c) requirements, USEPA enacted the federal General Conformity[3] Rule (40 Code of Federal Regulations [C.F.R.] Parts 5, 51, and 93) in 1993. The purpose of the General Conformity Rule is to prevent federal actions from generating emissions that interfere with state and local agencies’ SIPs and emission-reduction strategies to attain the NAAQS.

Pursuant to 23 U.S.C. 327 and a Memorandum of Understanding executed by the FRA and the State of California on July 23, 2019, FRA assigned its federal environmental review responsibilities under the NEPA and related statutes to the Authority under a federal program commonly known as NEPA Assignment. Accordingly, the Authority is now the NEPA lead agency. Consistent with 23 U.S.C. 327 and the July 23, 2019 NEPA Assignment Memorandum of Understanding, FRA retains its obligations to make general conformity determinations under the CAA. The Authority and FRA have agreed to collaborate on the development of general conformity determinations. As part of this collaboration, the Authority has developed and provided to FRA a Draft General Conformity Determination and supporting information, as well as the Authority’s proposed approach for achieving general conformity. Because the analysis used for the Draft EIR/EIS also generated the information necessary for the Draft General Conformity Determination, specific analysis may be incorporated by reference in the General Conformity Determination. FRA will make the ultimate general conformity determination for this project.

[3] Note that “Transportation Conformity” is an analytical process required for all federally funded roadway transportation projects, but it does not apply to the project.

Table 3.3-1 State and Federal Ambient Air Quality Standards

Criteria Pollutant	Averaging Time	California Standards	National Standards[1]	
			Primary	Secondary
Ozone	1-hour	0.09 ppm	None[2]	None[2]
	8–hour	0.070 ppm	0.070 ppm	0.070 ppm
Particulate matter (PM_{10})	24-hour	50 μg/m³	150 μg/m³	150 μg/m³
	Annual mean	20 μg/m³	None	None
Fine particulate matter ($PM_{2.5}$)	24-hour	None	35 μg/m³	35 μg/m³
	Annual mean	12 μg/m³	12.0 μg/m³	15.0 μg/m³
Carbon monoxide	8-hour	9.0 ppm	9 ppm	None
	1-hour	20 ppm	35 ppm	None
	8-hour (Lake Tahoe)	6 ppm	None	None
Nitrogen dioxide	Annual mean	0.030 ppm	0.053 ppm	0.053 ppm
	1-hour	0.18 ppm	0.100 ppm	None
Sulfur dioxide	Annual mean	None	0.030 ppm[3]	None
	24-hour	0.04 ppm	0.14 ppm[3]	None
	3-hour	None	None	0.5 ppm
	1-hour	0.25 ppm	0.075 ppm	None
Lead	30-day average	1.5 μg/m³	None	None
	Calendar quarter	None	1.5 μg/m³	1.5 μg/m³
	3-month average	None	0.15 μg/m³	0.15 μg/m³
Sulfates	24-hour	25 μg/m³	None	None
Visibility-reducing particles	8-hour	–[4]	None	None
Hydrogen sulfide	1-hour	0.03 ppm	None	None
Vinyl chloride	24-hour	0.01 ppm	None	None

Source: CARB 2016a
[1] National standards are divided into primary and secondary standards. Primary standards are intended to protect public health, whereas secondary standards are intended to protect public welfare and the environment.
[2] The federal 1-hour standard of 12 parts per 100 million was in effect from 1979 through June 15, 2005. The revoked standard is referenced because it was employed for such a long period and is a benchmark for state implementation plans.
[3] The annual and 24-hour NAAQS for SO_2 apply only for 1 year after designation of the new 1-hour standard to those areas that were previously nonattainment for 24-hour and annual NAAQS.
[4] CAAQS for visibility-reducing particles is defined by an extinction coefficient of 0.23 per kilometer – visibility of 10 miles or more because of particles when relative humidity is less than 70 percent.
μg/m³ = micrograms per cubic meter
ppm = parts per million
CAAQS = California ambient air quality standards
NAAQS = national ambient air quality standards

The General Conformity Rule applies to all federal actions in areas that do not meet the NAAQS that are not exempt from the General Conformity Rule, covered by a Presumed-to-Conform approved list,[4] or do not meet *de minimis* emission levels established in the General Conformity Rule (75 *Federal Register* [Fed. Reg.] 17255). The General Conformity Rule applies only to direct

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[4] Category of activities designated by a federal agency as having emissions below *de minimis* levels or otherwise do not interfere with the applicable SIP or the attainment and maintenance of the NAAQS.

and indirect emissions generated by a federal action that are subject to New Source Review for which a federal permitting agency has directly caused or initiated, has continued program responsibility for, or can practically control. The rule does not include stationary industrial sources requiring air quality permits from local air pollution control agencies. Because the San Jose to Merced Project Section likely will require and/or receive one or more federal approvals or future federal construction funding, the Authority anticipates FRA will issue a General Conformity Determination in accordance with the implementing regulations of Section 176 of the CAA.

A conformity determination under the General Conformity Rule is required for the project alternatives if the Authority determines that all of the following criteria apply:

- The action will occur in a nonattainment or maintenance area.
- One or more specific exemptions do not apply to the action.
- The action is not included in the federal agency's "presumed to conform" list.
- The emissions from the proposed action are not within the approved emissions budget for an applicable facility.
- The total direct and indirect emissions of a pollutant (or its precursors) are at or above the *de minimis* levels established in the General Conformity Rule (75 Fed. Reg. 17255).

The evaluation of whether total direct and indirect emissions exceed the requirements of 40 C.F.R. Section 93.158(c) is performed by comparing total annual emissions to the applicable *de minimis* emissions level listed in 40 C.F.R. Section 93.153(b). If the evaluation indicates that emissions are in excess of any of the General Conformity *de minimis* thresholds, the Authority must perform a conformity determination.

Mobile Source Air Toxics and Hazardous Air Pollutants

While NAAQS or CAAQS do not exist for MSATs or hazardous air pollutants (HAP), USEPA regulates these pollutants through rules and emission control programs. In February 2007, USEPA finalized a rule (Control of Hazardous Air Pollutants from Mobile Sources, February 9, 2007) to limit the benzene content of gasoline and reduce toxic emissions from passenger vehicles and gas cans. USEPA is also developing programs that would provide additional benefits (further controls) for small off-road gasoline engines, diesel locomotives, and marine engines. These regulatory controls will complement existing USEPA programs that reduce risk in local communities, including the Clean School Bus USA, the Voluntary Diesel Retrofit Program, Best Workplaces for Commuters, and the National Clean Diesel Campaign.

Federal Greenhouse Gas Regulations and Guidance

In *Massachusetts v. U.S. Environmental Protection Agency, et al.*, 549 U.S. 497 (2007), the United States Supreme Court ruled that GHGs fit within the CAA's definition of air pollutants and that USEPA has the authority to regulate GHGs. Pursuant to its authority under the CAA, USEPA published a rule on October 30, 2009, that requires mandatory reporting of GHG emissions from facilities that emit 25,000 metric tons or more per year of GHG emissions. The final rule covers the GHGs CO_2, CH_4, N_2O, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride (SF_6), and other fluorinated gases, including nitrogen trifluoride and hydrofluorinated ethers. While the mandatory reporting rule is not a transportation-related regulation, the reporting methodology developed as part of the regulation is helpful in identifying potential GHG emissions from transportation projects.

Federal GHG regulation has continued to evolve since the initial Supreme Court ruling in 2007. Key legislation and regulatory orders applicable to the project alternatives are briefly described in the following list. Refer to the Air Quality and Greenhouse Gases Technical Report (Volume 2, Appendix 3.3-A) for additional detail.

- **U.S. Presidential Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance* (October 5, 2009)**—Requires federal agencies to set a 2020 GHG emission-reduction target, increase energy efficiency, conserve resources, support sustainable communities, and leverage federal purchasing power to promote environmentally responsible products and technologies.

- ***Final Endangerment and Cause or Contribute Findings for Greenhouse Gases* (December 7, 2009)**—States that current and projected concentrations of the six key well-mixed GHGs in the atmosphere—CO_2, CH_4, N_2O, hydrofluorocarbons, perfluorocarbons, and SF_6—threaten the public health and welfare of current and future generations.

- **Updated Corporate Average Fuel Economy Standards (October 15, 2012)**—Requires substantial improvements in fuel economy and reductions in GHG emissions for all light-duty vehicles sold in the U.S. The updated standards apply to new passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering model years 2017 through 2025, and are equivalent to 54.5 miles per gallon. On August 2, 2018, the National Highway Transportation Safety Administration (NHTSA) and USEPA proposed to amend the fuel efficiency standards for passenger cars and light trucks and establish new standards covering model years 2021 through 2026 by maintaining the current model year 2020 standards through 2026 (Safer Affordable Fuel-Efficient [SAFE] Vehicles Rule). On September 19, 2019, USEPA and NHTSA issued a final action on the One National Program Rule, which is consider part 1 of the SAFE Vehicles Rule and a precursor to the proposed fuel efficiency standards. The One National Program Rule enables USEPA/NHTSA to provide nationwide uniform fuel economy and GHG vehicle standards, specifically by 1) clarifying that federal law preempts state and local tailpipe GHG standards, 2) affirming NHTSA's statutory authority to set nationally applicable fuel economy standards, and 3) withdrawing California's CAA preemption waiver to set state-specific standards.

  USEPA and NHTSA published their decisions to withdraw California's waiver and finalize regulatory text related to the preemption on September 27, 2019 (84 Fed. Reg. 51310). The agencies also announced that they will publish the second part of the SAFE Vehicles Rule (i.e., the standards) in October 2019. California, 22 other states, the District of Columbia, and two cities filed suit against the proposed One National Program Rule on September 20, 2019 *(California et al. v. United States Department of Transportation et al.*, 1:19-cv-02826, U.S. District Court for the District of Columbia). The lawsuit requests a "permanent injunction prohibiting Defendants from implementing or relying on the Preemption Regulation." The fate of the One National Program Rule and SAFE Vehicles Rule remains uncertainly in the face of pending legal deliberations.

- ***Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles* (September 15, 2011, and August 16, 2016)**—Phase I of the standards applies to model years 2014 through 2018 and is tailored to each of three regulatory categories of heavy-duty vehicles—combination tractors, heavy-duty pickup trucks and vans, and vocational vehicles. Phase 2 of the standards apply to model years 2019 through 2027 medium- and heavy-duty vehicles.

- ***Guidance on Considering Climate Change in NEPA Reviews and Conducting Programmatic NEPA Reviews* (August 1, 2016 and June 26, 2019)**—The White House Council on Environmental Quality (CEQ) released final guidance regarding the consideration of GHG in National Environmental Policy Act (NEPA) documents for federal actions in August 2016 (CEQ 2016). On April 25, 2017, CEQ withdrew the final guidance pursuant to U.S. Presidential Executive Order 13783, but noted "the withdrawal of the guidance does not change any law, regulation, or other legally binding requirement (82 Fed. Reg. 16576)." The CEQ released new draft guidance on June 26, 2019, which, if finalized, would replace the withdrawn August 2016 guidance. The June 2019 draft guidance requires federal agencies to analyze the direct, indirect, and cumulative impacts of a proposed action's GHG emissions, as well as consider the impacts of climate change on the project.

3.3.2.2 State

California Clean Air Act and California Ambient Air Quality Standards

In 1988, the state legislature adopted the California Clean Air Act, which established a statewide air pollution control program. The act is administered by the California Air Resources Board (CARB) at the state level and by local air quality management districts at the regional level. The air districts are required to develop plans and control programs for attaining the CAAQS by the earliest practicable date. The CAAQS are generally more stringent than NAAQS and incorporate additional standards for sulfates, hydrogen sulfide, visibility-reducing particles, and vinyl chloride. CAAQS and NAAQS are listed together in Table 3.3-1.

The CARB is responsible for implementation of the California Clean Air Act, meeting state requirements of the federal CAA, and establishing the CAAQS. The CARB is also responsible for setting emission standards for vehicles sold in California and for other emission sources, such as consumer products and certain off-road equipment. The CARB also establishes passenger vehicle fuel specifications.

Mobile Source Air Toxics and Toxic Air Contaminates

California regulates TACs (equivalent to the federal HAPs) primarily through the Toxic Air Contaminant Identification and Control Act (Tanner Act) and the Air Toxics "Hot Spots" Information and Assessment Act of 1987 (Hot Spots Act). The Tanner Act created California's program to reduce exposure to air toxics. The Hot Spots Act supplements the Tanner Act by requiring a statewide air toxics inventory, notification of people exposed to a significant health risk, and stationary source plans to reduce these risks.

Diesel Particulate Matter Control Measures

In August 1998, the CARB identified DPM from diesel-fueled engines as a TAC. In September 2000, the CARB approved a comprehensive Diesel Risk Reduction Plan to reduce DPM from new and existing diesel-fueled engines and vehicles. The CARB has also adopted regulations to reduce emissions from both on-road and off-road heavy-duty diesel vehicles (e.g., equipment used in construction). These regulations, known as Airborne Toxic Control Measures, reduce the idling of school buses and other commercial vehicles, control DPM, and limit the emissions of ocean-going vessels in California waters. The regulations also include measures to control emissions of air toxics from stationary sources. The California Toxics Inventory, developed by interpolating from CARB estimates of total organic gases and PM, provides emissions estimates by stationary, area-wide, on-road mobile, off-road mobile, and natural sources (CARB 2015).

Asbestos Control Measures

The CARB has adopted two airborne toxic control measures for controlling naturally occurring asbestos (NOA): the *Asbestos Airborne Toxic Control Measure for Surfacing Applications* and the *Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations*. While USEPA is responsible for enforcing regulations relating to asbestos renovations and demolitions, it can delegate this authority to state and local agencies. The CARB and local air districts have been delegated authority to enforce the Federal National Emission Standards for Hazardous Air Pollutants regulations for asbestos.

California Greenhouse Gas Regulations and Guidance

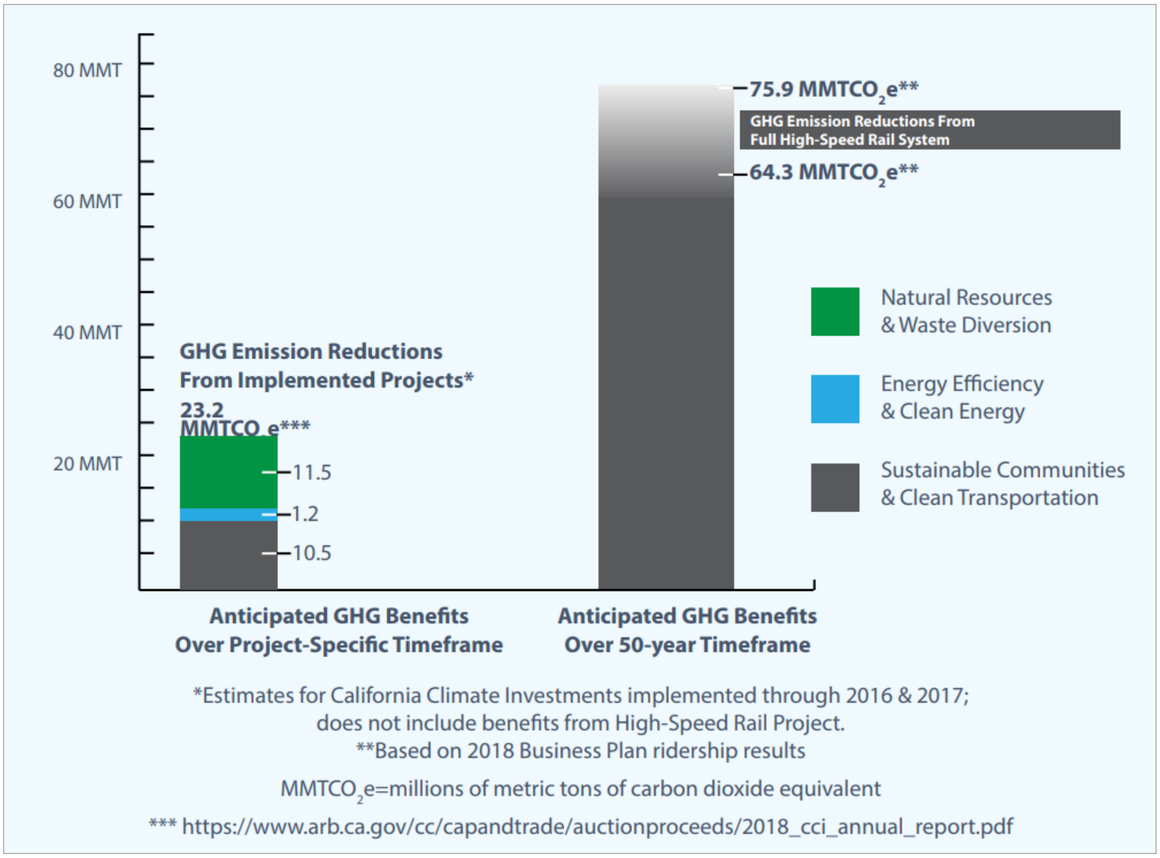
California has taken proactive steps to reduce GHG emissions. This section briefly describes key legislation and regulatory orders applicable to the project alternatives. Refer to the Air Quality and Greenhouse Gases Technical Report (Volume 2, Appendix 3.3-A) for additional detail.

- **Assembly Bill (AB) 1493 (2002)**—Requires CARB to develop and implement regulations to reduce automobile and light-truck GHG emissions, beginning with the model year 2009.
- **California Executive Order (EO) S-3-05 (2005)**—Establishes goals to reduce California's GHG emissions to 2000 levels by 2010, 1990 levels by 2020, and 80 percent below the 1990 levels by 2050.

- **AB 32 (2006)**—Requires the CARB to implement emission limits, regulations, and other feasible and cost-effective measures such that statewide GHG emissions are reduced to 1990 levels by 2020. Pursuant to AB 32, CARB adopted the Climate Change Scoping Plan (AB 32 Scoping Plan) in December 2008, which outlines measures for meeting the 2020 GHG emissions reduction limit. The first update to the AB 32 Scoping Plan was published in 2014. The scoping plan was subsequently updated as part of the California's 2017 Scoping Plan, which was adopted to address Senate Bill (SB) 32.
- **EO S-01-07 (2007)**—Mandates that a statewide goal be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020, and that a low-carbon fuel standard for transportation fuels be established in California.
- **SB 375 (2008)**—Requires the state's 18 metropolitan planning organizations to incorporate a sustainable communities strategy in their regional transportation plans (RTP) to attain the GHG emissions reduction targets set by CARB for 2020 and 2035.
- **SB 32 and AB 197 (2016)**—Requires the CARB to reduce statewide GHG emissions to at least 40 percent below the 1990 level by 2030. On December 14, 2017, the CARB adopted the 2017 Climate Change Scoping Plan, the strategy for achieving California's 2030 GHG emissions target. The 2030 midterm target helps to frame the suite of policy measures, regulations, planning efforts, and investments in clean technologies and infrastructure needed to continue driving down emissions. The plan is intended to drive the state toward more electric vehicles; cleaner electricity to fuel those cars; denser, more walkable communities with more efficient buildings; and less-polluting agriculture.
- **SB 100 (2018)**—Extends the state's Renewables Portfolio Standard to 50 percent by December 31, 2026; 60 percent by December 31, 2030; and 100 percent by December 31, 2045.
- **EO B-55-18 (2018)**—Establishes goal to achieve carbon neutrality by 2045.
- **Innovative Clean Transit Regulation (2018)—**Requires public transit agencies to gradually transition to 100 percent zero-emission bus fleets by 2040.

California Climate Investments Program—A statewide initiative that puts billions of cap-and-trade dollars to work reducing GHG emissions, strengthening the economy and improving public health and the environment. The cap-and-trade program also creates a financial incentive for industries to invest in clean technologies and to develop innovative ways to reduce pollution. California Climate Investments projects include affordable housing, sustainable agriculture, environmental restoration, waste diversion and recycling, renewable energy, public transportation, and zero-emission vehicles. According to the California Climate Investments program, California HSR will generate an aggregate reduction in statewide GHG emissions over a 50-year period. *Sources: Authority 2018*

- Figure 3.3-1 illustrates the estimated aggregate reductions in GHG emissions that would result from the HSR system over a 50-year timeframe.



Sources: Authority 2018

Figure 3.3-1 Aggregate GHG Emissions Reductions That Would Result from the California High-Speed Rail Project

3.3.2.3 Regional and Local

This section describes the three air management districts and other regional and local planning agencies in the RSA and provides an overview of regional air quality and climate action plans relevant to the analysis of air quality and GHGs. Volume 2, Appendix 2-J provides a complete list of regional and local plans and policies relevant to air quality and GHGs considered in the preparation of this analysis.

Air Quality Management Districts

The project crosses three air basins—San Francisco Bay Area Air Basin (SFBAAB), North Central Coast Air Basin (NCCAB), and San Joaquin Valley Air Basin (SJVAB)—and falls under the jurisdiction of three air districts—Bay Area Air Quality Management District (BAAQMD), Monterey Bay Air Resources District (MBARD), and San Joaquin Valley Air Pollution Control District (SJVAPCD). The BAAQMD, MBARD, and SJVAPCD have the following responsibilities:

- Implementing air quality regulations, including developing plans and control measures for stationary sources of air pollution to meet the NAAQS and CAAQS.
- Implementing permit programs for the construction, modification, and operation of sources of air pollution.
- Coordinating with local transportation planning agencies on mobile emissions inventory development, transportation control measure development and implementation, and transportation conformity.

- Enforcing air pollution statutes and regulations governing stationary sources. With CARB oversight, the air districts also administer local regulations.

All three air districts have adopted advisory emission thresholds to assist California Environmental Quality Act (CEQA) lead agencies in determining the level of significance of a project's emissions. They have also adopted air quality plans, which are discussed further in this section, to improve air quality, protect public health, and protect the climate. Please refer to the Air Quality and Greenhouse Gases Technical Report (Volume 2, Appendix 3.3-A) for a summary of air district rules applicable to the project.

Metropolitan Planning Organizations

The project crosses three metropolitan planning organizations—Metropolitan Transportation Commission (MTC), Association of Monterey Bay Area Governments, and Merced County Association of Governments (MCAG)—and one regional transportation planning agency, Council of San Benito County Governments. The metropolitan planning organizations and regional transportation planning agency are responsible for transportation planning within their local jurisdictions. MTC is the federally designated metropolitan planning organization for the San Francisco Bay Area (Bay Area), and is supported by the Association of Bay Area Governments, which is the Bay Area regional planning body. The Council of San Benito County Governments and MCAG are the transportation agencies for San Benito and Merced Counties, respectively.

Air Quality Plans

State Implementation Plan

As discussed in Section 3.3.2.1, Federal, the CAA requires areas with unhealthy levels of O_3, inhalable PM, CO, NO_2, and SO_2 to develop SIPs that describe how an area will attain NAAQS. SIPs are not single documents. They are a compilation of new and previously submitted plans, programs (such as monitoring, modeling, or permitting), district rules, state regulations, and federal controls. Many of California's SIPs rely on the same core set of control strategies, including emission standards for cars and heavy trucks, fuel regulations, and limits on emissions from consumer products. Section 3.3.5.1, Air Quality, describes SIPs relevant to the RSA.

Transportation Plans and Programs

An RTP is a long-range plan that includes both long- and short-range strategies and actions that lead to the development of an integrated multimodal transportation system to address future transportation demand. RTPs address a region's growth, transportation goals, objectives, and policies for the next 25 years and identify the actions necessary to achieve those goals. Transportation improvement programs provide a comprehensive listing of all surface transportation projects that are to receive federal funding, are subject to a federally required action, or are considered regionally significant for air quality conformity purposes. The relevant RTPs and transportation improvement programs in the RSA are described in detail in the Air Quality and Greenhouse Gases Technical Report (Volume 2, Appendix 3.3-A).

Climate Action Plans

Several cities in the RSA have adopted or are in the process of developing climate action plans, GHG reduction plans, or equivalent documents aimed at reducing local GHG emissions. Jurisdictions with adopted or in development climate action plans or GHG reduction plans for either municipal operations, community activities, or both include Santa Clara, San Jose, Gilroy, Morgan Hill, and Santa Clara County. These plans all call for reductions in GHG emissions below current levels and actions to reduce VMT and associated transportation emissions. All plans include increased transit service as a key strategy in reducing local GHG emissions.

3.3.3 Consistency with Plans and Laws

As indicated in Section 3.1.5.3, Consistency with Plans and Laws, the CEQA and CEQ regulations require a discussion of inconsistencies or conflicts between a proposed undertaking and federal, state, regional, or local plans and laws. As such, this Draft EIR/EIS describes inconsistency of the project alternatives with federal, state, regional, and local plans and laws to provide planning context.

Several federal and state laws and implementing regulations listed in Section 3.3.2.1, Federal, and Section 3.3.2.2, State, protect the air quality and public health at a regional and local level and aim to curb GHG emissions and the effects of global climate change. The federal and state requirements considered in this analysis are summarized as follows:

- Federal and state laws and regulations that set standards for the ambient air quality in air basins and establish thresholds of significance for air basins in the state to conform to the required standards.
- State laws and executive orders that establish GHG reduction targets to minimize global climate change effects, and that require reductions in GHG emissions from on-road vehicles. State plans approved by the CARB and prepared by the BAAQMD, MBARD, and SJVAPCD outline strategies for nonattainment areas to attain the air quality standards.

The Authority, as the lead agency proposing to construct and operate the HSR system, is required to comply with all federal and state laws and regulations and to secure all applicable federal and state permits prior to initiating construction on the selected alternative. Therefore, there would be no inconsistencies between the project alternatives and these federal and state laws and regulations. The project, including the San Jose to Central Valley Wye Project Extent, is consistent with state efforts to reduce GHG emissions, and is a central component of the state's strategy for reducing GHG emissions from the transportation sector in the 2017 Scoping Plan Update.

The Authority is a state agency and therefore is not required to comply with local land use and zoning regulations; however, it has endeavored to design and construct the HSR system so that it is compatible with land use and zoning regulations. The CEQA and CEQ regulations require the discussion of inconsistencies or conflicts between a proposed undertaking and regional or local plans and laws.

The Authority reviewed 15 plans and 85 policies. Volume 2, Appendix 2-J, Regional and Local Plans and Policies, presents the plans and policies by resource. The project alternatives are consistent with 84 policies and inconsistent with 1 policy. Volume 2, Appendix 2-K, Policy Consistency Analysis, further details the inconsistencies between the project and regional and local plans and policies.

The project alternatives would be inconsistent with certain provisions of the *Plan Bay Area 2040* (Association of Bay Area Governments and MTC 2017)—Plan Bay Area's Target #3. This target requires a 10 percent reduction in health impacts associated with adverse air quality. During construction, all project alternatives could result in new temporary violations of the NAAQS and CAAQS, which have been established to protect public health. However, as described in Section 3.3.7, Mitigation Measures, the Authority has committed to offsetting all construction emissions in excess of BAAQMD and federal thresholds through AQ-MM#1. Furthermore, project operations would lower air pollution after construction.

3.3.4 Methods for Evaluating Impacts

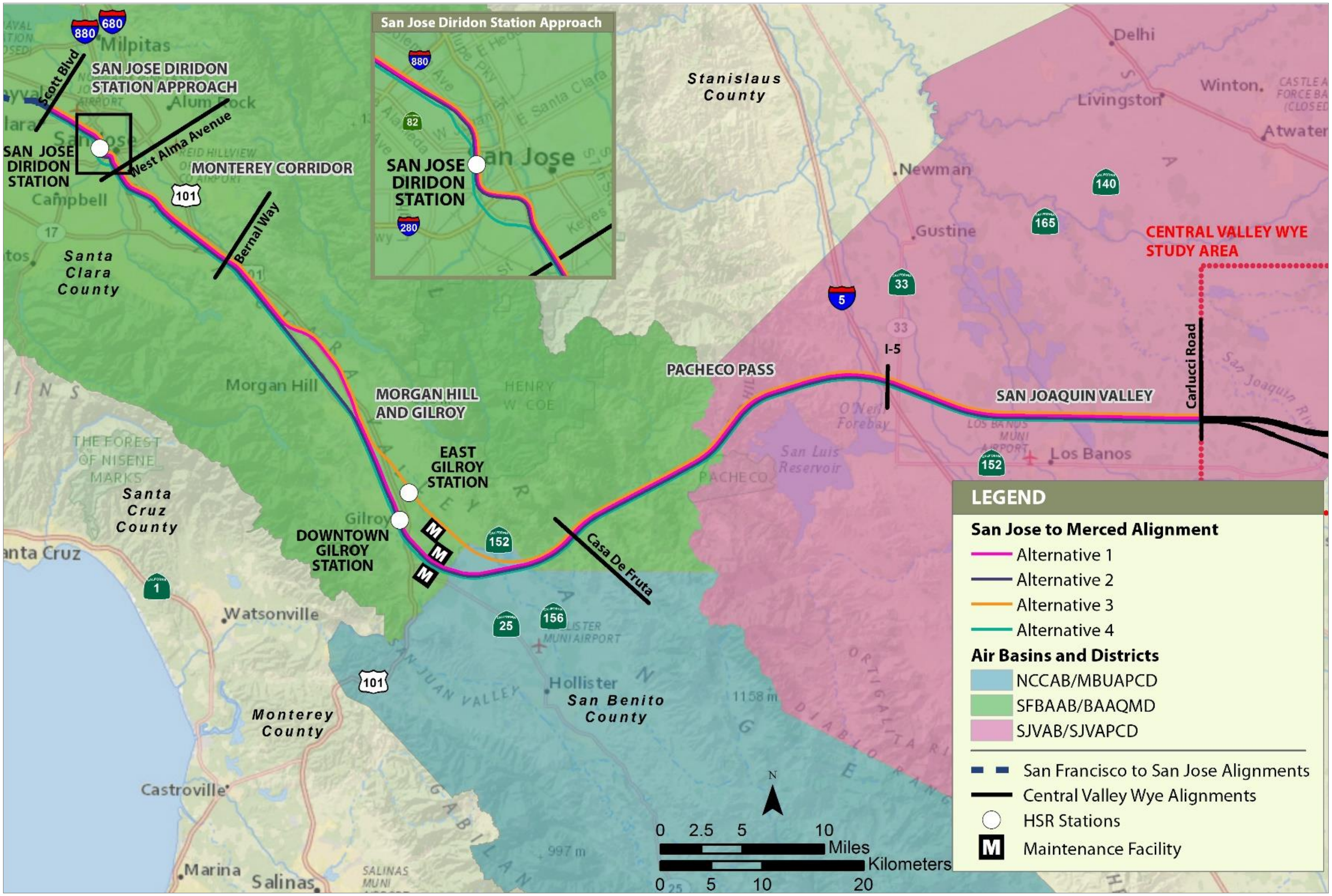
The evaluation of impacts on air quality and GHGs is a requirement of NEPA and CEQA. The following sections summarize the RSAs and the methods used to analyze air quality and GHGs.

3.3.4.1 Definition of Resource Study Area

As defined in Section 3.1, Introduction, RSAs are the geographic boundaries in which the environmental investigations specific to each resource topic were conducted. The RSA for air quality and GHGs encompasses the areas directly and indirectly affected by project construction and operations. The RSAs for air quality and GHGs are distinct because of the nature of criteria pollutants and GHGs mixing into the atmosphere. Three geographic scales define the RSAs:

- Local—The footprint during construction for each project alternative plus areas within 1,000 feet of the temporary features of the project footprint (for localized health risk impacts during construction only).
- Region—The affected air basins (SFBAAB, NCCAB, and SJVAB) for regional impacts during construction and operations.
- State—The entire state with respect to ambient air quality standards during operations. The RSA for impacts on GHGs also includes the entire state and global atmosphere (during construction and operations), the areas for each RSA. Figure 3.3-2 illustrates the regional air quality RSA for the project, including the SFBAAB, and the project alternatives.

Table 3.3-2 describes the RSAs and includes a general definition and a boundary description for each RSA for the project.



Sources: Authority 2019a; CARB 2012

Figure 3.3-2 Resource Study Area Air Basins and Air Districts

Table 3.3-2 Definition of Air Quality and Greenhouse Gases Resource Study Areas

Type	Boundary Definition
Air Quality	
Construction	**Local:** Localized air quality impacts from construction, such as health effects associated with certain criteria pollutants and DPM emissions, would occur in areas within 1,000 feet of the project footprint and staging areas.
	Regional: Regional air quality impacts from construction, such as health effects from increased O_3 and secondary PM formation, could occur in the SFBAAB, NCCAB, and SJVAB.
Operations	**Regional and State:** The air quality RSA associated with operations of the project is the affected air basins—SFBAAB, NCCAB, SJVAB—and the entire state. The project could affect on-road emissions throughout the three air basins and state and aircraft operations regionally and statewide. Emissions from power plants would occur at power facilities throughout the state. Thus, the resulting change in emissions from these sources from project operations could affect regional and statewide air quality.
Greenhouse Gases	
Construction and operations	**State:** The RSA associated with global climate change is the entire state for both construction and operations. GHGs, once emitted, are circulated into the atmosphere on a global scale, and the resulting impacts of climate change occur on a global scale as well. California, through AB 32, SB 32, and other approaches, has chosen to reduce its statewide GHG emissions. Thus, GHG emissions from project construction equipment, power plants, and changes in on-road and aircraft operations, could affect statewide climate change.

AB = Assembly Bill
DPM = diesel particulate matter
GHG = greenhouse gas
NCCAB = North Central Coast Air Basin
O_3 = ozone
PM = particulate matter
RSA = resource study area
SB = Senate Bill
SFBAAB = San Francisco Bay Area Air Basin
SJVAB = San Joaquin Valley Air Basin

3.3.4.2 Impact Avoidance and Minimization Features

IAMFs are project features that are considered to be part of the project and are included as applicable in each of the alternatives for purposes of the environmental impact analysis. The full text of the IAMFs that are applicable to the project is provided in Volume 2, Appendix 2-E, Project Impact Avoidance and Minimization Features. The following IAMFs are applicable to the air quality and GHG analysis:

- AQ-IAMF#1: Fugitive Dust Emissions
- AQ-IAMF#2: Selection of Coatings
- AQ-IAMF#3: Renewable Diesel
- AQ-IAMF#4: Reduce Criteria Exhaust Emissions from Construction Equipment
- AQ-IAMF#5: Reduce Criteria Exhaust Emissions from On-Road Construction Equipment
- AQ-IAMF#6: Reduce the Potential Impact of Concrete Batch Plants
- GEO-IAMF#5: Hazardous Minerals
- HMW-IAMF#5: Demolition Plans
- HMW-IAMF#10: Hazardous Materials Plans

This environmental impact analysis considers these IAMFs as part of the project design. Within Section 3.3.6, Environmental Consequences, each impact narrative describes how these project features are applicable and, where appropriate, effective at avoiding or minimizing potential impacts to less than significant under CEQA.

3.3.4.3 Methods for Impact Analysis

Overview of Impact Analysis

This section describes the sources and methods the Authority used to analyze potential project impacts on air quality and climate change. These methods apply to both NEPA and CEQA analyses unless otherwise indicated. Refer to Section 3.1.5.4, Methods for Evaluating Impacts, for a description of the general framework for evaluating impacts under NEPA and CEQA. Project inconsistencies and conflicts with regional and local plans and policies that regulate air quality and climate change (Volume 2, Appendix 2-K, Policy Consistency Analysis) also were considered in this analysis.

Methods Used to Analyze Impacts

Construction Impacts

- Mass Emissions Modeling
- Health Risk Assessment
- Other Localized Effects
- Asbestos, Lead-based Paint, Valley Fever, and Odors

Operations Impacts

- Mass Emissions Modeling
- Carbon Monoxide Hotspots
- Particulate Matter Hotspots
- Mobile Source Air Toxics
- Operational Health Risk Assessment
- Odors

As discussed in Section 3.3.1, Introduction, the impact analysis focuses on three types of air pollutants that are of greatest concern for the project—criteria pollutants, TACs, and GHGs. The Authority assessed and quantified the impacts of these pollutants generated by construction and operations of the project alternatives using standard and accepted software tools, techniques, and emission factors. Emissions and impacts under all four project alternatives are analyzed at an equal level of detail. This section summarizes the methods used to analyze impacts. The Air Quality and Greenhouse Gases Technical Report (Volume 2, Appendix 3.3-A) provides additional detail on the analysis, including specific modeling assumptions and outputs.

Construction Impacts

Mass Emissions Modeling

Project construction would generate emissions of VOC, NO_X, CO, sulfur oxides (SO_X), PM_{10}, $PM_{2.5}$, CO_2, CH_4, and N_2O that could result in short-term air quality and GHG impacts. Emissions would originate from off-road equipment exhaust, employee and haul truck vehicle exhaust (on-road vehicles), site grading and earth movement, onsite concrete batching, demolition, paving, architectural coating, electricity consumption, and helicopters (for reconductoring work). These emissions would be temporary (i.e., limited to the construction period) and would cease when construction activities are complete.

The Authority estimated combustion exhaust, fugitive dust (PM_{10} and $PM_{2.5}$), and fugitive off-gassing (VOCs) using a combination of emission factors and methods from the California Emissions Estimator Model (CalEEMod), version 2016.3.2; CARB's EMFAC2017 model; and USEPA's AP-42 Compilation of Air Pollutant Emission Factors based on project-specific construction data (e.g., schedule, equipment, on-site and off-site truck volumes) provided by the project engineering team (Scholz 2018). All major design components of the project (viaduct, embankment, at grade, trench, tunnel, and cut and fill) were quantitatively analyzed and included in the emissions modeling. The analysis also considered emissions generated by heavy-duty trucks used to haul ballast and subballast from regional quarries to the project, as well as emissions from the reconductoring of existing Pacific Gas and Electric Company (PG&E) of the Spring to Llagas and Green Valley to Llagas power lines. All ballast would be hauled from quarries located within one of the three project air basins (SFBAAB, NCCAB, and SJVAB). The PG&E reconductoring work would occur within the SFBAAB.

As discussed in Chapter 2, Alternatives, the Authority has incorporated IAMFs into the project that would avoid or minimize potential impacts on air quality. The construction impact analysis and emissions modeling accounts for emissions benefits achieved by incorporation of AQ-IAMF#1 through AQ-IAMF#6.

Daily and Annual Emissions Estimates

The analysis assumes that project construction would occur over multiple phases between 2022 and 2028. Analysts quantified daily criteria pollutant and GHG emissions generated by construction of each phase using the methods previously described in the Mass Emissions Modeling section. Analysts converted the daily estimates to annual totals based on the detailed construction schedule for each project alternative, and identified maximum daily emissions, based on concurrent construction activity, within the BAAQMD and MBARD, consistent with air district requirements (BAAQMD 2017a; MBUAPCD 2008). The highest daily emissions in each construction year were selected as the peak day for analysis purposes. This approach is conservative and based on available information and, therefore, is not necessarily representative of actual daily emissions that would occur during the construction period.

Emissions by Air District and Basin

The project falls under the jurisdiction of three air districts—BAAQMD, MBARD, and SJVAPCD—all of which have adopted their own distinct local thresholds of significance. To compare emissions to the federal and state thresholds, activities occurring within each air district were quantified and analyzed separately.[5]

Emissions generated by construction in the five subsections in the project extent that would occur exclusively within one air district (e.g., South San Jose) were wholly assigned to that air district. Emissions estimates for subsections and ballast hauling that span more than one air district were apportioned based on the location of construction activity. For example, construction of the Pacheco Pass Subsection would occur in both the BAAQMD and SJVAPCD. Accordingly, the emissions estimates were apportioned to the BAAQMD and SJVAPCD based on the number of rail miles constructed within each air district.

Health Risk Assessment

The Authority conducted a health risk assessment (HRA) to assess the potential impacts associated with public exposure to DPM and localized $PM_{2.5}$ exhaust. The HRA was conducted using the *Guidance Manual for Preparation of Health Risk Assessments* (California Office of Environmental Health Hazard Assessment [OEHHA] 2015) for the Air Toxics Hot Spots Program and *Health Risk Assessments for Proposed Land Use Projects* developed by the California Air Pollution Control Officers Association in 2009. The HRA was only performed for construction of the HSR facilities (e.g., alignment, stations). The PG&E reconductoring work is not included in the HRA because it would be spread throughout an 11.1-mile corridor and would only occur at individual pole locations on a short-term (i.e., few weeks) and temporary basis.

The HRA consists of three parts: (1) PM emissions inventory (2) air dispersion modeling to evaluate off-site concentrations of PM emissions, and (3) assessment of cancer and noncancer risks associated with predicted concentrations. The following subsections provide a brief description of each component.

Particulate Matter Emissions Inventory

The mass emissions analysis includes PM emissions generated by heavy-duty equipment and vehicle exhaust, as well as fugitive dust from site grading and soil movement. The particulate constituent analyzed in the HRA depends on the emission location and associated air district guidance. The BAAQMD (2017a) guidance considers DPM as the surrogate for total diesel exhaust, with its guidance requiring that diesel $PM_{2.5}$ emissions serve as the basis for the cancer and noncancer risk calculations in the SFBAAB (Kirk 2016). BAAQMD guidance also indicates that localized $PM_{2.5}$ risks should be evaluated using total $PM_{2.5}$ exhaust emissions (i.e., emissions from both diesel- and gasoline-powered equipment). SJVAPCD (2015a) has adopted slightly

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[5] The CARB acknowledges that air basins, in particular the SJVAB, are both contributors and receptors of pollutant transport throughout the state. While technical documents have been published analyzing the transport relationship among California air basins, quantifying the effects of pollutant transport as a result of project implementation would require detailed projections of future climatic and meteorological conditions. Air districts in the RSA have adopted thresholds and mitigation requirements that are commensurate with expected criteria air pollutant contributions from upwind air basins (CARB 2011).

different guidance and requires that diesel PM_{10} emissions serve as the basis for the risk calculations in the SJVAB. SJVAPCD has not adopted a localized $PM_{2.5}$ threshold or analysis requirement.

Air Dispersion Modeling

Analysts used USEPA's AERMOD dispersion model to quantify annual average PM concentrations at nearby receptor locations for each subsection. The modeling approach follows, where applicable, the OEHHA and California Air Pollution Control Officers Association methods, but is also consistent with SJVAPCD and BAAQMD methods, as provided in their guidance documents and based on staff consultation (SJVAPCD 2015a; BAAQMD 2012).[6] Analysts used three representative meteorological datasets, which broadly cover the different meteorological conditions in the RSA. Eight types of construction work areas were assumed to characterize construction activities and emissions. Receptor spacing was determined based on air district guidance and varies based on the type of construction (e.g., trench vs. tunnel) and location (e.g., rural vs. urban). Receptor heights were all set to 1.2 meters, consistent with OEHHA (2015) guidance.

Risk Calculations

Consistent with USEPA, CARB, and air district regulatory guidance, the HRA examines cancer and noncancer (chronic)[7] exposure to the surrounding community and uses OEHHA's guidance on risk calculations (OEHHA 2015). Cancer risk is defined as the lifetime probability (chance) of developing cancer from exposure to a carcinogen, typically expressed as the increased chance in 1 million. Noncancer chronic effects are defined as the long-term risk associated with health outcomes other than cancer, typically expressed as a ratio, with a ratio of 1.0 indicating the level at which adverse noncancer effects are likely to occur. Consistent with BAAQMD (2017a) guidance, the analysis also considers noncancer health effects from exposure to total $PM_{2.5}$ exhaust from construction in the SFBAAB.

The risk factors from OEHHA incorporate worst-case, health-protective assumptions. They were established using data from animal and epidemiological exposure studies and represent increased health effects assuming continuous lifetime exposure to a pollutant. The HRA presented in this section is therefore conservative in that it utilizes these worst-case, health-protective assumptions.

Localized Criteria Pollutant Analysis

Criteria pollutants are classified as either regional or localized pollutants. Regional pollutants can be transported over long distances and affect ambient air quality far from the emissions source. Localized pollutants affect ambient air quality near the emissions source. As discussed in Section 3.3.1, ozone is considered a regional criteria pollutant, whereas CO, NO_2, SO_2, and Pb are localized pollutants. Particulate matter can be both a local and a regional pollutant, depending on its composition. The primary criteria pollutants of concern generated by the project are ozone precursors (VOC and NO_X), NO_2, CO, PM, and SO_2.

Potential health effects induced by regional criteria pollutant emissions generated by the project (ozone precursors and PM) are evaluated using the mass emissions modeling and are discussed further in Section 3.3.6, Environmental Consequences. Localized pollutants (NO_2, CO, PM, and SO_2) generated by a project are deposited and potentially affect populations near the emissions source. Accordingly, analysts conducted a quantitative ambient air quality analysis (AAQA) to assess the potential for construction-generated criteria pollutants to cause new or contribute to existing violations of the NAAQS and CAAQS. As discussed above, the NAAQS and CAAQS are health-protective standards and define the maximum amount of ambient pollution that can be present without harming public health.

The AAQA considers annual, daily, and hourly emissions impacts of all localized criteria pollutants, as applicable based on the established air quality standard. Specifically, the pollutants

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[6] BAAQMD's conservative modeling guidance was followed for the portion of the project that traverses the MBARD.

[7] Note that the OEHHA, CARB, BAAQMD, and SJVAPCD have not identified acute health effects from diesel exhaust. Therefore, acute health effects are not included in this analysis.

of concern with established annual standards are NO_2,[8] PM_{10}, and $PM_{2.5}$. The following pollutants of concern have established hourly or daily standards:

- CO (1 hour and 8 hours)
- PM_{10} and $PM_{2.5}$ (24 hours)
- NO_2 (1 hour)
- SO_2 (1 hour and 24 hours)

The Authority modeled off-site concentrations of pollutants using the annual mass emissions inventory and the AERMOD dispersion model. A representative maximum emission scenario for hourly and daily impacts was developed for each of the project's five subsections based on maximum activity levels that could take place concurrently. All major design components of the project (e.g., viaduct, embankment, at grade) were quantitatively analyzed. The combined effect of emissions from geographically proximate construction was also assessed.

Asbestos, Lead-Based Paint, Valley Fever, and Odor Impacts

The Authority used the *San Jose to Merced Project Section Geology, Soils, and Seismicity Technical Report* (Authority 2019b) to determine if NOA occurs within the local RSA. LBP may have been used during construction of existing structures throughout the RSA. The Authority considered whether demolition would occur and whether the project would comply with applicable standards for appropriate disposal. The Valley fever and odor analyses are likewise qualitative and consider the potential for receptors to be exposed to *Coccidioides immitis* (*C. immitis*) fungus spores and nuisance odors.

Operations Impacts

The following discussion identifies the methods and assumptions used for evaluating operations-phase emissions and impacts on air quality and global climate change. The analysis is based on impact assessment in 2029 (initial operation) and 2040 (operations after initial ridership build-up). Because existing background conditions (e.g., background traffic volumes, trip distribution, and vehicle emissions) in 2015 would change over the 25-year project life, the project's air quality operations impacts are evaluated against both existing (2015) conditions and future No Project conditions as they are expected to be in 2029 and 2040 (when the full Phase 1 of the statewide HSR system is in operation). The difference between emissions with the project and without the project represents the net impact of the project.

The Authority calculated criteria pollutant and GHG emissions under two ridership scenarios: a medium ridership scenario of the Silicon Valley to Central Valley line (from San Jose to north of Bakersfield) and a high ridership scenario of the same line. Both scenarios are based on the level of ridership as presented in the Authority's *2016 Business Plan* (Authority 2016).[9] The tables in the impact analysis, therefore, present two values for operations emissions for each pollutant corresponding to these two scenarios.

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[8] NO_X is both a regional and localized pollutant. Regional effects (i.e., O_3 formation) take place over long distances and time scales and are not analyzed through a localized ambient air quality analysis. Likewise, since VOC is a regional pollutant, it is not addressed in the localized analysis. Rather, O_3 impacts (through NO_X and VOC emissions) are addressed through a comparison of project emissions to the air district and federal *de minimis* thresholds (see Table 3.3-11). Localized effects can occur from the conversion of NO_X to NO_2, and these effects are assessed through the localized NO_2 analysis to confirm emissions would not exceed the CAAQS or NAAQS.

[9] As described in Volume 2, Appendix 3.3-C, Changes to Project Benefits Based on 2018 Business Plan, the Authority Board adopted the 2018 Business Plan on May 15, 2018. The 2018 Business Plan assumes an opening year of 2033 for Phase 1 and presents different ridership forecasts for 2029 and 2040 than were assumed in this EIR/EIS. Under the 2018 Business Plan ridership forecasts, the HSR project would achieve the same benefits described in this section, but they would occur at different times and may be less than those presented in Section 3.3.6, Environmental Consequences. Nonetheless, HSR would ultimately afford a more energy-efficient choice for personal travel that would help alleviate highway congestion, provide greater capacity for goods movement, and reduce criteria pollutant and GHG emissions.

Mass Emissions Modeling

The project would affect long-distance, city-to-city travel along freeways and highways throughout the state (on-road vehicles), as well as long-distance, city-to-city aircraft takeoffs and landings (aircraft). The HSR system would also affect electrical demand throughout the state (power plants). Because the project would use electric multiple-unit (EMU) trains, train operations would not produce direct emissions from combustion of fossil fuels. However, fugitive dust from the surface surrounding the track would be resuspended by the trains traveling at high velocities (train movement). The new and expanded stations and maintenance facilities would generate local emissions from mobile sources and building operation (stations and maintenance facilities). Finally, new circuit breakers installed as part of the PG&E reconductoring work would generate additional SF_6 emissions (circuit breakers). The Authority considered emissions from these seven sources—on-road vehicles, aircraft, power plants, train movement, stations, maintenance facilities, and circuit breakers—in the analysis of operations air quality impacts, as described in the following subsections.

Operational Emission Sources

- **On-Road Vehicles**: Displaced public vehicle trips from mode shift to passenger rail.
- **Aircrafts**: Displaced public aircraft trips from mode shift to passenger rail.
- **Power Plants**: Electricity generation and distribution to power EMUs.
- **Train Movement**: Fugitive dust suspended by train movement over the rail track.
- **Stations**: Area sources (e.g., landscaping equipment), electricity and water consumption, waste generation, emergency generator testing, and vehicle traffic associated with station operation.
- **Maintenance Facilities**: Employee, delivery, and rail trips, as well as off-road maintenance equipment.
- **Circuit Breakers**: Annual leakage of SF_6 emissions.

On-Road Vehicles

Project operations would provide expanded passenger rail service between San Jose and Merced that would reduce passenger vehicle usage. The Authority evaluated reductions in on-road vehicle emissions using average daily displaced VMT estimates and the CARB's EMFAC2017 model. Appendix 3.2-B, Vehicle Miles Traveled Forecasting, describes the methodology used for forecasting the reduction in VMT. Emission reductions from displaced VMT were calculated by multiplying the estimated VMT by the applicable pollutant's emission factors from EMFAC2017, which are based on speed, vehicle mix, and analysis year.

Aircraft

Like on-road vehicles, project operations would reduce aviation demand throughout the state. The Authority used the estimated number of air trips removed attributable to the HSR system and the Federal Aviation Administration's Aviation Environmental Design Tool to estimate criteria pollutant benefits from reduced aircraft activity. The Authority modeled GHG reductions using fuel consumption and emission factors from the CARB's 2000–2014 *Greenhouse Gas Emissions Inventory Technical Support Document* and the accompanying documentation (CARB 2016b). The analysis also accounts for criteria pollutant and GHG benefits from reduced ground-maintenance equipment, which were calculated using USEPA's OFFROAD model.

Power Plants

Propulsion of the EMUs would consume electricity, which would be generated by power plants throughout the state. The Authority quantified criteria pollutant and GHG emissions based on the estimated annual electricity demand for the project and emission factors from the CARB and USEPA. The analysis conservatively assumed the HSR system would be powered by the state's current electrical grid, which is composed of renewable and nonrenewable generating units. Because an increasing fraction of future electricity will be generated by renewable resources, as required by state law (60 percent by 2030), the emissions intensity of the statewide electrical grid would be lower when the HSR system became operational in 2029 and 2040. Accordingly, electricity-related emissions generated by the project are expected to be lower than the emissions estimated for this analysis. Furthermore, under the 2013 Policy Directive POLI-PLAN-03, the Authority has adopted a goal to purchase 100 percent of the HSR system's power from renewable energy sources. This goal also supports the SB 100 policy to require 100 percent renewable energy for supply to electricity end-use customers by 2045.

Train Movement

The Authority estimated resuspended fugitive dust emissions using USEPA's (2006) method for estimating emissions from wind erosion and using assumptions from Watson (1996).

Stations

The project would include an expanded San Jose Diridon Station and either an expanded Downtown Gilroy Station or a new East Gilroy Station. Emissions associated with the operation of the stations would primarily result from area sources (e.g., landscaping equipment), electricity and water consumption, waste generation, emergency generator testing, and vehicle traffic.

Analysts estimated emissions from these sources using CalEEMod (version 2016.3.2) and project-specific data, where available. Specifically, electricity and water consumption for each facility was calculated by scaling existing utility rates (e.g., gallons of water per square foot) from the San Jose Diridon Station (McGuire 2017). This approach is conservative because the project stations would be LEED Platinum[10] certified, which would reduce utility consumption per square foot relative to the existing rate. Analysts also estimated vehicle emissions associated with passenger and employee commutes (Burton 2017–2018).

The San Jose Diridon and Gilroy Stations would have emergency generators that would be used in the event of a power outage. Usage of each of the proposed emergency generators would occur for up to 50 hours per year for periodic testing, consistent with the CARB's Airborne Toxic Control Measure for Stationary Compression Ignition Engines and Section 330.3 of BAAQMD Regulation 9, Rule 8.

Maintenance Facilities

As discussed in Chapter 2, Alternatives, two maintenance facilities would be required for the project. A maintenance of way facility (MOWF) would be built either south of Gilroy (Alternatives 1, 2, and 4) or east of Gilroy (Alternative 3), and a maintenance of way siding (MOWS) would be built near Turner Island Road (Alternatives 1, 2, 3, and 4).

Building operation and emergency generator emissions were estimated using CalEEMod (version 2016.3.2) and default assumptions for the "general light industrial" land use category. Analysts also derived emissions from employee commute and delivery trips using CalEEMod and vehicle trip information estimates (Burton 2017–2018). Emissions from maintenance equipment, vehicle, and rail movement at the MOWF were estimated using a combination of emission factors and methodologies from CalEEMod, EMFAC2017, and USEPA (2009).

Circuit Breakers

Operations and maintenance activities required for the reconductored Spring to Llagas and Green Valley to Llagas power lines would not change from those currently required for the existing system; thus, no additional operations-related criteria pollutants would occur. However, the project would require the installation of electrical equipment, including up to 12 power circuit breakers with SF_6 gas insulated switchgear. Analysts estimated potential GHG emissions (SF_6) from the additional breakers based on the mass of each breaker (230 pounds) and an assumed 0.5 percent by mass annual leak rate, per PG&E standard specifications.

Carbon Monoxide Hot Spots

Traffic around the San Jose Diridon and Gilroy Stations and affected by grade crossings (Alternative 4 only) may contribute to localized increases in CO, known as CO "hot spots." As discussed further in Section 3.3.4.5, Method for Determining Significance under CEQA, the BAAQMD has adopted screening criteria that provide a conservative indication of whether project-generated traffic would cause a potential CO hot spot. Traffic data provided by Fehr & Peers (Burton 2017–2019) indicate that no intersections in the local RSA would exceed the 24,000 vehicles per hour screening criteria. However, up to 20 intersections, depending on the

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[10] LEED, or Leadership in Energy and Environmental Design, is a widely used green building rating system developed by the United States Green Building Council. Projects pursing LEED earn points based on energy use, materials, water efficiency, and other sustainability criteria. LEED platinum is the highest rating level, corresponding to at least 80 points earned.

alternative, would violate the established level-of-service (LOS) standard in the applicable congestion management program (CMP) under 2040 Plus Project conditions, thereby failing one of BAAQMD's CO screening criteria.

Analysts performed a microscale CO hot-spot analysis at the following five locations to verify that station traffic would not cause or contribute to a violation of the CO CAAQS. These intersections were selected because they were identified as having the highest traffic volumes and worst levels of congestion/delay of the 20 intersections that would violate CMP LOS standards.

- The Alameda (State Route [SR] 82)/Taylor Street-Naglee Avenue
- Autumn Street (SR 82)/West Santa Clara Street (SR 82)
- Coleman Avenue/Interstate (I-) 880 Northbound Ramps
- Monterey Road (SR 82)/Blossom Hill Road Westbound Ramps (SR 82/County Route G10)
- U.S. Highway (US) 101 Southbound Ramps/Blossom Hill Road

In addition to these locations, the intersection of Monterey Road and Skyway Drive was analyzed under Alternative 4. The traffic analysis indicates that this intersection would have the highest traffic volumes and worst congestion of the locations analyzed with at-grade crossings (Burton 2017–2019).

Analysts evaluated the potential for CO hot spots using the California Department of Transportation Institute of Transportation Studies *Transportation Project-Level Carbon Monoxide Protocol* (CO Protocol) (Garza et al. 1997) and traffic data from Fehr & Peers (Burton 2017–2019).

Particulate Matter Hot Spots

PM hot spots may be created by localized increases in vehicle or rail traffic, particularly when that traffic consists of a significant number of diesel-powered vehicles. Redistributing or moving vehicle or rail traffic would also increase PM concentrations at certain locations and result in corresponding decreases in other locations. This section briefly discusses methods for evaluating potential PM hot spots from changes in on-road vehicle and freight rail traffic.

On-Road Vehicles

Although the project is not subject to transportation conformity, portions of the local RSA are classified as either nonattainment or maintenance for the federal PM_{10} or $PM_{2.5}$ standards. Consequently, analysts conducted a hot-spot analysis following USEPA's 2015 *Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (USEPA 2015). The analysis focused on potential air quality concerns under NEPA from the project's effects on roads and followed the recommended practice in USEPA's Final Rule regarding the localized or hot-spot analysis of $PM_{2.5}$ and PM_{10} (40 C.F.R. Part 93, issued March 10, 2006).

Freight Rail

Neither Union Pacific Railroad (UPRR) service nor associated emissions from locomotive operation would be affected, relative to existing conditions. While the source of PM emissions would shift commensurate with the lateral track shift, the amount of emissions, and therefore the potential for the project to result in new or worsened PM hot spots would not change. Accordingly, analysts did not conduct a PM hot-spot analysis for the relocated freight because the project would not change the amount of freight emissions. Potential changes in receptor exposure to DPM and $PM_{2.5}$ are analyzed under the Operations Health Risk Assessment subsection below.

Mobile Source Air Toxics

The Federal Highway Administration's (FHWA) (2016) *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents* provides advice on when and how to analyze MSATs in the NEPA process for highway projects. Depending on the specific project circumstances, FHWA has identified the following three categories of analysis:

- **Tier 1**—No analysis for projects without any potential for meaningful MSAT effects
- **Tier 2**—Qualitative analysis for projects with low potential MSAT effects

- **Tier 3**—Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects

Analysts assessed potential MSAT effects associated with the project alternatives according to FHWA's updated interim guidance and the project analysis tiers. The project would reduce regional VMT and traffic congestion, resulting in a reduction in MSAT emissions. The level of effects from regional MSAT emissions, therefore, corresponds to FHWA's Tier 1 and no further analysis was conducted. Changes in vehicle activity could result in localized MSAT increases. The potential level of effects from these circumstances corresponds to FHWA's Tier 2 and qualitative analysis was conducted.

Operations Health Risk Assessment

Freight Relocation

Project construction would reposition existing UPRR tracks. Redistributing or moving existing freight traffic would increase TAC concentrations at certain receptor locations and would result in corresponding decreases at other locations. Diesel-related exhaust, specifically DPM, is considered a carcinogenic TAC by the CARB, so an HRA was conducted to assess the risk (i.e., cancer and noncancer risks) associated with changes in operational freight activity.

Analysts used the BAAQMD's existing inventory of health risks from rail sources in the SFBAAB (Winkel 2018) to calculate the net effect of health risks associated with moving freight closer to sensitive receptors. The orientation and distance of the relocated track to existing receptors would change throughout the alignment; therefore, analysts estimated health risks at multiple locations to capture the range of potential project impacts. Analysts selected those locations where the difference in distance between the relocated and existing tracks was greatest relative to existing sensitive receptors.

Data from the Peninsula Corridor Joint Powers Board (2015) and USEPA (2009) were used to account for anticipated growth in freight traffic and changes in locomotive emission rates. The analysis assumes the freight relocation would be complete by 2022.

Diesel Buses

The San Jose Diridon and Gilroy Stations would be served by diesel-powered buses, which generate TACs at idle while loading and unloading passengers. Improved bus service to existing passenger rail terminals (San Jose Diridon and Downtown Gilroy Stations) is not part of the project. The Authority assumes that bus service levels are constant into the future because no operator has a funding plan to deliver more service. Buses operated by the Santa Clara Valley Transportation Authority (VTA) are a mix of diesel- and diesel-electric–powered vehicles. While bus service levels are assumed to be the same for either with or without project conditions, the East Gilroy Station would be an entirely new transit stop with HSR conditions. Analysts evaluated potential health risks from exposure to diesel exhaust under this specific project-induced change using transit data and USEPA's AERMOD dispersion (Burton 2019).

Emergency Generators

The San Jose Diridon and Gilroy Stations and the MOWS and MOWF would have emergency generators that would be used in the event of a power outage. These generators would be subject to the permitting requirements specified in BAAQMD Regulation 2, Rule 5, Section 302. Based on these permitting requirements, the generators would not be allowed to operate if they would result in cancer or acute hazard impacts in excess of the BAAQMD's health risk thresholds of significance. However, Regulation 2, Rule 5 does not address $PM_{2.5}$ concentrations or permit restrictions for facilities with emissions in excess of the BAAQMD's threshold of 0.3 micrograms per cubic meter ($\mu g/m^3$). Accordingly, $PM_{2.5}$ exhaust concentrations from emergency generator testing were estimated using USEPA's AERMOD dispersion model and emission data from CalEEMod.

Maintenance of Way Facility Maintenance Activities

The MOWF would use diesel-powered off-road equipment, vehicles, and locomotives to support maintenance and repair activities. Cancer and noncancer health risks, as well as $PM_{2.5}$

concentrations, were modeled using USEPA's AERMOD dispersion model. The analysis was conducted using the same general method and guidance as described for the construction HRA.

3.3.4.4 Method for Evaluating Impacts under NEPA

CEQ NEPA regulations (40 C.F.R. Parts 1500–1508) provide the basis for evaluating project effects (Section 3.1.5.4). As described in Section 1508.27 of these regulations, the criteria of context and intensity are considered together when determining the severity of the change introduced by the project:

- **Context**—For this analysis, the *context* would include existing conditions within the SFBAAB, NCCAB, and SJVAB, including the regional attainment status, existing ambient air quality monitoring data, and applicable regulations, as established by USEPA and the CARB, as well as existing conditions along the project footprint and within 1,000 feet of construction work areas and permanent project features, including the number and location of sensitive receptors.
- **Intensity**—For this analysis, *intensity* is determined by assessing the following conditions: (1) whether the project would conflict with implementation of applicable air quality plans, (2) whether the project threatens to violate or contributes to an existing or projected air quality violation, and (3) the degree to which the project would affect public health by exposing sensitive receptors to pollutant concentrations.

Analysts used the General Conformity Rule *de minimis* thresholds (40 C.F.R. Section 93.153) (Table 3.3-3) to inform the severity of an effect, where emissions in excess of these thresholds indicates that the project would not conform to the appropriate air basin SIPs. Analysts assumed that general conformity would apply only to construction of the project because the analysis demonstrates that HSR operations will decrease regional emissions of criteria pollutants.

Table 3.3-3 General Conformity Rule *de minimis* Thresholds for the Project

Air Basin	Annual Air Pollutant Emissions in Tons per Year					
	VOC	NO_X	CO	PM_{10}	$PM_{2.5}$	SO_2
SFBAAB[1]	100	100	None	None	100	100
NCCAB[2]	None	None	None	None	None	None
SJVAB[1]	10	10	None	100	100	100

[1] The General Conformity *de minimis* thresholds for criteria pollutants are based on the federal attainment status of the RSA in the SFBAAB and SJVAB. Although the RSA is in attainment for SO_2, because SO_2 is a precursor for $PM_{2.5}$, the $PM_{2.5}$ General Conformity *de minimis* thresholds are used.
[2] The NCCAB is considered attainment for all criteria pollutants. As such, a general conformity analysis is not required and there are no applicable *de minimis* thresholds.
CO = carbon monoxide
NCCAB = North Central Coast Air Basin
NO_X = nitrogen oxides
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
VOC = volatile organic compounds
RSA = resource study area
SFBAAB = San Francisco Bay Area Air Basin
SJVAB = San Joaquin Valley Air Basin
SO_2 = sulfur dioxide

3.3.4.5 Method for Determining Significance under CEQA

CEQA requires that an EIR identify the significant environmental impacts of a project (CEQA Guidelines § 15126). One of the primary differences between NEPA and CEQA is that CEQA requires a significance determination for each impact using a threshold-based analysis (see Section 3.1.3.3, Methods for Evaluating Impacts, for further information). By contrast, under NEPA, significance is used to determine whether an EIS will be required. NEPA requires that an EIS be prepared when the proposed federal action (project) as a whole has the potential to "significantly affect the quality of the human environment." Accordingly, Section 3.3.9, CEQA

Significance Conclusions, summarizes the significance of the environmental impacts on air quality and global climate change for the project. The Authority is using the following thresholds to determine if a significant impact on air quality and global climate change would occur as a result of the project. A significant impact is one that would:

- Conflict with or obstruct implementation of the applicable air quality plan.
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard.
- Expose sensitive receptors to substantial pollutant concentrations.
- Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.
- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.

As discussed throughout this section, the significance of air quality impacts is based largely on compliance with state and federal air quality standards, as well as standards and plans developed by local air districts. The primary federal and state standards are the NAAQS and CAAQS, respectively. Both the NAAQS and CAAQS have been established to protect public health and welfare. Local air districts are required to develop plans and control programs for attaining the state standards, which are generally more stringent than the corresponding federal standards and incorporate standards for additional pollutants. The air districts have also developed health-based guidance for assessing the significance of other pollutants, including asbestos. Therefore, the NAAQS and CAAQS, as well as the standards and plans developed by the air districts, provide appropriate thresholds for determining whether project-related emissions would result in a significant impact. The quantitative emissions thresholds developed by the regional air districts to evaluate the significance level of impacts are discussed in the following sections.

The analysis of localized impacts and health risks also relies on standards developed by OEHHA. OEHHA is the lead state agency for the assessment of health risks posed by environmental contaminants, including TACs and other pollutants. The agency's mission is to protect human health and the environment through scientific evaluation of risks posed by hazardous substances. The standards developed by OEHHA are based on extensive scientific evidence and are specifically intended for the protection of human health and the environment.

Impacts related to GHG emissions are evaluated based on consistency with established statewide GHG reduction goals, including the goals set forth in AB 32 and SB 32. AB 32 required California to reduce GHG emissions to 1990 levels by 2020, and SB 32 continues that timeline and requires greater reduction in GHG emissions. The GHG reduction goals are based on scientific consensus on the GHG emissions reduction needed to avert the worst effects of climate change. The CEQA Guidelines provide that a lead agency may consider a project's consistency with the State's long-term climate goals or strategies in determining the significance of impacts (CEQA Guidelines §15064.4).

In December 2018, the California Supreme Court issued its decision in *Sierra Club v. County of Fresno* (6 Cal. 5th 502) (hereafter referred to as the Friant Ranch Decision). The case considered a challenge to the long-term, regional air quality analysis in the EIR for the proposed Friant Ranch development. The Friant Ranch project is a 942-acre master-plan development in unincorporated Fresno County within the SJVAB. The Court concluded that the air quality analysis was inadequate because it failed to provide enough detail "for the public to translate the bare [criteria pollutant emissions] numbers provided into adverse health impacts or to understand why such a translation is not possible at this time." The Court's decision clarifies that environmental documents must connect a project's air quality impacts to specific health effects or explain why it is not technically feasible to perform such an analysis.

All criteria pollutants that would be generated by the proposed project are associated with some form of health risk (e.g., asthma). The potential for pollutants to affect public health depends on a multitude of variables, including how they are dispersed and transported in the atmosphere. As discussed above, both construction and operations of the project would generate regional ozone precursors (VOC and NO_X) and PM emissions. The project would also result in localized emissions of CO, NO_2, PM, and SO_2.

Quantitative emission thresholds that can be used to evaluate the significance level of regional and localized pollutants are discussed in the following subsection. To the degree feasible, the following sections discuss the project's air quality impacts in terms of specific health effects or explain why it is not technically feasible to perform such an analysis in accordance with the Friant Ranch Decision.

Regional Emissions Supplemental Thresholds

Adverse health effects induced by regional criteria pollutant emissions generated by the project (ozone precursors and PM) depend on numerous interconnected variables (e.g., cumulative concentrations, local meteorology and atmospheric conditions, the number and character of exposed individuals [e.g., age, gender]). For these reasons, ozone precursors (VOC and NO_X) contribute to the formation of ground-borne ozone on a regional scale, where emissions of VOC and NO_X generated in one area may not equate to a specific ozone concentration in that same area. Similarly, some types of particulate pollutants may be transported over long distances or formed through atmospheric reactions. As such, the magnitude and locations of specific health effects from exposure to increased ozone or regional PM concentrations are the product of emissions generated by numerous sources throughout a region, as opposed to a single individual project.

Technical limitations of existing models to correlate project-level regional emissions to specific health consequences are recognized by air quality management districts throughout the state, including the SJVAPCD and South Coast Air Quality Management District (SCAQMD), who provided *amici curiae* briefs for the Friant Ranch legal proceedings. In its brief, SJVAPCD (2015c) acknowledges that while HRAs for localized air toxics, such as DPM, are commonly prepared, "it is not feasible to conduct a similar analysis for criteria air pollutants because currently available computer modeling tools are not equipped for this task." The air district further notes that emissions solely from the Friant Ranch project (which equate to less than one-tenth of one percent of the total NO_X and VOC in the Valley) is not likely to yield valid information, and that any such information should not be "accurate when applied at the local level." SCAQMD (2015) presents similar information in their brief, stating that "it takes a large amount of additional precursor emissions to cause a modeled increase in ambient ozone levels."[11]

The BAAQMD's (2017a), MBARD's (2008), and SJVAPCD's (2015a) CEQA guidelines contain emissions thresholds used to evaluate the significance of a project's regional emissions (Table 3.3-4). If a project's emissions are below the significance thresholds, impacts would be considered less than significant and the project would not be expected to contribute a significant level of air pollution such that regional air quality in the basin would be degraded. If the construction- or operations-phase emissions are greater than these values, impacts for that phase would be considered significant and project-generated emissions may contribute to cumulative and regional health effects. In such cases, all feasible mitigation is applied, and emissions are reduced to the extent possible.

[11] For example, SCAQMD's analysis of their 2012 Air Quality Attainment Plan showed that modeled NOx and VOC reductions of 432 and 187 tons per day, respectively, only reduced ozone levels by 9 parts per billion. Analysis of SCAQMD's Rule 1315 showed that emissions of NOx and VOC of 6,620 and 89,180 pounds per day, respectively, contributed to 20 premature deaths per year and 89,947 school absences (SCAQMD 2015).

Table 3.3-4 BAAQMD, MBARD, and SJVAPCD Regional Mass Emission Thresholds

Analysis	BAAQMD[1]	MBARD	SJVAPCD
Construction	VOC: 54 lbs/day NO_X: 54 lbs/day PM_{10}: 82 lbs/day (exhaust only) $PM_{2.5}$: 54 lbs/day (exhaust only)	PM_{10}: 82 lbs/day[2]	VOC: 10 tons/year or 100 lbs/day[3] NO_X: 10 tons/year or 100 lbs/day[3] PM_{10}: 15 tons/year or 100 lbs/day[3] $PM_{2.5}$: 15 tons/year or 100 lbs/day[3] CO: 100 tons/year or 100 lbs/day[3, 4] SO_X: 27 tons/year or 100 lbs/day[3, 4]
Operation	VOC: 54 lbs/day or 10 tons/year NO_X: 54 lbs/day or 10 tons/year PM_{10}: 82 lbs/day or 15 tons/year $PM_{2.5}$: 54 lbs/day or 10 tons/year	VOC: 137 lbs/day NO_X: 137 lbs/day CO: 550 lbs/day PM_{10}: 82 lbs/day SO_2: 150 lbs/day	Same as construction

Sources: BAAQMD 2017a; MBUAPCD 2008; SJVAPCD 2015a

[1] BAAQMD's CEQA Guidelines state that the thresholds should be applied to average daily emissions. However, consultation with air district staff indicates that maximum daily emissions should be used to determine project-level impacts. Accordingly, this analysis conservatively applies BAAQMD's thresholds to maximum daily emissions.

[2] According to MBARD's CEQA guidelines, construction projects that temporarily emit precursors of O_3 (i.e., VOC or NO_X) are accommodated in the emission inventories of state and federally required air plans and would not have a significant impact on the attainment and maintenance of state or federal O_3 ambient air quality standard (MBUAPCD 2008). The MBARD guidelines have an exception if a project uses "non-typical equipment, e.g., grinders, and portable equipment"; the project would use standard construction equipment.

[3] The 100-pound-per-day threshold is a screening-level threshold to help determine whether increased emissions from a proposed project will cause or contribute to a violation of CAAQS or NAAQS. Projects with emissions below the threshold would not be in violation of CAAQS or NAAQS. Projects with emissions above the threshold would require an ambient air quality analysis to confirm this conclusion (SJVAPCD 2015a). The 100-pound-per-day threshold is applied to average daily emissions, which are calculated by amortizing emissions over the number of working days in each construction year.

[4] While CO and SO_X have more direct and localized impacts, SJVAPCD has adopted a "regional" threshold that considers basin-wide effects of cumulative CO and SO_X emissions with respect to attainment of the ambient air quality standards.

BAAQMD = Bay Area Air Quality Management District
CAAQS = California ambient air quality standards
CEQA = California Environmental Quality Act
CO = carbon monoxide
lbs = pounds
MBARD = Monterey Bay Air Resources District
NAAQS = National ambient air quality standards
NO_X = nitrogen oxide
O_3 = ozone
$PM_{2.5}$ = particulate matter that is 2.5 microns in diameter and smaller
PM_{10} = particulate matter that is 10 microns in diameter and smaller
SJVAPCD = San Joaquin Valley Air Pollution Control District
SO_X = sulfur oxide
SO_X = sulfur dioxide
VOC = volatile organic compound

The air district thresholds presented in Table 3.3-4 consider existing air quality concentrations and attainment or nonattainment designations under the NAAQS and CAAQS. The NAAQS and CAAQS are informed by a wide range of scientific evidence that demonstrates there are known safe concentrations of criteria pollutants. While recognizing that air quality is a cumulative problem, the air districts consider projects that generate criteria pollutant and ozone precursor emissions below these thresholds to be minor in nature and would not adversely affect air quality such that the NAAQS or CAAQS would be exceeded. Emissions generated by the project could increase photochemical reactions and the formation of tropospheric ozone and secondary PM, which at certain concentrations, could lead to increased incidence of specific health consequences. Although these health effects are associated with ozone and particulate pollution, the effects are a result of cumulative and regional emissions. As such, for project's with relatively small emissions contributions (i.e., emissions below the regional air district thresholds), that project's incremental contribution cannot be traced to specific health outcomes on a regional scale, and a quantitative correlation of project-generated regional criteria pollutant emissions to specific human health impacts is not technically feasible.

Localized Emissions Supplemental Thresholds

Criteria Pollutants

Localized criteria pollutants generated by a project are deposited and potentially affect population near the emissions source. Because these pollutants dissipate with distance, emissions from individual projects can result in direct and material health impacts on adjacent sensitive receptors. As discussed above, the NAAQS and CAAQS are health protective standards and define the maximum amount of ambient pollution that can be present without harming public health. Epidemiological, controlled human exposure, and toxicology studies evaluate potential health and environmental effects of criteria pollutants, and form the scientific basis for new and revised ambient air quality standards.

For localized emissions of CO, NO_2, and SO_2, the threshold is the ambient air quality standard for each respective pollutant (Table 3.3-1). The increase in pollutant concentration associated with project emissions is added to the existing concentration to estimate the total ambient air pollutant concentration for comparison with the threshold. If concentrations are below the standard, impacts would be considered less than significant and the project would not result in a localized public health concern. If concentrations are greater than the standards, impacts would be considered significant and the project may contribute to localized health effects.

Existing concentrations of PM_{10} and $PM_{2.5}$ in most of the RSA already exceed the ambient air quality standards. Analysts evaluated the potential for the project to worsen these existing violations by comparing the incremental project increase in PM concentrations to the applicable significant impact levels (SIL), as recommended by the SJVAPCD (2015a) and BAAQMD (Kirk 2016). This analysis uses the fugitive sources SILs because the construction-related emissions are principally from fugitive sources. These SILs are 10.4 $\mu g/m^3$ and 1.2 $\mu g/m^3$ for the 24-hour average PM_{10} and $PM_{2.5}$ concentrations, respectively, and 2.08 $\mu g/m^3$ and 0.2 $\mu g/m^3$ for the annual average PM_{10} and $PM_{2.5}$ concentrations, respectively. An incremental increase that does not exceed the SILs would not be considered to contribute substantially to further exceedances of the ambient air quality standards or public health effects.

Carbon Monoxide Concentrations from On-Road Vehicles

As discussed in Section 3.3.4.3, Methods for Impact Analysis, the BAAQMD has also adopted the following screening criteria that provide a conservative indication of whether project-generated traffic would cause a potential CO hot spot:

- Project traffic would not increase traffic volumes at affected intersections to more than 44,000 vehicles per hour.
- Project traffic would not increase traffic volumes at affected intersections to more than 24,000 vehicles per hour where vertical and/or horizontal mixing is substantially limited (e.g., tunnel, parking garage, bridge underpass, natural or urban street canyon, below-grade roadway).

- The project is consistent with an applicable CMP established by the county congestion management agency for designated roads or highways, RTP, and local congestion management agency plans.

The BAAQMD's screening criteria are used to evaluate whether additional project traffic would result in a CO hot spot. The health-protective CO CAAQS is used as a quantitative threshold for intersections that violate the screening criteria.

The MBARD and SJVAPCD have also adopted screening criteria for the analysis of CO hot spots from project-generated traffic. These criteria are based on whether a project would reduce the LOS at affected intersections to LOS E or F. Given that BAAQMD's screening criteria include quantitative criteria based on the number of additional vehicles added to affected intersections, BAAQMD's screening criteria are conservatively used to evaluate whether project traffic along the entire RSA would result in a CO hot spot and violation of the CO CAAQS.

Diesel Particulate Matter and Localized Particulate Matter

The BAAQMD, MBARD, and SJVAPCD have adopted separate thresholds to evaluate receptor exposure to DPM emissions. The "substantial" DPM threshold defined by the BAAQMD and MBARD is the probability of contracting cancer for the maximum exposed individual exceeding 10 in 1 million, or the ground-level concentrations of noncarcinogenic TACs resulting in a hazard index greater than 1 for the maximum exposed individual. SJVAPCD's hazard index is also greater than 1 for the maximum exposed individual, but its cancer risk threshold is 20 in 1 million.

The BAAQMD has adopted an incremental concentration-based significance threshold to evaluate receptor exposure to localized $PM_{2.5}$, where a "substantial" contribution is defined as $PM_{2.5}$ exhaust (diesel and gasoline) concentrations exceeding 0.3 μg/m^3. PM_{10} from earthmoving activities is expected to be significant without application of dust control measures. The SJVAPCD also requires dust control measures to reduce fugitive $PM_{2.5}$ and PM_{10} during construction activities.

The BAAQMD's cumulative cancer risk threshold is 100 cases per million and its noncancer thresholds are a hazard index of greater than 10.0 and a $PM_{2.5}$ concentration of greater than 0.8 μg/m^3. Neither the SJVAPCD nor MBARD have adopted cumulative health risk thresholds.

Table 3.3-5 summarizes the cancer and noncancer health risk thresholds used in the analysis.

Table 3.3-5 BAAQMD, MBARD, and SJVAPCD Cancer and Noncancer Health Risk Thresholds

Air District	Cancer Risk	Hazard Index	$PM_{2.5}$ Concentration (μg/m^3)
BAAQMD	10 per million (project) 100 per million (cumulative)	1.0 (project) 10.0 (cumulative)	0.3 (project) 0.8 (cumulative)
MBARD	10 per million (project and cumulative)	1.0 (project and cumulative)	-
SJVAPCD	20 per million (project and cumulative)	1.0 (project and cumulative)	-

Sources: BAAQMD 2017a; MBUAPCD 2008; SJVAPCD 2015a
$PM_{2.5}$ = particulate matter that is 2.5 microns in diameter and smaller
μg/m^3 = micrograms per cubic meter
\- = no threshold
BAAQMD = Bay Area Air Quality Management District
MBARD = Monterey Bay Air Resources District
SJVACPD = San Joaquin Valley Air Pollution Control District

Asbestos and Lead-Based Paint

There are no quantitative thresholds related to receptor exposure to asbestos and LBP. However, the BAAQMD, MBARD, and SJVAPCD require the demolition or renovation of asbestos- or LBP-containing building materials to comply with the limitations of the National Emissions Standards for Hazardous Air Pollutants regulations (40 C.F.R. Parts 61 and 63).

Greenhouse Gas Emissions Supplemental Thresholds

GHG emissions and global climate change represent cumulative impacts of human activities and development projects locally, regionally, nationally, and worldwide. GHG emissions cumulatively contribute to the environmental impacts of global climate change. No single project could generate enough GHG emissions to noticeably change the global average temperature; instead, the combination of GHG emissions from past, present, and future projects and activities have and will continue to contribute to global climate change and its associated environmental impacts.

None of the local air districts (BAAQMD, MBARD, or SJVAPCD) have adopted a GHG emission threshold for construction-related emissions. The BAAQMD recommends that GHG emissions from construction be quantified and disclosed, and that a determination regarding the significance of these GHG emissions be made with respect to whether a project is consistent with the AB 32 GHG emission reduction goals. The BAAQMD further recommends incorporation of best management practices (BMP) to reduce GHG emissions during construction, as feasible and applicable.

The BAAQMD and SJVAPCD have established significance thresholds to evaluate operations emissions, which apply only to land use development and stationary source projects. Similarly, MBARD recommends use of San Luis Obispo Air Pollution Control District's (SLOAPCD) residential/commercial land use threshold (Clymo 2015). The BAAQMD's, SJVAPCD's, and SLOAPCD's thresholds were also established based on statewide emission reduction goals outlined in AB 32, and do not consider deeper reductions that would be required to meet the long-term goals of SB 32, EO S-03-05, or EO B-55-18.

The project is a transportation project that does not fit into the land use development or stationary source project categories. Accordingly, there are no adopted quantitative GHG thresholds relevant to the project. Therefore, direct and indirect GHG emissions from the project are discussed with respect to larger statewide GHG emission reduction goals, where a significant impact would occur if project emissions would obstruct attainment of the targets outlined under AB 32, SB 32, EO S-03-05, or EO B-55-18.

3.3.5 Affected Environment

This section discusses the affected environment related to air quality and GHGs in the respective RSAs. The affected environment would be identical for all project alternative, because all project alternatives would be within the same regional air basins. This information provides the context for the environmental analysis and the evaluation of impacts. Refer to the Air Quality and Greenhouse Gases Technical Report (Volume 2, Appendix 3.3-A) for more detailed information on the affected environment.

3.3.5.1 Air Quality

Meteorology and Climate

California is divided into 15 air basins based on geographic features that create distinctive regional climates. The project alternatives cross the SFBAAB, NCCAB, and SJVAB. Accordingly, local meteorological conditions vary greatly in the RSA because of topography and elevation, as well as proximity to local waterbodies. This section briefly discusses climate and meteorological information associated with the three project air basins.

San Francisco Bay Area Air Basin (Santa Clara Valley Subregion)

The portion of the project in the SFBAAB crosses the Santa Clara Valley subregion. Warm summer temperatures, mild winds, and mountains surrounding the valley tend to combine to promote O_3 formation. In addition to the many local sources of pollution, prevailing winds carry O_3 precursors from surrounding counties to the Santa Clara Valley. The valley tends to channel pollutants to the southeast. On summer days, O_3 can be recirculated throughout the region. A similar recirculation pattern occurs in the winter, affecting levels of CO and PM. This movement of the air up and down the valley significantly increases the effects of pollutants (BAAQMD 2017a).

North Central Coast Air Basin

The NCCAB comprises Monterey, Santa Cruz, and San Benito Counties. A small portion of the project alignment south of Gilroy falls within the NCCAB. The semi-permanent high-pressure cell in the eastern Pacific, known as the Pacific High, is the basic controlling factor in the climate of the air basin. In the summer, the high-pressure cell is dominant and frequently leads to temperature inversions that inhibit air movement. In the fall, weak offshore flows can transport pollutants from the Bay Area or Central Valley into the NCCAB, leading to higher levels of air pollution. Air quality is generally good in the winter and early spring as the Pacific High migrates southward and has less influence on the air basin (MBUAPCD 2008).

San Joaquin Valley Air Basin

The SJVAB contains all of San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, and Tulare Counties, as well as a portion of Kern County. The portion of the project from the Pacheco Pass east falls within the SJVAB. The area has an inland Mediterranean climate that is characterized by warm, dry summers and cool winters. Although marine air generally flows into the basin from the Delta, the surrounding mountain ranges restrict air movement through and out of the valley, leading to frequent temperature inversions and poor air quality. Elevated pollutant concentrations are sometimes mediated by precipitation and fog, which tends to be greatest in the northern part of the air basin (SJVAPCD 2015a).

Pollutants of Concern

As discussed above, the federal and state governments have established NAAQS and CAAQS, respectively, for six criteria pollutants. All criteria pollutants can have human health and environmental effects at certain concentrations. The ambient air quality standards for these pollutants (Table 3.3-1) are set to project public health and the environment within an adequate margin of safety (CAA Section 109). Principal characteristics and possible health and environmental effects from exposure to the primary criteria pollutants generated by the project are discussed in the following subsections. This section also summarizes potential health effects from exposure to TAC and Valley fever.

Ozone and Precursor Emissions (VOC and NO_X)

Ozone, or smog, is photochemical oxidant that is formed when VOC and NO_X (both by-products of the internal combustion engine) react with sunlight. VOC are compounds made up primarily of hydrogen and carbon atoms. Internal combustion associated with motor vehicle usage is the major source of hydrocarbons. Other sources of VOC are emissions associated with the use of paints and solvents, the application of asphalt paving, and the use of household consumer products such as aerosols. The two major forms of NO_X are nitric oxide (NO) and NO_2. NO is a colorless, odorless gas formed from atmospheric nitrogen and oxygen when combustion takes place under high temperature and/or high pressure. NO_2 is a reddish-brown irritating gas formed by the combination of NO and oxygen. In addition to serving as an integral participant in ozone formation, NO_X also directly acts as an acute respiratory irritant and increases susceptibility to respiratory pathogens.

Ozone poses a higher risk to those who already suffer from respiratory diseases (e.g., asthma), children, older adults, and people who are active outdoors. Exposure to ozone at certain concentrations can make breathing more difficult, cause shortness of breath and coughing, inflame and damage the airways, aggregate lung diseases, increase the frequency of asthma attacks, and cause chronic obstructive pulmonary disease. Studies show associations between short-term ozone exposure and non-accidental mortality, including deaths from respiratory issues. Studies also suggest long-term exposure to ozone may increase the risk of respiratory-related deaths (USEPA 2019a). The concentration of ozone at which health effects are observed depends on an individual's sensitivity, level of exertion (i.e., breathing rate), and duration of exposure. Studies show large individual differences in the intensity of symptomatic responses, with one study finding no symptoms to the least responsive individual after a 2-hour exposure to 400 parts per billion of ozone and a 50 percent decrement in forced airway volume in the most responsive individual. Although the results vary, evidence suggest that sensitive populations (e.g., asthmatics) may be affected on days when the 8-hour maximum ozone concentration reaches 80 parts per billion (USEPA 2019b). For reference, the average background level of ozone in the Bay Area is approximately 45 parts per billion (BAAQMD 2017b).

In addition to human health effects, ozone has been tied to crop damage, typically in the form of stunted growth, leaf discoloration, cell damage, and premature death. Ozone can also act as a corrosive and oxidant, resulting in property damage such as the degradation of rubber products and other materials.

Carbon Monoxide

Carbon monoxide is a colorless, odorless, toxic gas produced by incomplete combustion of carbon substances, such as gasoline or diesel fuel. In the study area, high CO levels are of greatest concern during the winter, when periods of light winds combine with the formation of ground-level temperature inversions from evening through early morning. These conditions trap pollutants near the ground, reducing the dispersion of vehicle emissions. Moreover, motor vehicles exhibit increased CO emission rates at low air temperatures. The primary adverse health effect associated with CO is interference with normal oxygen transfer to the blood, which may result in tissue oxygen deprivation. Exposure to CO at high concentrations can also cause fatigue, headaches, confusion, dizziness, and chest pain. There are no ecological or environmental effects to ambient CO (CARB 2019a).

Particulate Matter

Particulate matter consists of finely divided solids or liquids such as soot, dust, aerosols, fumes, and mists. Two forms of particulates are now generally considered: inhalable course particles, or PM_{10}, and inhalable fine particles, or $PM_{2.5}$. Particulate discharge into the atmosphere results primarily from industrial, agricultural, construction, and transportation activities. However, wind on arid landscapes also contributes substantially to local particulate loading.

Particulate pollution can be transported over long distances and may adversely affect people's lungs, especially people who are naturally sensitive or susceptible to breathing problems. Numerous studies have linked PM exposure to premature death in people with preexisting heart or lung disease. Other symptoms of exposure may include nonfatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms. Studies show that every 1 $\mu g/m^3$ reduction in $PM_{2.5}$ results in a 1 percent reduction in mortality rate for individuals over 30 years old (BAAQMD 2017b). Depending on its composition, both PM_{10} and $PM_{2.5}$ can also affect water quality and acidity, deplete soil nutrients, damage sensitive forests and crops, affect ecosystem diversity, and contribute to acid rain (USEPA 2019c).

Nitrogen Dioxide

As discussed above, NO_2 is formed by the combination of NO and oxygen through internal combustion. Long-term exposure to high concentrations of NO_2 aggravate respiratory diseases, such as asthma, leading to increased hospital admissions. NO_2 can also reduce visibility and react with water, oxygen, and other chemicals to contribute to acid rain, which can harm sensitive ecosystems (USEPA 2019d).

Sulfur Dioxide

SO_2 is generated by burning of fossil fuels, industrial processes, and natural sources, such as volcanoes. Short-term exposure to SO_2 can aggravate the respiratory system, making breathing difficult. SO_2 can also affect the environment by damaging foliage and decreasing plant growth (USEPA 2019e).

Toxic Air Contaminants

Although NAAQS and CAAQS have been established for criteria pollutants, no ambient standards exist for TACs. A TAC is defined by California law as an air pollutant that "may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health." The primary TACs of concern associated with the project are asbestos and MSAT, including DPM.

Asbestos is the name given to several naturally occurring fibrous silicate minerals. It has been mined for applications requiring thermal insulation, chemical and thermal stability, and high tensile strength. Before the adverse health effects of asbestos were identified, asbestos was widely used as insulation and fireproofing in buildings, and it can still be found in some older buildings. It is also found in its natural state in rock or soil. The inhalation of asbestos fibers into the lungs can result in a variety of adverse health effects, including inflammation of the lungs, respiratory ailments (e.g., asbestosis, which is scarring of lung tissue that results in constricted breathing), and cancer (e.g., lung cancer and mesothelioma, which is cancer of the linings of the lungs and abdomen).

MSATs are a group of 93 compounds emitted from mobile sources that are regulated under USEPA's 2007 Rule on the Control of Hazardous Air Pollutants from Mobile Sources. USEPA has further identified nine compounds with significant contributions from mobile sources that are among the national- and regional-scale cancer risk drivers. These are acrolein, benzene, 1,3-butadiene, acetaldehyde, DPM, ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. CARB estimates that DPM emissions are responsible for about 70 percent of the total ambient air toxics risk in California (CARB 2019b). Within the Bay Area, the BAAQMD has found that of all controlled TACs, emissions of DPM are responsible for about 82 percent of the total ambient cancer risk (BAAQMD 2017b). Short-term exposure to DPM can cause acute irritation (e.g., eye, throat, and bronchial), neurophysiological symptoms (e.g., lightheadedness and nausea), and respiratory symptoms (e.g., cough and phlegm). USEPA has determined that diesel exhaust is "likely to be carcinogenic to humans by inhalation" (USEPA 2002).

Valley Fever

Valley fever is not an air pollutant, but is a disease caused by inhaling *Coccidioides immitis* fungus spores. The spores are found in certain types of soil and become airborne when the soil is disturbed. While *C. immitis* is not typically found in the Bay Area, the fungus is endemic to the Central Valley (California Department of Public Health 2017). Propagation of *C. immitis* is dependent on climatic conditions, with the potential for growth and surface exposure highest following early seasonal rains and long dry spells. *C. immitis* spores can be released when disturbed by earthmoving activities, although receptors must be exposed to and inhale the spores to be at increased risk of developing Valley fever. Moreover, exposure to *C. immitis* does not guarantee that an individual will become ill—approximately 60 percent of people exposed to the fungal spores are asymptomatic and show no signs of an infection (USGS 2000). Individuals with symptoms may develop fever, chest pain, respiratory irritation, headaches, and fatigue.

Ambient Air Quality

The existing air quality conditions in the RSA can be characterized by regional monitoring data. The CARB and various air districts operate air quality monitoring stations throughout California to monitor pollutant concentrations. For the purposes of this analysis, three stations, one in each air basin closest to the project footprint, were selected to represent conditions along the corridor: San Jose–Jackson Street (SFBAAB), Hollister–Fairview Road (NCCAB), and Merced–South Coffee Avenue (SJVAB).

Table 3.3-6 summarizes the results of ambient monitoring at the three stations, where available, for the most recent 3 years of available data (CARB 2018a; USEPA 2018a). Figure 3.3-3 shows the locations of the monitoring stations relative to the project footprint. Between 2015 and 2017, monitored CO and NO_2 concentrations did not exceed any federal or state standards at any of the three monitoring locations. However, the state and federal standards for O_3 and $PM_{2.5}$ and state standard for PM_{10} were exceeded. Using violations of the ambient air quality standards as a proxy for air quality, conditions tend to be poorest in the eastern portion of the RSA in Merced County, with improving air quality as the RSA moves westward to the SFBAAB. As discussed above, the ambient air quality standards define clean air and represent the maximum amount of pollution that can be present in outdoor air without any harmful effects on people and the environment. Existing violations of the ozone and PM ambient air quality standards indicate that certain individuals exposed to this pollutant may experience certain health effects, including increased incidence of cardiovascular and respiratory ailments.

The four NAAQS/CAAQS designations are defined as follows:

- **Nonattainment**: Assigned to areas where monitored pollutant concentrations consistently violate the standard in question.
- **Maintenance**: Assigned to areas where monitored pollutant concentrations exceeded the standard in question in the past, but are no longer in violation of that standard.
- **Attainment**: Assigned to areas where pollutant concentrations meet the standard in question over a designated period of time.
- **Unclassified**: Assigned to areas where data are insufficient to determine whether a pollutant is violating the standard in question.

Attainment Status

Local monitoring data (Table 3.3-6) are used to designate areas as nonattainment, maintenance, attainment, or unclassified for the NAAQS and CAAQS. Table 3.3-7 summarizes the attainment status of the portions of the SFBAAB, NCCAB, and SJVAB along the project corridor with regard to the NAAQS and CAAQS.

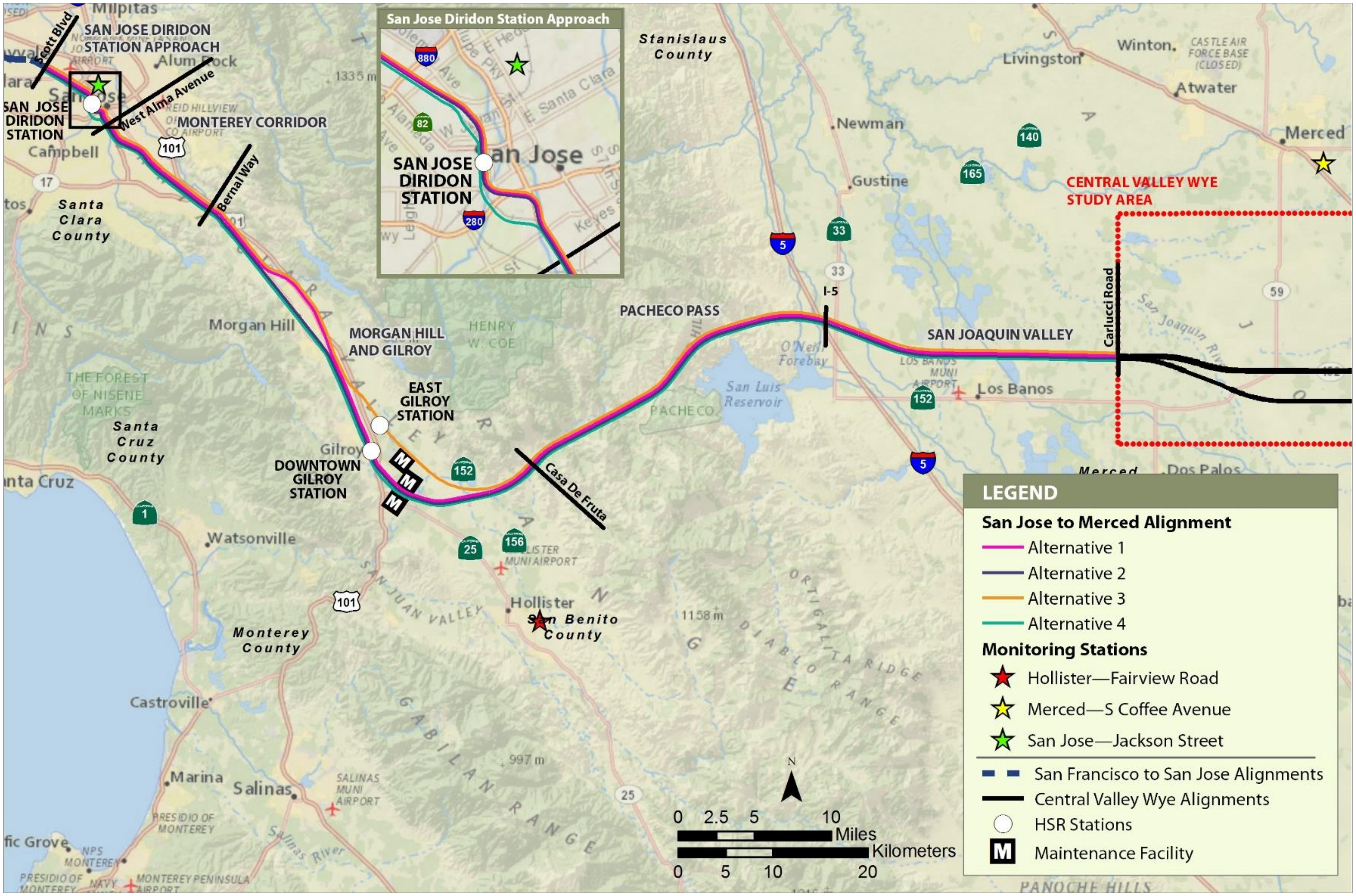
Table 3.3-6 Ambient Criteria Pollutant Concentrations at Air Quality Monitoring Stations along the Project Corridor

Pollutant and Standards	San Jose—Jackson Street			Hollister—Fairview Road			Merced—South Coffee Avenue		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
Ozone (O_3)									
Maximum 1-hour concentration (ppm)	0.094	0.087	0.121	0.079	0.073	0.078	0.102	0.097	0.093
Maximum 8-hour concentration (ppm)	0.081	0.066	0.088	0.065	0.060	0.072	0.089	0.086	0.084
Number of days standard exceeded[1]									
CAAQS 1-hour (>0.09 ppm)	0	0	3	0	0	0	2	2	0
NAAQS 8-hour (>0.070 ppm)	2	0	4	0	0	1	29	28	16
CAAQS 8-hour (>0.070 ppm)	2	0	4	0	0	1	34	29	17
Carbon Monoxide (CO) [b]									
Maximum 8-hour concentration (ppm)	1.8	1.4	1.8	N/A	N/A	N/A	N/A	N/A	N/A
Maximum 1-hour concentration (ppm)	2.4	1.9	2.1	N/A	N/A	N/A	N/A	N/A	N/A
Number of days standard exceeded[1]									
NAAQS 8-hour (≥9 ppm)	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A
CAAQS 8-hour (≥9.0 ppm)	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A
NAAQS 1-hour (≥35 ppm)	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A
CAAQS 1-hour (≥20 ppm)	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A
Nitrogen Dioxide (NO_2) [a]									
National maximum 1-hour concentration (ppm)	49.3	51.1	67.5	N/A	N/A	N/A	35.0	35.4	38.9
State maximum 1-hour concentration (ppm)	49	51	67	N/A	N/A	N/A	35	35	38
State annual average concentration (ppm)	12	11	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Number of days standard exceeded[1]									
NAAQS 1-hour (98th Percentile>0.100 ppm)	0	0	0	N/A	N/A	N/A	0	0	0
CAAQS 1-hour (0.18 ppm)	0	0	0	N/A	N/A	N/A	0	0	0

Pollutant and Standards	San Jose—Jackson Street			Hollister—Fairview Road			Merced—South Coffee Avenue		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
Annual standard exceeded?[1]									
NAAQS annual (>0.053 ppm)	No	No	No	N/A	N/A	N/A	No	No	No
CAAQS annual (>0.030 ppm)	No	No	No	N/A	N/A	N/A	No	No	No
Particulate Matter (PM_{10})[2, a]									
National[3] maximum 24-hour concentration (mg/m^3)	58.8	40.0	69.4	65.8	44.3	80.9	N/A	N/A	N/A
National[3] second-highest 24-hour concentration (mg/m^3)	47.2	35.2	67.3	52.5	43.2	74.7	N/A	N/A	N/A
State[4] maximum 24-hour concentration (mg/m^3)	58.0	41.0	69.8	N/A	N/A	N/A	N/A	N/A	N/A
State[4] second-highest 24-hour concentration (mg/m^3)	49.3	37.5	67.6	N/A	N/A	N/A	N/A	N/A	N/A
National annual average concentration (mg/m^3)	21.3	17.5	20.7	17.4	16.5	19.6	NA	NA	NA
State annual average concentration (mg/m^3)[5]	21.9	18.3	21.3	N/A	N/A	N/A	N/A	N/A	N/A
Number of days standard exceeded[1]									
NAAQS 24-hour (>150 mg/m^3)[6]	0	0	0	0	0	0	N/A	N/A	N/A
CAAQS 24-hour (>50 mg/m^3)[6]	3	0	19	N/A	N/A	N/A	N/A	N/A	N/A
Annual standard exceeded?[1]									
CAAQS annual (>20 mg/m^3)	Yes	No	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Particulate Matter ($PM_{2.5}$)[a]									
National[3] maximum 24-hour concentration (mg/m^3)	49.4	22.6	49.7	18.6	20.4	42.0	61.2	43.0	48.2
National[3] second-highest 24-hour concentration (mg/m^3)	37.0	21.8	46.5	14.6	17.2	34.3	55.7	43.0	47.4
State[4] maximum 24-hour concentration (mg/m^3)	49.4	22.7	49.7	18.6	20.4	42.0	61.2	43.0	48.2
State[4] second-highest 24-hour concentration (mg/m^3)	37.0	21.8	46.5	14.6	17.2	34.3	55.7	43.0	47.4
National annual average concentration (mg/m^3)	9.9	8.3	9.5	4.2	4.3	5.0	12.7	11.9	N/A
State annual average concentration (mg/m^3)[5]	10.6	8.4	N/A	4.3	N/A	5.1	N/A	N/A	11.9
Number of days standard exceeded[1]									
NAAQS 24-hour (>35 mg/m^3)	2	0	6	0	0	1	16	5	N/A

Pollutant and Standards	San Jose—Jackson Street			Hollister—Fairview Road			Merced—South Coffee Avenue		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
Annual standard exceeded?[1]									
NAAQS annual (>12.0 mg/m³)	No	No	No	No	No	No	No	No	N/A
CAAQS annual (>12 mg/m³)	No	No	No	No	No	No	No	N/A	No
Sulfur Dioxide (SO_2)									
No data available	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Sources: [a] CARB 2018a; [b] USEPA 2018a
[1] An exceedance of a standard is not necessarily a violation because of the regulatory definition of a violation.
[2] National statistics are based on standard conditions data. In addition, national statistics are based on samplers using federal reference or equivalent methods.
[3] State statistics are based on local conditions data.
[4] Measurements usually are collected every 6 days.
[5] State criteria for sufficiently complete data for calculating valid annual averages are more stringent than the national criteria.
[6] Mathematical estimate of how many days' concentrations would have been measured as higher than the level of the standard had each day been monitored. Values have been rounded.
> = greater than or equal to
≥ = greater than
CAAQS = California ambient air quality standards
CO = carbon monoxide
mg/m^3 = milligrams per cubic meter
N/A = not applicable or there was insufficient or no data available to determine the value
NAAQS = national ambient air quality standards
NO_2 = nitrogen dioxide
O_3 = ozone
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
ppm = parts per million
SO_2 = sulfur dioxide



Sources: Authority 2019a; CARB 2018a

MARCH 2019

Figure 3.3-3 Monitoring Station Locations

Table 3.3-7 Federal and State Attainment Status along the Project Corridor within the SFBAAB, NCCAB, and SJVAB

Pollutant	SFBAAB		NCCAB		SJVAB	
	Federal	State	Federal	State	Federal	State
Ozone (O_3)	Nonattainment (marginal)	Nonattainment	Attainment/ Unclassified	Nonattainment-Transitional	Nonattainment (extreme)	Nonattainment
Particulate matter (PM_{10})	Attainment/ Unclassified	Nonattainment	Attainment/ Unclassified	Nonattainment	Maintenance (serious)	Nonattainment
Particulate matter ($PM_{2.5}$)	Nonattainment (moderate)	Nonattainment	Attainment/ Unclassified	Attainment	Nonattainment (serious/moderate)	Nonattainment
Carbon monoxide (CO)	Attainment	Attainment	Attainment	Unclassified	Attainment	Unclassified
Nitrogen dioxide (NO_2)	Attainment/ Unclassified	Attainment	Attainment/ Unclassified	Attainment	Attainment/ Unclassified	Attainment
Sulfur dioxide (SO_2)	Attainment/ Unclassified	Attainment	Attainment/ Unclassified	Attainment	Attainment/ Unclassified	Attainment

Sources: CARB 2018b; USEPA 2018b
CO = carbon monoxide
NCCAB = North Central Coast Air Basin
NO_2 = nitrogen dioxide
O_3 = ozone
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SFBAAB = San Francisco Bay Area Air Basin
SJVAB = San Joaquin Valley Air Basin
SO_2 = sulfur dioxide

Sensitive Receptors

Sensitive receptors are people who have an increased sensitivity to air pollution or environmental contaminants. Sensitive receptor locations include schools, parks and playgrounds, daycare centers, nursing homes, and hospitals. Residential dwellings are also considered sensitive land uses because people can be exposed to pollutants for extended periods. Recreational areas are considered moderately sensitive to poor air quality because vigorous exercise associated with recreation places a high demand on the human respiratory function.

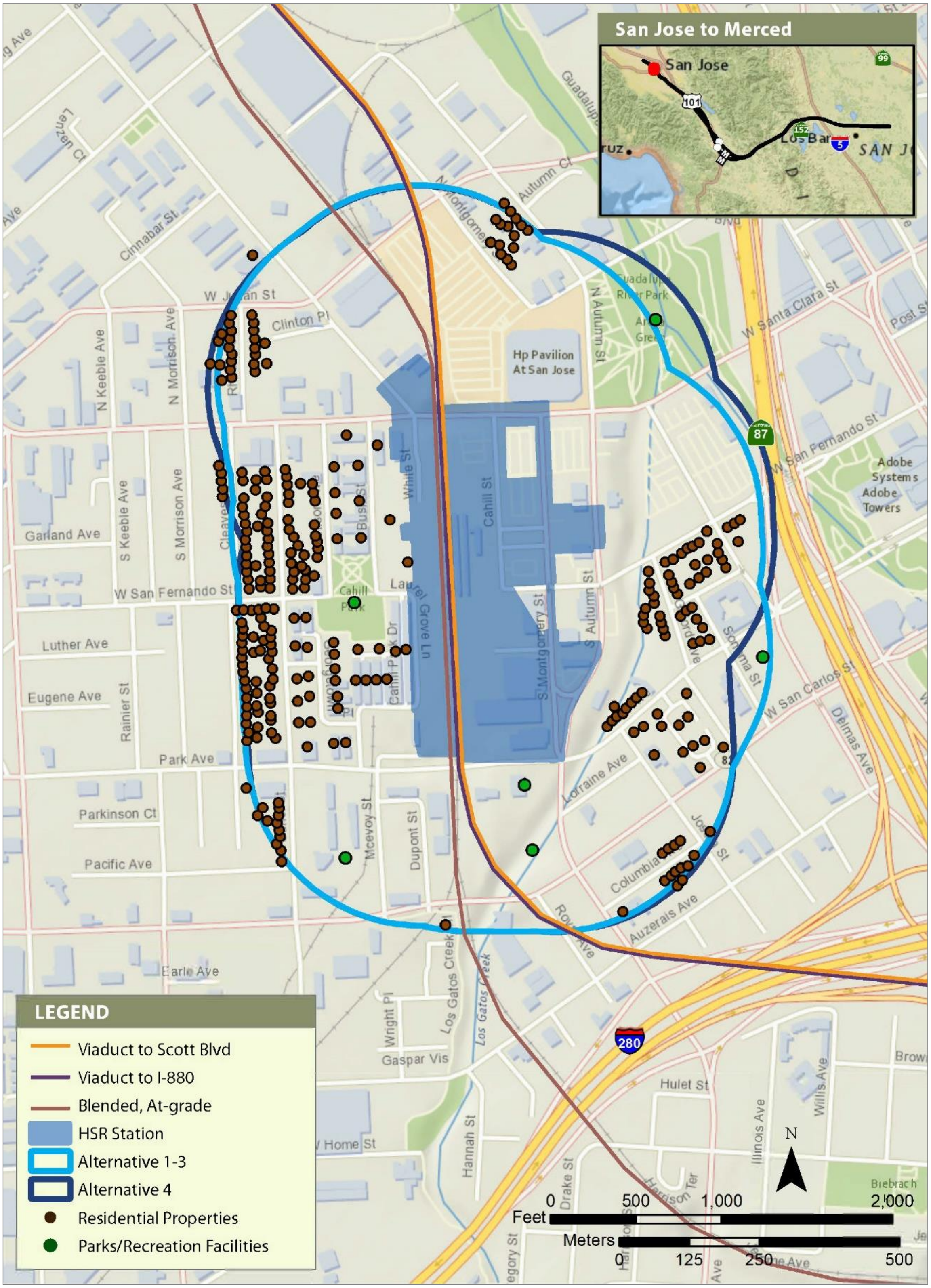
Analyses performed by the CARB indicate that providing a separation of at least 1,000 feet from diesel sources and high-traffic areas would substantially reduce exposure to air contaminants and decrease asthma symptoms in children (CARB 2005). Sensitive receptor locations located within 1,000 feet of the San Jose Diridon Station, Downtown Gilroy Station, East Gilroy Station, and East Gilroy MOWF are shown in Table 3.3-8 and on Figure 3.3-4 through Figure 3.3-7. There are no receptors within 1,000 feet of the South Gilroy MOWF. In the RSA, residential land uses are the most common. Other sensitive receptor locations along the corridor include child care/schools, elder care facilities, and parks/recreational facilities.

Table 3.3-8 Sensitive Receptor Locations within 1,000 Feet of the San Jose Diridon and Gilroy Stations and East Gilroy Maintenance of Way Facility

Station and Receptor	Distance from Station (feet)[1]	
San Jose Diridon Station	**Alternatives 1, 2, and 3**	**Alternative 4**
Nearest residential receptor	33	36
Arena Green Park	-	802
Cahill Park	325	326
Planned community park	144	144
Discovery Dog Park	957	-
Los Gatos Creek Trail	527	527
Sunol Community Day School play area (school is closed by grass and blacktop remain)	745	745
Crossroads Community Day School	649	642
Edge High School	973	973
Founders Community Day School	973	973
Downtown Gilroy Station	**Alternatives 1 and 2**	**Alternative 4**
Nearest residential receptor	17	41
Elliot Elementary School (play area)	839	939
Forest Street Park	244	362
Wheeler Tot Lot	826	816
Elliot Elementary School	703	804
Miranda's Residential Care Home	934	971

Station and Receptor	Distance from Station (feet)[1]
East Gilroy Station	**Alternative 3**
Nearest residential receptor	21
East Gilroy Maintenance of Way Facility[2]	**Alternative 3**
Nearest residential receptor	90
Pacific Point Christian School play yard	775
Pacific Point Christian School	463

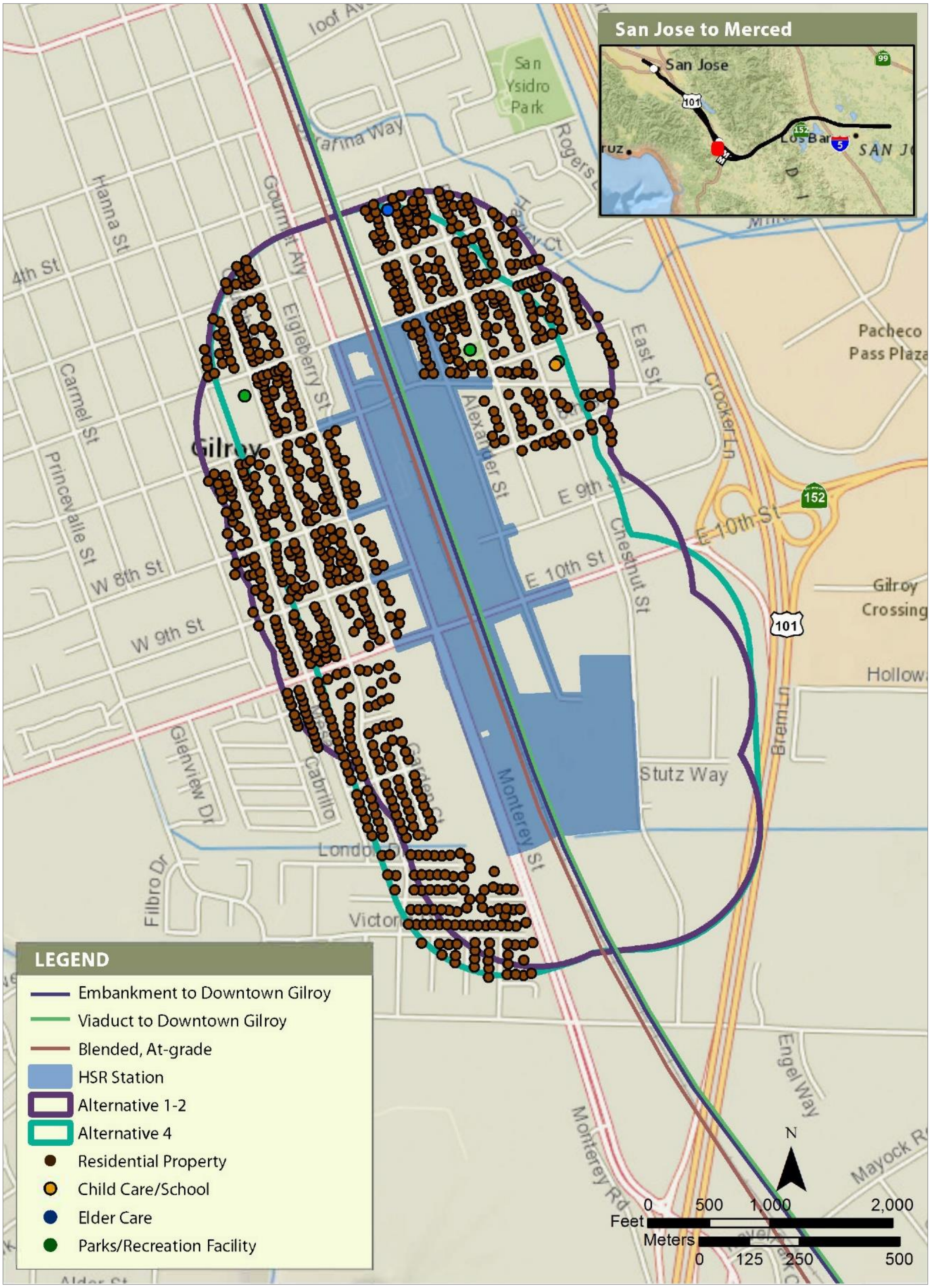
Sources: Authority 2019a; CPAD 2016
[1] Distance measured from the receptor to the closest edge of the temporary construction areas associated with the stations, as shown in Figure 3.3-4 through Figure 3.3-7.
[2] There are no sensitive receptors within 1,000 feet of the South Gilroy maintenance of way facility.



Sources: Authority 2019a; CPAD 2016; Google Inc. 2018

JUNE 2019

Figure 3.3-4 Sensitive Receptor Locations within 1,000 Feet of the San Jose Diridon Station



Sources: Authority 2019a; CPAD 2016; Google Inc. 2018

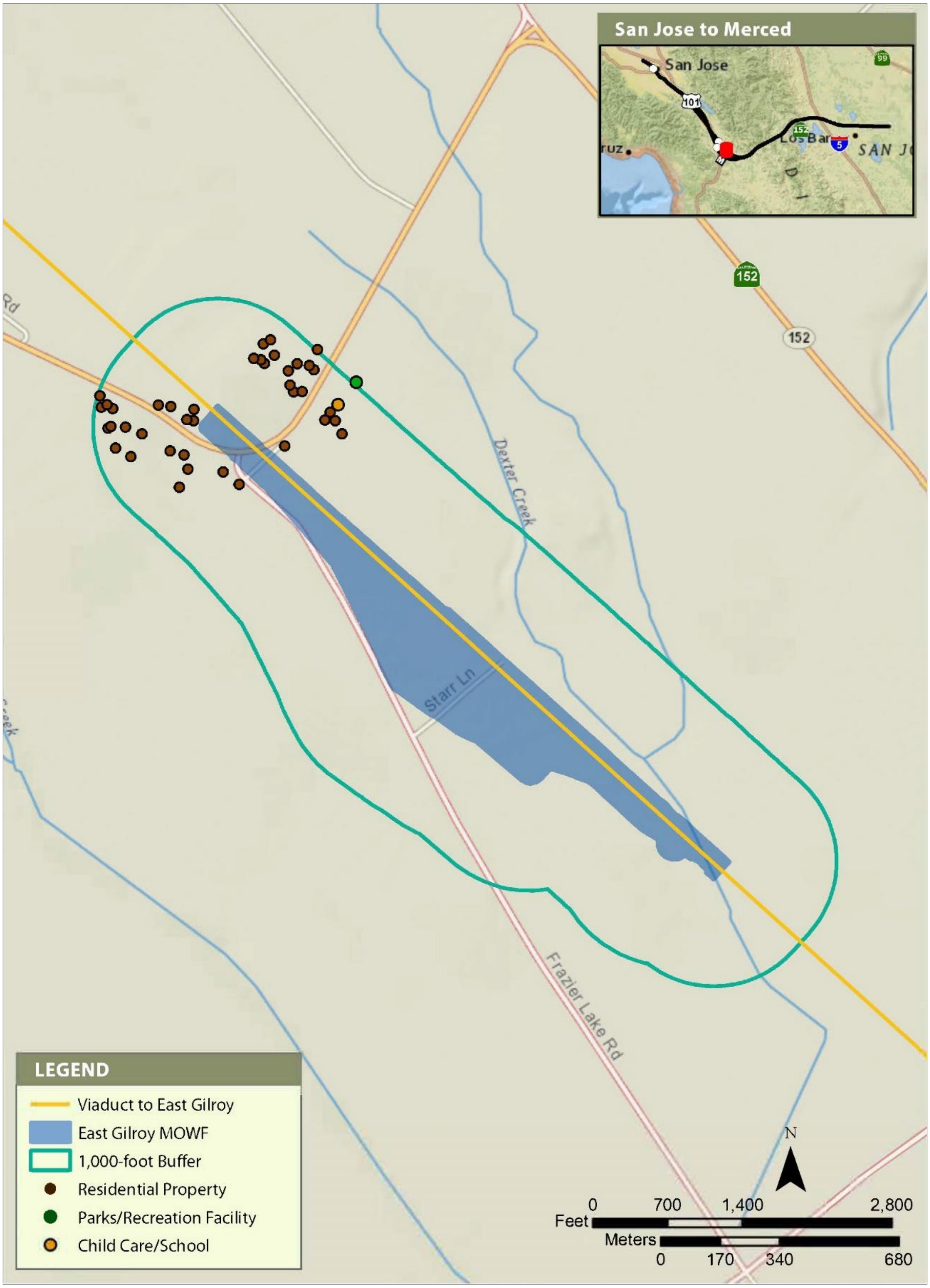
JUNE 2019

Figure 3.3-5 Sensitive Receptor Locations within 1,000 Feet of the Downtown Gilroy Station

Sources: Authority 2019a; CPAD 2016; Google Inc. 2018

JUNE 2019

Figure 3.3-6 Sensitive Receptor Locations within 1,000 Feet of the East Gilroy Station



Sources: Authority 2019a; CPAD 2016; Google Inc. 2018 OCTOBER 2019

Figure 3.3-7 Sensitive Receptor Locations within 1,000 Feet of the East Gilroy Maintenance of Way Facility

Air Quality Plans

As discussed in Section 3.3.2.3, Regional and Local, the CARB and local air districts within the RSA have prepared SIPs that describe how areas will attain NAAQS, where applicable. Table 3.3-9 summarizes the status of each SIP relevant to the RSA.

Table 3.3-9 State Implementation Plans

Plan	Status
2001 San Francisco Bay Area Ozone Attainment Plan for the 1-Hour National Ozone Standard	In a March 30, 2001, Fed. Reg. notice (66 Fed. Reg. 17379), USEPA proposed to make a finding that the Bay Area has not attained the national 1-hour O_3 standard. USEPA proposed partial approval and partial disapproval of the 1999 Ozone Attainment Plan. On August 28, 2001, USEPA took final action on its March 2001 notice, triggering a CAA requirement that a new plan be submitted within 1 year of the effective date of USEPA's final action. The revised 2001 Ozone Attainment Plan included the necessary changes to address the USEPA's disapproval of the prior plan. In addition, to address the requirements triggered by the USEPA's finding of failure to attain, the plan included a new emissions inventory and commitments to adopt and implement additional control measures to attain the standard by 2006, the attainment deadline. It also included additional contingency measures in the event the Bay Area did not attain the standard by 2006.
2017 Clean Air Plan	Although not a federal planning document, the Bay Area 2017 Spare the Air, Cool the Climate (Clean Air Plan) provided a comprehensive plan to improve Bay Area air quality and protect public health. The Clean Air Plan defined a control strategy that the BAAQMD and its partners is implementing to: (1) attain all state and national ambient air quality standards; (2) eliminate disparities among Bay Area communities in cancer health risk from toxic air contaminants; and (3) reduce GHG emissions to protect the climate.
2005 Report on Attainment of the California Particulate Matter Standards in the Monterey Bay Region	Although not a federal planning document, the plan fulfilled the requirements of Senate Bill 656 to reduce public exposure to PM. The plan outlines readily available, feasible, and cost-effective control measures for PM within the MBARD.
2007 Federal Maintenance Plan for Maintaining the National Ozone Standard in the Monterey Bay Region	This plan presents the strategy for maintaining the NAAQS for O_3 in the NCCAB. The NCCAB attained the 8-hour NAAQS in 2014.
2012–2015 Air Quality Management Plan	Although not a federal planning document, the Air Quality Management Plan is prepared triennially by the MBARD to document the region's continued progress toward meeting the state 8-hour O_3 standard.
2007 PM_{10} Maintenance Plan and Request for Redesignation	On September 25, 2008, USEPA redesignated the San Joaquin Valley to attainment for the PM_{10} NAAQS and approved the 2007 PM_{10} Maintenance Plan.

Plan	Status
2007 8-Hour Ozone Plan	On May 5, 2010, USEPA reclassified the 8-hour O_3 nonattainment status of the San Joaquin Valley from "serious" to "extreme." The reclassification required the state to incorporate more stringent requirements, such as lower permitting thresholds, and implement reasonably available control technologies at more sources. The 2007 8-hour Ozone Plan contained a comprehensive and exhaustive list of regulatory and incentive-based measures to reduce emissions of O_3 and PM precursors throughout the San Joaquin Valley. On December 18, 2007, the SJVAPCD Governing Board adopted the plan with an amendment to extend the rule adoption schedule for organic waste operations. On January 8, 2009, USEPA found that the motor vehicle budgets for 2008, 2020, and 2030 from the 2007 8-hour Ozone Plan were not adequate for transportation conformity purposes. The next plan will address USEPA's 2008 8-hour O_3 standard of 75 parts per billion.
2013 Plan for the Revoked 1-Hour Ozone Standard	On September 19, 2013, USEPA approved the San Joaquin Valley's 2013 Plan for the Revoked 1-Hour Ozone Standard. Effective June 15, 2005, USEPA revoked the federal 1-hour O_3 standard for areas including the SJVAB.
2015 Plan for the 1997 $PM_{2.5}$ Standard	On April 30, 2008, the SJVAPCD adopted the 2008 $PM_{2.5}$ Plan, satisfying all federal implementation requirements for the 1997 federal $PM_{2.5}$ standard. Per guidance from USEPA, the plan addressed the 1997 $PM_{2.5}$ standard under Subpart 1 of federal CAA Title 1, Part D (Subpart 1). Subsequently, in 2013, the U.S. Court of Appeals for the District of Columbia Circuit ruled that USEPA erred by solely using CAA Subpart 1 in establishing its $PM_{2.5}$ implementation rule, without consideration of the PM-specific provisions in CAA Title 1, Part D, Subpart 4 (Subpart 4). In June 2014, USEPA classified the SJVAB as a "moderate" nonattainment area under Subpart 4. USEPA recently reclassified the Valley as "serious" nonattainment effective May 7, 2015. The 2015 $PM_{2.5}$ Plan addresses the federal mandates for a "serious" nonattainment area related to the 1997 $PM_{2.5}$ standard.
2016 Moderate Area Plan for the 2012 $PM_{2.5}$ Standard	The 2016 Moderate Area Plan addresses the federal mandates for areas classified as "moderate" nonattainment for the 2012 $PM_{2.5}$ federal annual air quality standard of 12 micrograms per cubic meter
2016 Plan for the 2008 8-Hour Ozone Standard[1]	The SJVAPCD adopted the 2016 Plan for the 2008 8-Hour Ozone Standard in June 2016. This plan satisfies CAA requirements and provides for expeditious attainment of the 75 parts per billion 8-hour O_3 standard.
2018 $PM_{2.5}$ Plan	The 2018 $PM_{2.5}$ Plan provides a single integrated plan to attain the federal health-based 1997, 2006, and 2012 NAAQS. The plan builds upon comprehensive strategies already in place from previously adopted SJVAPCD attainment plans and measures.

Sources: BAAQMD 2001, 2017b; MBUAPCD 2005, 2007, 2017; SJVAPCD 2007a, 2007b, 2013, 2015b, 2016a, 2016b, 2018

BAAQMD = Bay Area Air Quality Management District
Bay Area = San Francisco Bay Area
CAA = Clean Air Act
Fed. Reg. = *Federal Register*
GHG = greenhouse gases
MBARD = Monterey Bay Air Resources District
NAAQS = national ambient air quality standards
NCCAB = North Central Coast Air Basin
O_3 = ozone
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SJVAPCD = San Joaquin Valley Air Pollution Control District
USEPA = U.S. Environmental Protection Agency

Emissions Inventory

An emissions inventory is an accounting of the total emissions from all sources in a geographic area over a specified time period. Emission inventories are used in air quality planning and can provide a general indication of existing air quality in an area.

The CARB maintains an annual emission inventory for each county and air basin in the state. The inventories for Santa Clara, San Benito, and Merced Counties consist of data submitted to the CARB by the local air districts, plus estimates for certain source categories, which are provided by CARB staff. Based on the 2012 air pollutant inventory data, except for San Benito County, mobile source emissions represent most of the VOC, NO_X, and CO emissions. In San Benito County, area sources represent most VOC emissions, and mobile source emissions represent the majority of NO_X and CO. Area sources represent the majority of PM_{10} and $PM_{2.5}$ emissions in all three counties.

3.3.5.2 Greenhouse Gases

The CARB (2018c) maintains a statewide emissions inventory of GHGs. In 2016, the largest contributor to GHG emissions was the transportation sector (41 percent). This sector includes emissions from on-road vehicles, intrastate aviation, waterborne vessels, and rail operations. The next largest contributor to emissions was the industrial sector (23 percent), followed by electricity generations (in-state and imports).

3.3.6 Environmental Consequences

This section discusses the potential impacts on air quality and climate change that could result from the No Project Alternative and implementing the project alternatives. It is organized by topic: violations of ambient air quality standards and conflicts with air quality attainment plans within each air basin (SFBAAB, NCCAB, and SJVAB), followed by potential exposure of receptors to increased health risks and odors. Construction-related emissions are presented first followed by emissions during long-term operations.

3.3.6.1 Air Quality

Project construction and operations could result in temporary and permanent impacts on air quality. The types of impacts analyzed in this section include the potential degradation of air quality in the SFBAAB, NCCAB, and SJVAB; exposure of sensitive receptors to pollutant concentrations; and elevated health risks.

No Project Impacts

The population of the Bay Area and San Joaquin Valley is expected to grow through 2040 (Section 2.6.1.1, Projections Used in Planning). The population in the San Joaquin Valley is projected to grow at a higher rate than any other region in California. Development in the Bay Area and San Joaquin Valley to accommodate the population increase would continue under the No Project Alternative and result in associated direct and indirect impacts on air quality and GHGs. The No Project Alternative considers the impacts of conditions forecasted by current plans for land use and transportation near the project, including planned improvements to the highway, aviation, conventional passenger rail, freight rail, and port systems through the 2040 planning horizon for the environmental analysis if the project is not built. Without the project, the regional VMT would be higher, resulting in increased pressure to improve capacity for all transportation modes throughout the area. The Authority estimates that additional highway and airport projects (up to 4,300 highway lane miles, 115 airport gates, and 4 airport runways) would be planned and constructed to achieve equivalent capacity and relieve this increased pressure (Authority 2012). Planned and other reasonably foreseeable projects anticipated to be built by 2040 would include residential, commercial, industrial, recreational, and transportation projects, all of which could contribute to regional air quality conditions. A full list of anticipated future development projects is provided in Volume 2 in Appendix 3.19-A, Nontransportation Plans and Projects, and Appendix 3.19-B, Transportation Plans and Projects.

The anticipated improvements in emissions efficiency for on-road vehicles and aircraft in the future have been incorporated into the No Project Alternative analysis. Additionally, because of the state requirement that an increasing fraction (60 percent by 2030) of electricity generated for the state's power portfolio come from renewable energy sources, it is likely that future emissions from power plant sources would be lower than the emissions estimated for this analysis, which is based on the state's existing mix of renewable and nonrenewable sources.

Table 3.3-10 and Table 3.3-11 summarize estimated emissions under the No Project Alternative in 2015, 2029, and 2040, which correlate with assumptions under the medium and high ridership scenarios, respectively. As shown in the tables, total emissions for some pollutants would decrease from 2015 to 2040 (VOC, CO, and NO_X). For other pollutants (SO_2, PM_{10}, and $PM_{2.5}$), total emissions would increase from 2015 to 2040. The increase in PM would be primarily a result of higher VMT, aircraft, and electricity demand brought about by population and economic growth. The increase in SO_2 would be primarily related to growth in air travel and power plant production. The decrease in other pollutants would result from expected improvements in on-road vehicle engine technology, fuel efficiency, and turnover in older, more heavily polluting vehicles, which would offset emissions increases from higher on-road VMT and aircraft and power plant activity.

Table 3.3-10 Estimated Statewide Emissions, No Project Alternative: Medium Ridership Scenario

Emission Source	VOC (tons/yr)	CO (tons/yr)	NO_X (tons/yr)	SO_2 (tons/yr)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2015						
On-road vehicles	7,839	324,144	33,370	767	22,981	6,242
Aircraft	338	2,888	2,779	299	84	84
Power plants	1,893	25,767	13,476	1,609	3,189	2,880
Total statewide emissions	10,070	352,800	49,624	2,675	26,254	9,206
2029						
On-road vehicles	1,712	125,365	9,783	577	26,322	6,998
Aircraft	411	3,445	3,391	367	103	102
Power plants	2,310	34,760	14,890	1,936	3,807	3,442
Total statewide emissions	4,434	163,570	28,064	2,880	30,232	10,542
2040						
On-road vehicles	1,059	91,121	6,688	534	28,262	7,383
Aircraft	474	3,968	3,908	423	118	118
Power plants	2,579	39,173	16,080	2,104	4,082	3,686
Total statewide emissions	4,112	134,261	26,676	3,062	32,463	11,187

Source: Authority 2019c
Totals may not add up exactly because of rounding.
CO = carbon monoxide
NO_X = nitrogen oxide
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year

Table 3.3-11 Estimated Statewide Emissions, No Project Alternative: High Ridership Scenario

Emission Source	VOC (tons/yr)	CO (tons/yr)	NO_X (tons/yr)	SO_2 (tons/yr)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2015						
On-road vehicles	7,800	322,534	33,204	763	22,867	6,211
Aircraft	315	2,692	2,589	279	78	78
Power plants	1,893	25,767	13,476	1,609	3,189	2,880
Total statewide emissions	10,008	350,993	49,269	2,651	26,134	9,170
2029						
On-road vehicles	1,725	126,531	9,983	590	26,898	7,147
Aircraft	341	2,856	2,811	304	85	85
Power plants	2,310	34,760	14,890	1,936	3,807	3,442
Total statewide emissions	4,377	164,146	27,684	2,830	30,789	10,674
2040						
On-road vehicles	1,093	94,097	6,907	552	29,185	7,625
Aircraft	520	4,348	4,282	464	129	129
Power plants	2,579	39,173	16,080	2,104	4,082	3,686
Total statewide emissions	4,192	137,618	27,269	3,120	33,397	11,440

Source: Authority 2019c
Totals may not add up exactly because of rounding.
CO = carbon monoxide
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year

Project Impacts

Construction Impacts

Project construction would include earthworks and excavation support, tunnel, bridge and aerial structure construction, station construction, track work, and railway systems construction. Chapter 2, Alternatives, provides detailed descriptions of construction activities.

Impact AQ#1: Temporary Direct and Indirect Impacts on Air Quality within the SFBAAB

The predominant pollutants associated with project construction are fugitive dust (PM_{10} and $PM_{2.5}$) from earthmoving activities and combustion pollutants, particularly O_3 precursors (NO_X and VOC) and CO from heavy equipment and trucks. VOCs would also be generated from paints and other coatings used during construction activities.

Table 3.3-12 presents construction emissions from Alternatives 1 through 4 in the SFBAAB in tons per year and pounds per day. Exceedances of General Conformity *de minimis* levels and BAAQMD CEQA thresholds are shown in bolded underline with an asterisk (*). The emissions calculations incorporate the following air quality IAMFs.

- AQ-IAMF#1 would minimize fugitive dust emissions through the implementation of a dust control plan. The fugitive dust control plan would outline measures such as washing vehicles before exiting the construction site, watering unpaved surfaces, limiting vehicle travel speed, and suspending dust-generating activities during high wind events.
- AQ-IAMF#2 would minimize off-gassing emissions of VOCs that would occur from paints and other coatings by requiring the use of low-VOC paint and super-compliant or Clean Air paint that has a lower VOC content than that required by air district rules.
- AQ-IAMF#3 would minimize exhaust emissions from off-road equipment with renewable diesel. Renewable diesel is produced from non-petroleum renewable resources and waste products and generates substantially fewer emissions than traditional diesel per gallon combusted.
- AQ-IAMF#4 would minimize exhaust emissions from off-road equipment by requiring all heavy-duty equipment used during the construction phase to meet Tier 4 engine requirements. Tier 4 engine requirements are currently the strictest emissions standards adopted by the CARB and USEPA.
- AQ-IAMF#5 would minimize exhaust emissions from on-road trucks by requiring all trucks used to haul construction materials to operate a model year 2010 engine or newer.
- AQ-IAMF#6 would minimize fugitive dust emissions from concrete batching through implementation of typical control measures, such as water sprays, enclosures, hoods, and other suitable technology.

Even with incorporation of project features (IAMFs), the project would result in a temporary impact on regional air quality during construction because increased VOC and NO_X emissions would exceed the BAAQMD's CEQA thresholds. NO_X emissions would also exceed the General Conformity *de minimis* threshold for all four project alternatives.

The BAAQMD's thresholds were established to prevent emissions from new projects in the SFBAAB from contributing to CAAQS or NAAQS violations. Since construction emissions of VOC and NO_X would exceed these thresholds, the project would contribute a significant level of regional air pollution within the SFBAAB. Moreover, project construction may conflict with the *2001 San Francisco Bay Area Ozone Attainment Plan for the 1-Hour National Ozone Standard* (BAAQMD 2001) or 2017 Clean Air Plan (BAAQMD 2017b), which were adopted to achieve regional attainment with the ambient air quality standards. Certain individuals residing in areas that do not meet the CAAQS or NAAQS, including the SFBAAB, could be exposed to pollutant concentrations that cause or aggravate acute and/or chronic health conditions (e.g., asthma, lost work days, premature mortality). While construction of the project would contribute to existing and future air pollution, average daily project-generated emissions represent approximately 0.01 percent and 0.10 percent of SFBAAB VOC and NOx emissions (2015 est.), respectively (BAAQMD 2017b). As previously discussed, the magnitude and locations of any potential changes in ambient air quality, and thus health consequences, from these additional emissions cannot be quantified with a high level of certainty due to the dynamic and complex nature of ozone formation and distribution (e.g., meteorology, emissions sources, sunlight exposure). Similar limitations exist for precisely modeling project-level health consequences of directly emitted PM. However, it is known that public health would continue to be affected in SFBAAB so long as the region does not attain the CAAQS or NAAQS.

Table 3.3-12 Construction-Related Criteria Pollutant Emissions in the San Francisco Bay Area Air Basin[1]

Year	Tons per year										Maximum Pounds per day[2]									
					PM_{10}			$PM_{2.5}$							PM_{10}			$PM_{2.5}$		
	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]
Alternative 1																				
2022	4	50	144	0	<1	61	61	<1	13	13	42	**624** *	1,396	5	4	675	679	4	145	149
2023	6	79	200	1	1	101	102	1	22	22	**63** *	**967** *	2,214	7	6	1,310	1,315	6	283	289
2024	7	**106** *	245	1	1	144	145	1	31	32	**61** *	**961** *	2,151	7	6	1,290	1,296	6	279	284
2025	6	85	205	1	1	107	108	1	22	23	**64** *	**1,158** *	2,022	7	10	1,195	1,201	10	249	255
2026	3	36	89	<1	<1	39	39	<1	8	8	32	**369** *	1,145	3	3	428	431	3	91	93
2027	2	35	52	<1	<1	27	27	<1	5	6	41	**375** *	545	8	12	268	272	12	56	60
2028	1	11	28	<1	<1	7	8	<1	2	2	33	**330** *	706	7	10	250	254	10	53	57
Applicable *de minimis* level[4]	100	100	-	100	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-
BAAQMD CEQA threshold	-	-	-	-	-	-	-	-	-	-	54	54	-	-	82	-	-	54	-	-
Alternative 2																				
2022	6	76	192	1	1	88	88	1	20	20	54	**773** *	1,770	5	5	903	908	5	200	205
2023	7	**118** *	255	1	1	145	145	1	32	33	**77** *	**1,334** *	2,628	8	7	1,705	1,712	7	380	387
2024	9	**155** *	304	1	1	201	202	1	44	45	**75** *	**1,325** *	2,555	8	7	1,683	1,690	7	375	381
2025	7	**112** *	240	1	1	136	137	1	30	30	**76** *	**1,334** *	2,363	8	10	1,579	1,585	9	346	352
2026	4	56	125	<1	<1	61	61	<1	13	14	42	**564** *	1,494	4	4	640	644	4	142	146
2027	3	69	76	<1	<1	61	62	<1	12	12	50	**750** *	805	9	13	614	618	13	121	130
2028	1	14	38	<1	<1	10	11	<1	2	2	35	**711** *	1,050	8	10	634	639	10	127	132
Applicable *de minimis* level[4]	100	100	-	100	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-
BAAQMD CEQA threshold	-	-	-	-	-	-	-	-	-	-	54	54	-	-	82	-	-	54	-	-
Alternative 3																				
2022	5	51	173	0	<1	58	58	<1	12	13	46	**514** *	1,602	4	4	608	612	4	130	134
2023	7	89	244	1	1	109	110	1	24	24	**73** *	**1,021** *	2,584	8	7	1,371	1,377	7	298	305
2024	8	**114** *	292	1	1	152	153	1	33	34	**71** *	**1,012** *	2,508	8	7	1,344	1,351	6	292	298
2025	7	85	233	1	1	104	105	1	22	23	**73** *	**1,064** *	2,373	7	9	1,239	1,245	9	261	267
2026	3	41	116	<1	<1	41	41	<1	9	9	39	**415** *	1,405	4	4	448	452	4	95	99
2027	2	41	54	<1	<1	32	33	<1	6	7	42	**444** *	572	8	12	306	309	12	62	72
2028	1	12	30	<1	<1	8	8	<1	2	2	33	**426** *	775	8	10	340	344	10	70	74
Applicable *de minimis* level[4]	100	100	-	100	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-
BAAQMD CEQA threshold	-	-	-	-	-	-	-	-	-	-	54	54	-	-	82	-	-	54	-	-

Year	Tons per year										Maximum Pounds per day[2]									
					PM_{10}			$PM_{2.5}$							PM_{10}			$PM_{2.5}$		
	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]
Alternative 4																				
2022	5	77	176	1	<1	102	102	<1	23	24	52	**787** *	1,691	5	4	1,059	1,063	4	239	244
2023	7	**113** *	222	1	1	151	151	1	34	35	**64** *	**1,191** *	2,135	7	6	1,582	1,588	6	361	366
2024	8	**156** *	272	1	1	205	206	1	46	47	**74** *	**1,363** *	2,355	8	7	1,785	1,792	7	399	406
2025	7	**139** *	240	1	1	171	172	1	38	39	**74** *	**1,731** *	2,216	9	13	1,737	1,743	12	386	393
2026	3	62	109	<1	<1	72	73	<1	16	16	42	**686** *	1,440	4	4	845	849	4	190	194
2027	3	84	70	<1	<1	79	80	<1	15	16	45	**899** *	994	9	12	824	829	12	161	166
2028	1	13	29	<1	<1	12	12	<1	3	3	31	**754** *	741	7	10	744	746	10	145	148
Applicable *de minimis* level[4]	100	100	-	100	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-
BAAQMD CEQA threshold	-	-	-	-	-	-	-	-	-	-	54	54	-	-	82	-	-	54	-	-

[1] Emissions results include implementation of AQ-IAMF#1 through AQ-IAMF#6. Exceedances of *de minimis* levels and BAAQMD CEQA thresholds are shown in **bolded underline with an asterisk (*)**.
[2] Presents the highest emissions estimate during a single day of construction in each year, based on concurrent construction activities.
[3] Total PM_{10} and $PM_{2.5}$ emissions consist of exhaust and fugitive dust emissions. Annual values may not add due to rounding. Daily results may not add because the table presents maximum emissions results for each individual pollutant component. For example, the maximum PM exhaust emissions may not occur on the same day as the maximum total dust emissions.
[4] The General Conformity *de minimis* thresholds for criteria pollutants are based on the federal attainment status of the project vicinity in the SFBAAB. The project vicinity is considered a marginal nonattainment area for the O_3 NAAQS and a moderate nonattainment area for the $PM_{2.5}$ NAAQS. Although the project vicinity is in attainment for SO_2, because SO_2 is a precursor for $PM_{2.5}$, the $PM_{2.5}$ General Conformity *de minimis* thresholds are used.
- = no threshold
< = less than
BAAQMD = Bay Area Air Quality Management District
CEQA = California Environmental Quality Act
CO = carbon monoxide
IAMF = impact avoidance and minimization feature
NAAQS = national ambient air quality standards
NO_X = nitrogen oxide
O_3 = ozone
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SFBAAB = San Francisco Bay Area Air Basin
SO_2 = sulfur dioxide
VOC = volatile organic compound

Alternatives 2 and 4 would result in comparable levels of total emissions, and Alternatives 1 and 3 would result in comparable levels of total emissions. Alternatives 2 and 4 would result in the greatest emissions primarily because of embankment activities in the Morgan Hill and Gilroy Subsection, in contrast to viaduct construction under Alternatives 1 and 3, which would require less earthmoving (e.g., excavation) and heavy-duty equipment and vehicles. Maximum daily VOC and NO_X emissions in excess of BAAQMD thresholds would be generated between 2023 and 2025, with the greatest daily emissions occurring in 2025 under all project alternatives. Daily VOC and NO_X emissions would be highest in 2025 because of concurrent construction activities in the Morgan Hill and Gilroy Subsection and ballast hauling. Construction and emissions intensity would decline after 2025 after earthmoving and other equipment-intensive activities are complete.

The BAAQMD does not have mass emission CEQA thresholds for total PM, CO, or SO_2; localized air quality and public health impacts from these pollutants are evaluated based on the air dispersion modeling of ambient air concentrations. Impact AQ#5 discusses the conclusions of the modeled ambient air concentrations. None of the federal *de minimis* thresholds would be exceeded during construction.

CEQA Conclusion

The impact would be significant under CEQA for all four project alternatives because construction could result in temporary exceedance of BAAQMD's VOC and NO_X thresholds. Project features (AQ-IAMF#1 through AQ-IAMF#6) would minimize air quality impacts through application of all best available on-site controls to reduce construction emissions. However, even with these features, exceedances of BAAQMD's VOC and NO_X thresholds would still occur and the project would contribute a significant level of regional VOC and NO_X pollution within the SFBAAB. Mitigation measures to address this impact are identified in Section 3.3.9, CEQA Significance Conclusions. Section 3.3.7, Mitigation Measures, describes these measures in detail.

Impact AQ#2: Temporary Direct and Indirect Impacts on Air Quality within the NCCAB

Pollutants generated by construction activities within the NCCAB would be similar to those generated within the SFBAAB, as described under Impact AQ#1. The project would minimize impacts associated with fugitive dust emissions through implementation of a dust control plan (AQ-IAMF#1). Exhaust-related pollutants would be minimized through use of renewable diesel, Tier 4 off-road engines, and model year 2010 or newer on-road engines, as required by AQ-IAMF#3 through AQ-IAMF#5. No architectural coatings would be required within the NCCAB and no temporary batch plant would be operated, and as such, AQ-IAMF#2 and AQ-IAMF#6 do not apply.

Table 3.3-13 presents construction emissions from Alternatives 1 through 4 in the NCCAB in tons per year and pounds per day and includes AQ-IAMF#1 and AQ-IAMF#3 through AQ-IAMF#5. Exceedances of MBARD CEQA thresholds are shown in bolded underline with an asterisk (*). There are no applicable General Conformity *de minimis* thresholds because the NCCAB is considered in attainment for all criteria pollutants; therefore, a general conformity analysis is not required.

Alternatives 1, 2, and 4 would result in a temporary impact on air quality during construction because increased PM_{10} emissions would exceed the MBARD's CEQA threshold. Emissions under Alternative 3 would not exceed MBARD's PM_{10} threshold.

The MBARD's PM_{10} threshold was established to prevent emissions from new projects in the NCCAB from contributing to CAAQS or NAAQS violations. Since construction-related PM_{10} emissions exceed this threshold, Alternatives 1, 2, and 4 would contribute a significant level of regional PM pollution within the NCCAB. Moreover, construction of Alternatives 1, 2, and 4 may conflict with the *Report on Attainment of the California Particulate Matter Standards in the Monterey Bay Region* (MBUAPCD 2005), which was adopted to achieve regional attainment with the ambient air quality standards. Certain individuals residing in areas that do not meet the PM_{10} CAAQS could be exposed to pollutant concentrations that cause or aggravate acute and/or chronic health conditions (e.g., asthma, lost work days, premature mortality). While project construction would contribute to existing and future air pollution, average daily project-generated emissions represent approximately 0.10 percent of NCCAB PM_{10} emissions (2012 est.) (CARB 2017). As previously discussed, the magnitude and locations of any potential changes in ambient air quality, and thus health consequences, from these additional emissions cannot be quantified with a high level of certainty due to the dynamic and complex nature of regional PM distribution (e.g., meteorology, emissions sources). However, it is known that public health would continue to be affected in NCCAB so long as the region does not attain the PM_{10} CAAQS.

Total annual emissions are highest under Alternatives 2 and 4 because of embankment activities in the Morgan Hill and Gilroy Subsection and more movement of ballast through the NCCAB. Embankment construction generally requires more equipment and vehicles than viaduct construction, resulting in greater emissions. In addition, berm and embankment construction requires more ballast, which results in more ballast hauling and associated emissions. In general, emissions under all alternatives would be greatest during the first few years of construction when earthmoving and other emissions-intensive activities would occur. Emissions would peak again in 2027 and 2028 due to ballast hauling through the NCCAB.

The MBARD does not have mass emission CEQA thresholds for other criteria pollutants; localized air quality and public health impacts from these pollutants are evaluated based on the air dispersion modeling of ambient air concentrations. Impact AQ#5 discusses the conclusions of the modeled ambient air concentrations.

CEQA Conclusion

The impact would be significant under CEQA for Alternatives 1, 2, and 4 because construction could result in temporary exceedance of MBARD's PM_{10} threshold. Project features (AQ-IAMF#1 and AQ-IAMF#3 through AQ-IAMF#5) would minimize air quality impacts through application of all best available on-site controls to reduce construction emissions. However, even with these features, exceedances of MBARD's PM_{10} threshold would still occur under Alternatives 1, 2, and 4 and the project would contribute a significant level of regional PM_{10} pollution within the NCCAB. Mitigation measures to address this impact are identified in Section 3.3.9, CEQA Significance Conclusions. Section 3.3.7, Mitigation Measures, describes these measures in detail.

The impact would be less than significant for Alternative 3 because emissions would not exceed MBARD's PM_{10} threshold. As such, Alternative 3 would not be expected to contribute a significant level of PM_{10} pollution such that regional air quality within the NCCAB would be degraded. Therefore, CEQA does not require mitigation.

Table 3.3-13 Construction-Related Criteria Pollutant Emissions in the North Central Coast Air Basin by Alternative[1]

Year	Tons per year										Maximum Pounds per day[2]									
					PM_{10}			$PM_{2.5}$							PM_{10}			$PM_{2.5}$		
	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]
Alternative 1																				
2022	1	7	17	<1	<1	9	9	<1	2	2	5	93	176	1	1	101	**102 ***	1	21	22
2023	1	6	18	<1	<1	8	9	<1	2	2	4	66	157	<1	<1	86	**86 ***	<1	18	18
2024	<1	5	18	<1	<1	8	8	<1	2	2	4	43	148	<1	<1	67	67	<1	15	15
2025	<1	4	15	<1	<1	6	6	<1	1	1	4	54	136	<1	<1	62	62	<1	14	14
2026	<1	2	10	<1	<1	4	4	<1	1	1	3	28	105	<1	<1	45	45	<1	10	10
2027	<1	3	6	<1	<1	3	3	<1	1	1	2	69	67	<1	<1	36	36	<1	8	9
2028	<1	1	3	<1	<1	1	1	<1	<1	<1	3	48	94	<1	<1	36	36	<1	8	8
Applicable *de minimis* level[4]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBARD CEQA threshold	-	-	-	-	-	-	-	-	-	-	-[5]	-[5]	-	-	-	-	82	-	-	-
Alternative 2																				
2022	1	12	26	<1	<1	14	14	<1	3	3	8	121	244	1	1	142	**143 ***	1	31	32
2023	1	11	26	<1	<1	14	14	<1	3	3	7	107	225	1	1	130	**131 ***	1	29	29
2024	1	10	24	<1	<1	13	13	<1	3	3	6	81	201	1	1	107	**108 ***	1	25	25
2025	1	9	22	<1	<1	12	12	<1	3	3	5	96	185	1	1	103	**103 ***	1	24	24
2026	<1	6	16	<1	<1	8	8	<1	2	2	5	64	170	<1	<1	83	**84 ***	<1	19	20
2027	<1	11	11	<1	<1	9	10	<1	2	2	4	179	111	1	1	113	**114 ***	1	24	25
2028	<1	1	5	<1	<1	1	1	<1	<1	<1	5	132	157	1	1	109	**110 ***	1	22	23
Applicable *de minimis* level[4]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBARD CEQA threshold	-	-	-	-	-	-	-	-	-	-	-[5]	-[5]	-	-	-	-	82	-	-	-
Alternative 3																				
2022	1	6	19	<1	<1	7	7	<1	2	2	5	63	181	1	<1	76	76	<1	16	17
2023	1	6	22	<1	<1	8	8	<1	2	2	5	63	177	1	<1	75	76	<1	16	16
2024	1	5	21	<1	<1	7	8	<1	2	2	5	46	169	<1	<1	61	61	<1	13	14
2025	<1	5	18	<1	<1	6	6	<1	1	1	4	59	161	1	<1	58	59	<1	13	13
2026	<1	3	12	<1	<1	4	4	<1	1	1	4	32	132	<1	<1	42	42	<1	9	10
2027	<1	4	6	<1	<1	3	3	<1	1	1	2	101	64	<1	1	52	52	<1	12	12
2028	<1	1	3	<1	<1	1	1	<1	<1	<1	3	66	92	<1	<1	47	48	<1	10	11
Applicable *de minimis* level[4]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBARD CEQA threshold	-	-	-	-	-	-	-	-	-	-	-[5]	-[5]	-	-	-	-	82	-	-	-

Year	Tons per year										Maximum Pounds per day[2]									
					PM_{10}			$PM_{2.5}$							PM_{10}			$PM_{2.5}$		
	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]
Alternative 4																				
2022	1	12	23	<1	<1	16	16	<1	4	4	7	123	229	1	1	170	**170 ***	1	38	39
2023	1	12	24	<1	<1	18	18	<1	4	4	6	118	212	1	1	162	**163 ***	1	37	37
2024	1	11	23	<1	<1	17	17	<1	4	4	6	96	190	1	1	138	**139 ***	1	33	33
2025	1	11	21	<1	<1	16	16	<1	4	4	5	111	174	1	1	135	**135 ***	1	32	32
2026	<1	7	13	<1	<1	10	10	<1	2	2	4	84	152	<1	<1	119	**120 ***	<1	28	28
2027	<1	14	9	<1	<1	13	13	<1	3	3	5	200	149	1	1	146	**146 ***	1	30	31
2028	<1	1	4	<1	<1	2	2	<1	<1	<1	3	171	102	1	1	138	**138 ***	1	28	28
Applicable *de minimis* level[4]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBARD CEQA threshold	-	-	-	-	-	-	-	-	-	-	-[5]	-[5]	-	-	-	-	82	-	-	-

[1] Emissions results include implementation of AQ-IAMF#1 and AQ-IAMF#2 through AQ-IAMF#5. Exceedances of MBARD CEQA thresholds are shown in **bolded underline with an asterisk (*)**.
[2] Presents the highest emissions estimate during a single day of construction in each year, based on concurrent construction activities.
[3] Total PM_{10} and $PM_{2.5}$ emissions consist of the exhaust and fugitive dust emissions. Annual values may not add due to rounding. Daily results may not add because the table presents maximum emissions results for each individual pollutant component. For example, the maximum PM exhaust emissions may not occur on the same day as the maximum total dust. emissions.
[4] The NCCAB is considered attainment for all criteria pollutants. As such, a general conformity analysis is not required, and there are no applicable *de minimis* thresholds.
[5] According to the MBARD CEQA guidelines, construction projects that temporarily emit precursors of O_3 (i.e., VOC or NO_X) are accommodated in the emission inventories of state- and federally required air plans and would not have a significant impact on the attainment and maintenance of state or federal O_3 ambient air quality standards (MBUAPCD 2008). The MBARD guidelines have an exception that if a project uses "non-typical equipment, e.g., grinders, and portable equipment," the project would use standard construction equipment.
\- = no threshold
< = less than
CEQA = California Environmental Quality Act
CO = carbon monoxide
IAMF = impact avoidance and minimization feature
MBARD = Monterey Bay Air Resources District
MBUAPCD = Monterey Bay Unified Air Pollution Control District
NCCAB = North Central Coast Air Basin
NO_X = nitrogen oxide
O_3 = ozone
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound

Impact AQ#3: Temporary Direct and Indirect Impacts on Air Quality within the SJVAB

Pollutants generated by construction activities within the SJVAB would be similar to those generated within the SFBAAB, as described under Impact AQ#1. The project would minimize impacts associated with fugitive dust emissions through implementation of a dust control plan (AQ-IAMF#1) and BMPs at new concrete batch plants (AQ-IAMF#6). The contractor would utilize low-VOC paints to limit the emissions of VOCs, which contribute to O_3 formation (AQ-IAMF#2). Exhaust-related pollutants would be minimized through use of renewable diesel, Tier 4 off-road engines, and model year 2010 or newer on-road engines, as required by AQ-IAMF#3 through AQ-IAMF#5.

Table 3.3-14 presents construction emissions from Alternatives 1 through 4 in the SJVAB in tons per year and pounds per day and includes AQ-IAMF#1 through AQ-IAMF#6. Exceedances of federal *de minimis* and SJVAPCD CEQA thresholds are shown in <u>bolded underline with an asterisk (*)</u>.

Even with incorporation of project features (IAMFs), all four project alternatives would result in a temporary impact on air quality during construction because increased NO_X, CO, and PM_{10} emissions would exceed the SJVAPCD's annual CEQA thresholds. NO_X emissions would also exceed the General Conformity *de minimis* threshold for all four alternatives. SJVAPCD's thresholds were established to prevent emissions from new projects in the SJVAB from contributing to CAAQS or NAAQS violations. Since construction emissions exceed these thresholds, the project would contribute a significant level of regional air pollution within the SJVAB. Moreover, project construction may also conflict with the *2016 Plan for the 2008 8-Hour Ozone Standard*, *2013 Plan for the Revoked 1-Hour Ozone Standard, 2007 Ozone Plan*, and the *PM_{10} Maintenance Plan and Request for Redesignation* (SJVAPCD 2016a, 2013, 2007a, 2007b). Certain individuals residing in areas that do not meet the CAAQS or NAAQS, including the SJVAB, could be exposed to pollutant concentrations that cause or aggravate acute and/or chronic health conditions (e.g., asthmas, lost work days, premature mortality). While construction of the project would contribute to existing and future air pollution, project-generated operational emissions represent approximately 0.05 percent, 0.04 percent, and 0.07 percent of SJVAB NO_x, PM_{10}, and CO emissions (2015 and 2012 est.), respectively (SJVAPCD 2016b; CARB 2017). As previously discussed, the magnitude and locations of any potential changes in ambient air quality, and thus health consequences, from these additional emissions cannot be quantified with a high level of certainty due to the dynamic and complex nature of pollutant formation and distribution (e.g., meteorology, emissions sources, sunlight exposure). Similar limitations exist for precisely modeling project-level health consequences of directly emitted PM. However, it is known that public health would continue to be affected in SJVAB so long as the region does not attain the CAAQS or NAAQS.

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Table 3.3-14 Construction-Related Criteria Pollutant Emissions in the San Joaquin Valley Air Basin[1]

	Tons per year										Average Pounds per day[2]									
					PM_{10}			$PM_{2.5}$							PM_{10}			$PM_{2.5}$		
Year	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]
Alternatives 1, 2, 3, and 4																				
2022	6	**42** *	**218** *	1	1	39	**40** *	1	9	10	51	**348** *	**1,789** *	4	4	323	**327** *	4	76	81
2023	6	**55** *	**226** *	1	1	49	**50** *	1	11	11	51	**442** *	**1,807** *	4	5	392	**397** *	5	86	90
2024	6	**56** *	**220** *	1	1	48	**48** *	1	10	11	50	**450** *	**1,762** *	4	4	381	**386** *	4	82	87
2025	6	**54** *	**209** *	1	1	42	**43** *	1	9	10	47	**428** *	**1,673** *	4	4	337	**341** *	4	72	76
2026	4	**45** *	**131** *	<1	<1	35	**36** *	<1	7	8	30	**361** *	**1,048** *	3	3	281	**284** *	3	58	62
2027	2	**50** *	48	<1	<1	35	**35** *	<1	7	7	14	**400** *	**388** *	1	3	280	**283** *	3	55	58
2028	1	**10** *	22	<1	<1	6	6	<1	1	1	8	**114** *	**244** *	<1	2	61	63	2	14	16
Applicable *de minimis* level[4]	10	10	-	100	-	-	100	-	-	100	-	-	-	-	-	-	-	-	-	-
SJVAPCD CEQA threshold	10	10	100	27	-	-	15	-	-	15	100[5]	100[5]	100[5]	100[5]	-	-	100[5]	-	-	100[5]

[1] Emissions results include implementation of AQ-IAMF#1 through AQ-IAMF#6. Exceedances of federal *de minims* and SJVAPCD CEQA thresholds are shown in **bolded underline with an asterisk (*)**.
[2] Presents the average emissions estimate during a single day of construction in each year. Average emissions are presented in SJVAPCD (rather than maximum emissions), consistent with (SJVAPCD 2015a) guidance for correct application of its 100-pound-per-day AAQA screening criteria.
[3] Total PM_{10} and $PM_{2.5}$ emissions consist of the exhaust and fugitive dust emissions. Annual values may not add due to rounding. Daily results may not add because the table presents maximum emissions results for each individual pollutant component. For example, the maximum PM exhaust emissions may not occur on the same day as the maximum total dust emissions.
[4] The General Conformity *de minimis* thresholds for criteria pollutants are based on the federal attainment status of the project vicinity in the SJVAB. The project vicinity is considered an extreme nonattainment area for the O_3 NAAQS, a moderate nonattainment area for the $PM_{2.5}$ NAAQS, and a serious maintenance area for the PM_{10} NAAQS. Although the project vicinity is in attainment for SO_2, because SO_2 is a precursor for $PM_{2.5}$, the $PM_{2.5}$ General Conformity *de minimis* thresholds are used.
[5] The 100-pound-per-day threshold is a screening-level threshold to help determine whether increased emissions from a project will cause or contribute to a violation of CAAQS or NAAQS. Projects with emissions below the threshold would not be in violation of CAAQS or NAAQS. Projects with emissions above the threshold would require an AAQA to confirm this conclusion (SJVAPCD 2015a).

- = no threshold
< = less than
AAQA = ambient air quality analysis
CAAQS = California ambient air quality standards
CEQA = California Environmental Quality Act
CO = carbon monoxide
IAMF = impact avoidance and minimization feature
NAAQS = national ambient air quality standards
NO_X = nitrogen oxide
O_3 = ozone
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SJVAB = San Joaquin Valley Air Basin
SJVAPCD = San Joaquin Valley Air Pollution Control District
SO_2 = sulfur dioxide
VOC = volatile organic compound

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All project alternatives would result in the same amount of emissions because construction activities would be identical. Similar amounts of annual emissions would be generated during each year of construction between 2022 and 2027. Emissions would decline in 2028 after tunneling and other emissions-intensive activities are complete.

As shown in Table 3.3-15 through Table 3.3-18, construction emissions would also exceed the SJVAPCD's daily AAQA screening trigger for NO_X, CO, and PM_{10}. Localized air quality and public health impacts from these pollutants are evaluated based on the air dispersion modeling of ambient air concentrations. Impact AQ#5 discusses the conclusions of the modeled ambient air concentrations.

CEQA Conclusion

The impact would be significant under CEQA for all four project alternatives because construction could result in temporary exceedance of SJVAPCD's NO_X, CO, and PM_{10} annual thresholds. Project features (AQ-IAMF#1 through AQ-IAMF#6) would minimize air quality impacts through application of all best available on-site controls to reduce construction emissions. However, even with these features, exceedances of SJVAPCD's NO_X, CO, and PM_{10} annual thresholds would still occur and the project would contribute a significant level of regional NO_X, CO, and PM_{10} pollution within the SJVAB. Mitigation measures to address this impact are identified in Section 3.3.9, CEQA Significance Conclusions. Section 3.3.7, Mitigation Measures, describes these measures in detail.

Impact AQ#4: Temporary Direct Impacts on Implementation of an Applicable Air Quality Plan

Emissions from project construction would be temporary, occurring for approximately 7 years from 2022 through 2028. Once construction is complete, air quality in the SFBAAB, NCCAB, and SJVAB is expected to improve. However, during the construction period, construction activities could cause air quality impacts that exceed air district thresholds, which support implementation of air quality plans.

As described in Section 3.3.5.1, portions of the RSA in the SFBAAB and SJVAB are within nonattainment and maintenance areas for the NAAQS. Construction emissions generated within these nonattainment and maintenance areas are subject to USEPA's General Conformity thresholds. As discussed under Impacts AQ#1 and AQ#3, for all four project alternatives, NO_X emissions would exceed the General Conformity *de minimis* thresholds in the SFBAAB and SJVAB, even with implementation of all feasible on-site controls, as required by AQ-IAMF#1 through AQ-IAMF#6. Emissions of all other pollutants are below the applicable General Conformity thresholds.

The BAAQMD, MBARD, and SJVAPCD have also developed project-level thresholds. These thresholds prevent new projects from contributing to CAAQS or NAAQS violations, which supports implementation of regional air quality plans to attain federal and state ambient air quality standards. Construction emissions from all project alternatives would exceed the BAAQMD's CEQA thresholds for VOC and NO_X, as well as SJVAPCD's CEQA thresholds[12] for NO_X and PM_{10}. MBARD's PM_{10} threshold would also be exceeded under Alternatives 1, 2, and 4. Exceedances of adopted thresholds could conflict with applicable air quality plans. These exceedances would occur despite implementation of stringent on-site emissions controls, including implementation of fugitive dust control practices (AQ-IAMF#1 and AQ-IAMF#6), use of low-VOC paints (AQ-IAMF#2), use of renewable diesel (AQ-IAMF#3), use of Tier 4 off-road engines (AQ-IAMF#4), and use model year 2010 or newer on-road engines (AQ-IAMF#5).

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[12] Construction would also exceed SJVAPCD's CO threshold. However, the SJVAB is in attainment for the CO ambient air quality standards, and as such, there is no air quality attainment plan. Specific regional and local impacts from construction-generated CO emissions are assessed in Impacts AQ-3 and AQ-5, respectively.

CEQA Conclusion

The impact would be significant under CEQA because construction of the project alternatives could result in emissions that exceed air district thresholds. Exceedances of adopted thresholds could conflict with applicable air quality plans. These exceedances would occur despite stringent on-site emissions controls (project features) that the Authority would require to reduce construction emissions. Mitigation measures to address this impact are identified in Section 3.3.9, CEQA Significance Conclusions. Section 3.3.7, Mitigation Measures, describes these measures in detail.

Impact AQ#5: Temporary Direct Impacts on Localized Air Quality—Criteria Pollutants

Project construction has the potential to cause elevated criteria pollutant concentrations. These elevated concentrations may cause or contribute to exceedances of the short- and long-term NAAQS and CAAQS and affect local air quality and public health. The criteria pollutants of concern with established annual standards are NO_2, PM_{10}, and $PM_{2.5}$. The criteria pollutants of concern with established hourly or daily standards are the following:

- CO (1 hour and 8 hours)
- PM_{10} and $PM_{2.5}$ (24 hours)
- NO_2 (1 hour)
- SO_2 (1 hour and 24 hours)

Table 3.3-15 and Table 3.3-16 present the estimated maximum hourly and daily concentrations relative to the CAAQS and NAAQS, respectively. The tables present both the incremental project and total pollutant concentration; only the total pollutant concentration, which reflects the incremental project contribution plus the existing concentration, is compared to the CAAQS and NAAQS to determine if construction would cause an ambient air quality violation.

Table 3.3-17 presents the estimated maximum annual concentrations relative to the CAAQS and NAAQS. Similar to the hourly and daily analysis, only the total pollutant concentration (project plus background) is compared to the CAAQS and NAAQS.

As discussed in Section 3.3.4.5, Method for Determining Significance under CEQA, background concentrations of PM_{10} along the project corridor exceed the CAAQS. Similarly, background $PM_{2.5}$ concentrations exceed the daily NAAQS and annual CAAQS and NAAQS in the SJVAB. Consequently, Table 3.3-18 compares the incremental project increase in PM concentrations to the applicable SIL, as recommended by the SJVAPCD (2015a) and BAAQMD (Kirk 2016), to analyze the potential for the project to worsen existing $PM_{2.5}$ and PM_{10} violations.

The modeled concentrations presented in Table 3.3-15 through Table 3.3-18 include project features AQ-IAMF#1 through AQ-IAMF#6. Criteria pollutant concentrations are estimated for each subsection based on representative local meteorological conditions. Only the modeled maximum pollutant concentration is reported; refer to the Air Quality and Greenhouse Gases Technical Report (Volume 2, Appendix 3.3-A) for detailed concentration results by individual construction activity (e.g., at grade, tunnel). Exceedances of CAAQS are shown in bolded underline with an asterisk (*).

As shown in Table 3.3-15 through Table 3.3-18, project construction would lead to localized violations of the PM_{10}, $PM_{2.5}$, and NO_2 CAAQS and NAAQS, as well as exceedances of the PM_{10} and $PM_{2.5}$ SIL, indicating that construction-generated PM could contribute to existing PM_{10} and $PM_{2.5}$ violations of the ambient air quality standards. The CAAQS and NAAQS define clean air and represent the maximum amount of pollution that can be present in outdoor air without any harmful effects on people and the environment. Short-term exposure to NO_2 concentrations above the CAAQS or NAAQS can aggravate respiratory diseases (e.g., asthma) or lead to other respiratory symptoms (e.g., coughing, wheezing) in certain individuals. The main health effects of airborne PM are on the respiratory and cardiovascular system. Certain individuals exposed to PM concentrations above the CAAQS or NAAQS may experience irritation of the airways, decreased lung function, irregular heartbeat, nonfatal heart attacks, and premature death.

Table 3.3-15 Maximum Hourly and Daily CAAQS Criteria Pollutant Concentration Impacts from Project Construction (µg/m³)[1]

Alternative and Subsection	CO				NO_2		SO_2			
	1-hour		8-hour		1-hour		1-hour		24-hour	
	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]
Alternative 1										
San Jose Diridon Station Approach	267	3,016	147	2,209	119	246	1	11	<1	3
Monterey Corridor	80	2,829	45	2,107	56	184	<1	10	<1	3
Morgan Hill and Gilroy	605	5,417	149	2,211	234	**362 ***	2	12	<1	3
Pacheco Pass	525	5,337	85	1,116	180	242	1	10	<1	3
San Joaquin Valley	902	7,546	190	3,741	170	243	1	30	<1	6
Alternative 2										
San Jose Diridon Station Approach	317	3,066	147	2,209	119	247	1	11	<1	3
Monterey Corridor	582	3,331	218	2,280	233	**361 ***	2	11	<1	3
Morgan Hill and Gilroy	611	5,423	152	2,215	201	329	1	11	<1	3
Pacheco Pass	525	5,337	85	1,116	180	242	1	10	<1	3
San Joaquin Valley	902	7,546	190	3,741	170	243	1	30	<1	6
Alternative 3										
San Jose Diridon Station Approach	317	3,066	147	2,209	119	247	1	11	<1	3
Monterey Corridor	80	2,829	45	2,107	56	184	<1	10	<1	3
Morgan Hill and Gilroy	606	5,418	148	2,210	101	229	1	11	<1	3
Pacheco Pass	525	5,337	85	1,116	180	242	1	10	<1	3
San Joaquin Valley	902	7,546	190	3,741	170	243	1	30	<1	6

Alternative and Subsection	CO				NO_2		SO_2			
	1-hour		8-hour		1-hour		1-hour		24-hour	
	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]
Alternative 4										
San Jose Diridon Station Approach	218	2,967	111	2,173	81	209	1	10	<1	3
Monterey Corridor	122	2,871	68	2,130	74	202	<1	10	<1	3
Morgan Hill and Gilroy	1,282	6,094	270	2,332	274	**401 ***	2	12	<1	3
Pacheco Pass	525	5,337	85	1,116	180	242	1	10	<1	3
San Joaquin Valley	902	7,546	190	3,741	170	243	1	30	<1	6
CAAQS	-	23,000	-	10,000	-	339	-	655	-	105

[1] Only the highest modeled concentration is presented for each pollutant. Concentration results include implementation of AQ-IAMF#1 through AQ-IAMF#6. Exceedances of CAAQS are shown in **bolded underline with an asterisk (*)**. Note that background PM_{10} concentrations exceed the CAAQS in all project subsections. Consequently, the potential for the project to contribute to the existing violations is analyzed in Table 3.3-17.
[2] Represents the maximum incremental off-site concentration from project construction.
[3] Represents the maximum project-level incremental contribution plus background concentration.
- = no standard
< = less than
$\mu g/m^3$ = micrograms per cubic meter of air
CAAQS = California ambient air quality standards
CO = carbon monoxide
IAMF = impact avoidance and minimization feature
NO_2 = nitrogen dioxide
PM_{10} = particulate matter 10 microns or less in diameter
SO_2 = sulfur dioxide

Table 3.3-16 Maximum Hourly and Daily NAAQS Criteria Pollutant Concentration Impacts from Project Construction (µg/m³)[1]

Alternative and Subsection	CO				NO_2		$PM_{2.5}$		PM_{10}		SO_2	
	1-hour		8-hour		1-hour		24-hour		24-hour		1-hour	
	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]
Alternative 1												
San Jose Diridon Station Approach	286	2,617	134	1,891	81	167	13	**44** *	72	122	1	7
Monterey Corridor	79	2,408	38	1,794	44	129	2	33	20	70	<1	6
Morgan Hill and Gilroy	439	2,769	135	1,892	138	**223** *	10	**41** *	47	103	1	7
Pacheco Pass	421	2,636	79	1,072	96	145	2	**40** *	11	78	<1	6
San Joaquin Valley	803	4,278	182	1,404	81	143	-[4]		40	113	1	16
Alternative 2												
San Jose Diridon Station Approach	286	2,626	135	1,892	79	164	13	**44** *	72	122	1	7
Monterey Corridor	527	2,857	201	1,958	129	**214** *	17	**48** *	93	142	1	7
Morgan Hill and Gilroy	456	2,785	135	1,891	111	**196** *	11	**42** *	54	110	1	7
Pacheco Pass	421	2,636	79	1,072	96	145	2	**40** *	11	78	<1	6
San Joaquin Valley	803	4,278	182	1,404	81	143	-[4]		40	113	1	16
Alternative 3												
San Jose Diridon Station Approach	286	2,626	135	1,892	79	164	13	**44** *	72	122	1	7
Monterey Corridor	79	2,408	38	1,794	44	129	2	33	20	70	<1	6
Morgan Hill and Gilroy	445	2,685	135	1,892	47	132	3	34	19	75	1	7
Pacheco Pass	421	2,636	79	1,072	96	145	2	**40** *	11	78	<1	6
San Joaquin Valley	803	4,278	182	1,404	81	143	-[4]		40	113	1	16

Alternative and Subsection	CO				NO_2		$PM_{2.5}$		PM_{10}		SO_2	
	1-hour		8-hour		1-hour		24-hour		24-hour		1-hour	
	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]
Alternative 4												
San Jose Diridon Station Approach	181	2,511	83	1,840	57	143	20	**<u>51 *</u>**	47	97	<1	7
Monterey Corridor	120	2,450	58	1,814	60	145	4	35	28	77	<1	6
Morgan Hill and Gilroy	897	3,227	240	1,996	152	**<u>238 *</u>**	22	**<u>53 *</u>**	130	**<u>187 *</u>**	1	8
Pacheco Pass	421	2,636	79	1,072	96	145	2	**<u>40 *</u>**	11	78	<1	6
San Joaquin Valley	803	4,278	182	1,404	81	143	-[4]		40	113	1	16
NAAQS	-	40,000	-	10,000	-	188	-	35	-	150	-	196

[1] Only the highest modeled concentration is presented for each pollutant. Concentration results include implementation of AQ-IAMF#1 through AQ-IAMF#6. Exceedances of NAAQS are shown in **<u>bolded underline with an asterisk (*)</u>**.
[2] Represents the maximum incremental off-site concentration from project construction.
[3] Represents the maximum project-level incremental contribution plus background concentration.
[4] Background concentrations in the SJVAB exceed the NAAQS. Consequently, the potential for the project to contribute to the existing violation is analyzed in Table 3.3-18.
- = no standard
< = less than
$\mu g/m^3$ = micrograms per cubic meter of air
CO = carbon monoxide
IAMF = impact avoidance and minimization feature
NAAQS = national ambient air quality standards
NO_2 = nitrogen dioxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SJVAB = San Joaquin Valley Air Basin
SO_2 = sulfur dioxide

Table 3.3-17 Maximum Annual CAAQS and NAAQS Criteria Pollutant Concentration Impacts from Project Construction ($\mu g/m^3$)[1]

Construction Area	NO_2 (CAAQS)		NO_2 (NAAQS)		$PM_{2.5}$ (CAAQS)		$PM_{2.5}$ (NAAQS)		PM_{10} (CAAQS)	
	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]
Alternative 1										
San Jose Diridon Station Approach	6	30	5	30	1	12	1	10	-[4]	
Monterey Corridor	6	30	5	28	1	11	1	10	-[4]	
Morgan Hill and Gilroy	5	35	4	34	1	12	1	10	5	**25** *
Pacheco Pass	11	20	10	19	1	**13** *	1	**13** *	-[4]	
San Joaquin Valley	1	14	1	14	-[4]		-[4]		-[4]	
Alternative 2										
San Jose Diridon Station Approach	6	30	5	28	1	11	1	11	-[4]	
Monterey Corridor	13	37	12	34	2	**12** *	2	11	-[4]	
Morgan Hill and Gilroy	8	32	7	30	1	12	1	11	7	**27** *
Pacheco Pass	11	20	10	19	1	**13** *	1	**13** *	-[4]	
San Joaquin Valley	1	14	1	14	-[4]		-[4]		-[4]	
Alternative 3										
San Jose Diridon Station Approach	6	30	5	28	1	11	1	11	-[4]	
Monterey Corridor	6	30	5	28	1	11	1	10	-[4]	
Morgan Hill and Gilroy	3	27	3	25	<1	11	<1	11	2	**22** *
Pacheco Pass	11	20	10	19	1	**13** *	1	**13** *	-[4]	
San Joaquin Valley	1	14	1	14	-[4]		-[4]		-[4]	

Construction Area	NO_2 (CAAQS)		NO_2 (NAAQS)		$PM_{2.5}$ (CAAQS)		$PM_{2.5}$ (NAAQS)		PM_{10} (CAAQS)	
	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]	Project[2]	Total[3]
Alternative 4										
San Jose Diridon Station Approach	7	31	6	29	2	**12 ***	2	11	-[4]	
Monterey Corridor	6	30	6	29	1	12	1	10	-[4]	
Morgan Hill and Gilroy	3	27	3	26	1	11	1	10	3	**23 ***
Pacheco Pass	11	20	10	19	1	**13 ***	1	**13 ***	-[4]	
San Joaquin Valley	1	14	1	14	-[4]		-[4]		-[4]	
CAAQS/NAAQS	-	57	-	100	-	12	-	12	-	20

[1] Only the highest modeled concentration is presented for each pollutant. Concentration results include implementation of AQ-IAMF#1 through AQ-IAMF#6. Exceedances of CAAQS/NAAQS are shown in **bolded underline and an asterisk (*)**.
[2] Represents the maximum incremental off-site concentration from project construction.
[3] Represents the maximum project-level incremental contribution plus background concentration.
[4] Background concentrations exceed the NAAQS or CAAQS. Consequently, the potential for the project to contribute to the existing violation is analyzed in Table 3.3-18.
- = no standard
< = less than
μg/m^3 = micrograms per cubic meter of air
CAAQS = California ambient air quality standards
NAAQS = national ambient air quality standards
NO_2 = nitrogen dioxide
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter

Table 3.3-18 Maximum Incremental PM_{10} and $PM_{2.5}$ Concentrations from Project Construction (µg/m³)[1]

Construction Area	$PM_{2.5}$ (NAAQS)	PM_{10} (CAAQS)	PM_{10} (CAAQS)	$PM_{2.5}$ (CAAQS/NAAQS)
	24-hour[2]	24-hour[2]	Annual[2]	Annual[2]
Alternative 1				
San Jose Diridon Station Approach	-[3]	80.4 *	5.50 *	0.9 *
Monterey Corridor		20.5 *	5.70 *	0.9 *
Morgan Hill and Gilroy		50.9 *	-[3]	1.0 *
Pacheco Pass		10.9 *	2.40 *	0.9 *
San Joaquin Valley	5.8 *	49.3 *	0.55	0.1
Alternative 2				
San Jose Diridon Station Approach	-[3]	80.4 *	5.50 *	0.9 *
Monterey Corridor		122.2 *	10.30 *	0.8 *
Morgan Hill and Gilroy		64.1 *	-[3]	1.0 *
Pacheco Pass		10.9 *	2.40 *	0.9 *
San Joaquin Valley	5.8 *	49.3 *	0.55	0.1
Alternative 3				
San Jose Diridon Station Approach	-[3]	80.4 *	5.50 *	0.9 *
Monterey Corridor		20.5 *	5.70 *	0.9 *
Morgan Hill and Gilroy		21.7 *	-[3]	0.3 *
Pacheco Pass		10.9 *	2.40 *	0.9 *
San Joaquin Valley	5.8 *	49.3 *	0.55	0.1

Construction Area	$PM_{2.5}$ (NAAQS) 24-hour[2]	PM_{10} (CAAQS) 24-hour[2]	PM_{10} (CAAQS) Annual[2]	$PM_{2.5}$ (CAAQS/NAAQS) Annual[2]
Alternative 4				
San Jose Diridon Station Approach	-[3]	**53.7 ***	**7.00 ***	**1.7 ***
Monterey Corridor		**29.1 ***	**5.50 ***	**1.0 ***
Morgan Hill and Gilroy		**138.0 ***	-[3]	**0.6 ***
Pacheco Pass		**10.9 ***	**2.40 ***	**0.9 ***
San Joaquin Valley	**5.8 ***	**49.3 ***	0.55	0.1
SIL	1.2	10.4	2.08	0.2

[1] Only the highest modeled concentration is presented for each pollutant. Concentration results include implementation of AQ-IAMF#1 through AQ-IAMF#6. Exceedances of the SIL are shown in **bolded underline and an asterisk (*)**.
[2] Represents the maximum incremental off-site concentration from project construction.
[3] Background concentrations do not exceed the NAAQS or CAAQS. Consequently, the potential for the project to create new violations is analyzed in Table 3.3-14 through Table 3.3-16.
μg/m^3 = micrograms per cubic meter of air
CAAQS = = California ambient air quality standards
IAMF = impact avoidance and minimization feature
NAAQS = national ambient air quality standards
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SIL = significant impact level

Within the San Jose Diridon Station Approach Subsection, all project alternatives would violate the 24-hour $PM_{2.5}$ NAAQS, annual $PM_{2.5}$ SIL, and 24-hour and annual PM_{10} SILs. Berm and embankment construction under all alternatives would be the primary emissions-generating activity contributing to the violations. The extensive amount of berm construction under Alternative 4 in the San Jose Diridon Station Approach Subsection is also predicted to result in a violation of the annual $PM_{2.5}$ CAAQS.

Within the Monterey Corridor Subsection, all project alternatives would exceed the 24-hour PM_{10} SIL, annual PM_{10} SIL, and annual $PM_{2.5}$ SIL. Alternative 2 would also violate the 1-hour NO_2 CAAQS and NAAQS, annual $PM_{2.5}$ CAAQS, and 24-hour $PM_{2.5}$ NAAQS, primarily due to trenching activities. The primary types of construction contributing to these violations are at grade (Alternative 1) and aerial (Alternative 4).

Ambient air quality violations within the Morgan Hill and Gilroy Subsection would be similar to those in the Monterey Corridor Subsection, with all project alternatives exceeding the 24-hour and annual PM_{10} SIL, annual PM_{10} CAAQS, and annual $PM_{2.5}$ SIL. Alternative 4 would likewise violate the 1-hour NO_2 CAAQS and NAAQS, 24-hour $PM_{2.5}$ NAAQS, and 24-hour PM_{10} NAAQS, primarily due to aerial construction. Alternatives 1 and 2 would also violate the 1-hour NO_2 NAAQS and 24-hour $PM_{2.5}$ NAAQS. Concurrent construction of multiple project components would also lead to 1-hour NO_2 CAAQS violations under Alternative 1.

Ambient air quality violations within the Pacheco Pass Subsection are driven by batching and tunneling activities, which would be similar across all alternatives. Accordingly, construction of all four project alternatives is predicted to violate the 24-hour $PM_{2.5}$ NAAQS and annual $PM_{2.5}$ CAAQS and NAAQS. All alternatives would also exceed the 24-hour and annual PM_{10} SIL and annual $PM_{2.5}$ SIL.

Construction activities within the San Joaquin Valley Subsection would be identical among the four project alternatives. Emissions concentrations from berm construction and construction of the MOWS would violate the 24-hour $PM_{2.5}$ and PM_{10} SILs. These exceedances would occur under all alternatives.

CEQA Conclusion

The impact would be significant under CEQA for all four project alternatives because construction could result in temporary violations of the CAAQS and NAAQS and contribute to existing violations of the $PM_{2.5}$ and PM_{10} standards. Project features (AQ-IAMF#1 through AQ-IAMF#6) would minimize construction emissions through implementation of the best available on-site controls. However, exceedances of the CAAQS and NAAQS would still occur and the project would contribute a significant level of localized NO_2 and PM pollution within the RSA. No mitigation measures are available to address this impact.

Impact AQ#6: Temporary Direct Impacts on Localized Air Quality—Exposure to Diesel Particulate Matter and $PM_{2.5}$ (Health Risk)

Project construction, including project features AQ-IAMF#1 through AQ-IAMF#6, has the potential to create inhalation health risks and exposure to $PM_{2.5}$ at receptor locations adjacent to the project footprint. Cancer risk from exposure to diesel exhaust is much higher than the risk associated with any other air toxic from construction of the project alternatives. Construction would result in DPM emissions primarily from diesel-fueled off-road equipment and heavy-duty trucks.

Table 3.3-19 through Table 3.3-21 show estimated construction-related health risks relative to the BAAQMD, MBARD, and SJVAPCD thresholds, respectively, for all four project alternatives. Local topography and meteorology can greatly influence DPM air concentrations and the resulting exposure and health risk. Consequently, analysts estimated health risks for each of the five project subsections based on representative local meteorological conditions. The health risks shown in Table 3.3-19 through Table 3.3-21 represent the highest modeled off-site risk, which typically occurs adjacent to or within a few hundred yards of the construction footprint.

Table 3.3-19 Excess Cancer, Noncancer, and $PM_{2.5}$ Concentration Health Risks Associated with Construction of Alternatives 1, 2, 3, and 4 in the Bay Area Air Quality Management District[1]

Alternative/Subsection	Cancer (per million)[2]	Chronic HI[3]	Acute HI[3]	$PM_{2.5}$ ($\mu g/m^3$)
Alternative 1				
San Jose Diridon Station Approach	3.8	<0.1	0.2	<0.1
Monterey Corridor	4.8	<0.1	0.1	<0.1
Morgan Hill and Gilroy	2.7	<0.1	0.4	<0.1
Pacheco Pass	0.6	<0.1	0.4	<0.1
Alternative 2				
San Jose Diridon Station Approach	3.9	<0.1	0.2	<0.1
Monterey Corridor	5.0	<0.1	0.1	<0.1
Morgan Hill and Gilroy	4.6	<0.1	0.3	<0.1
Pacheco Pass	0.6	<0.1	0.4	<0.1
Alternative 3				
San Jose Diridon Station Approach	3.9	<0.1	0.2	<0.1
Monterey Corridor	2.7	<0.1	0.4	<0.1
Morgan Hill and Gilroy	9.4	<0.1	0.1	<0.1
Pacheco Pass	0.6	<0.1	0.4	<0.1
Alternative 4				
San Jose Diridon Station Approach	5.5	<0.1	0.1	<0.1
Monterey Corridor	6.1	<0.1	0.2	<0.1
Morgan Hill and Gilroy	2.6	<0.1	0.4	<0.1
Pacheco Pass	0.6	<0.1	0.4	<0.1
Threshold	**10.0**	**1.0**	**1.0**	**0.3**

[1] Only the highest modeled off-site risk is presented for each subsection. The reported risk includes impacts from combined construction of all features (e.g., at grade, viaduct, concrete batch plants) in each subsection. Refer to Appendix E of the Air Quality and Greenhouse Gases Technical Report (Volume 2, Appendix 3.3-A) for individual risk contributions.
[2] Cancer risk represents the incremental increase in the number of cancers in a population of one million. Risks are cumulative of inhalation, dermal, soil, mother's milk, and crop pathways.
[3] HI is shown by pollutant contributions to the most affected organ system (respiratory). All NO_2 risks assume an 80 percent ambient ratio to NO_X concentrations.

< = less than
$\mu g/m^3$ = micrograms per cubic meter of air
HI = hazard index
NO_2 = nitrogen dioxide
NO_X = nitrogen oxides
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter

Table 3.3-20 Excess Cancer and Noncancer Health Risks Associated with Construction of Alternatives 1, 2, 3, and 4 in the Monterey Bay Air Resources District[1]

Alternative/Subsection	Cancer (per million)[2]	Chronic HI[3]	Acute HI[3]
Alternative 1			
Morgan Hill and Gilroy	2.7	<0.1	0.4
Alternative 2			
Morgan Hill and Gilroy	4.6	<0.1	0.3
Alternative 3			
Morgan Hill and Gilroy	9.4	<0.1	0.1
Alternative 4			
Morgan Hill and Gilroy	2.6	<0.1	0.4
Threshold	**10.0**	**1.0**	**1.0**

[1] Only the highest modeled off-site risk is presented for each subsection. The reported risk includes impacts from combined construction of all features (e.g., at grade, viaduct, concrete batch plants) in each subsection. Refer to Appendix E of the Air Quality and Greenhouse Gases Technical Report (Volume 2, Appendix 3.3-A) for individual risk contributions.
[2] Cancer risk represents the incremental increase in the number of cancers in a population of one million. Risks are cumulative of inhalation, dermal, soil, mother's milk, and crop pathways.
[3] HI is shown by pollutant contributions to the most affected organ system (respiratory). All NO_2 risks assume an 80 percent ambient ratio to NO_X concentrations.
< = less than
HI = hazard index
NO_2 = nitrogen dioxide
NO_X = nitrogen oxides

Table 3.3-21 Excess Cancer and Noncancer Health Risks Associated with Construction of Alternatives 1, 2, 3, and 4 in the San Joaquin Valley Air Pollution Control District[1]

Alternative/Subsection	Cancer (per million)[2]	Chronic HI[3]	Acute HI[3]
Alternative 1			
Pacheco Pass	0.6	<0.1	0.4
San Joaquin Valley	5.0	<0.1	0.1
Alternative 2			
Pacheco Pass	0.6	<0.1	0.4
San Joaquin Valley	5.0	<0.1	0.1
Alternative 3			
Pacheco Pass	0.6	<0.1	0.4
San Joaquin Valley	5.0	<0.1	0.1
Alternative 4			
Pacheco Pass	0.6	<0.1	0.4
San Joaquin Valley	5.0	<0.1	0.1
Threshold	**20.0**	**1.0**	**1.0**

[1] Only the highest modeled off-site risk is presented for each subsection. The reported risk includes impacts from combined construction of all features (e.g., at grade, viaduct) in each subsection. Refer to Appendix E of the Air Quality and Greenhouse Gases Technical Report (Volume 2, Appendix 3.3-A) for individual risk contributions.
[2] Cancer risk represents the incremental increase in the number of cancers in a population of one million. Risks are cumulative of inhalation, dermal, soil, mother's milk, and crop pathways.
[3] HI is shown by pollutant contributions to the most affected organ system (respiratory). All NO_2 risks assume an 80 percent ambient ratio to NO_X concentrations.
< = less than
HI = hazard index
NO_2 = nitrogen dioxide
NO_X = nitrogen oxides

The health risk results among the alternatives are influenced by the anticipated intensity and duration of construction activity, as well as proximity to receptors. As shown in Table 3.3-19, health risks within San Jose Diridon Station Approach and Monterey Corridor Subsections in the BAAQMD would be similar among all alternatives, with Alternative 4 resulting in the greatest potential risk. Alternative 4 would require the highest levels of earthwork construction for berm and at-grade track within these subsections. The higher levels of earthwork construction would require additional equipment that generates higher levels of DPM, which present slightly greater health risks under Alternative 4. Within the Morgan Hill and Gilroy Subsection, Alternative 3 is predicted to add the greatest excess cancer risk because several residential receptors are near this alignment where it passes through “Old Gilroy” (SR 152 and Frazier Lake Road). Health risks within the Pacheco Pass Subsection in the BAAQMD would be the same among all alternatives.

As shown in Table 3.3-20, health risks within the MBARD would be similar to those quantified in the BAAQMD for the Morgan Hill and Gilroy Subsection. Alternative 3 is predicted to add the greatest excess cancer risk because the alignment passes near residents along Lover’s Lane. Risks within the SJVAPCD would be the same among all alternatives (see Table 3.3-21) because construction activities would be identical. Risks would be greatest in the San Joaquin Valley Subsection, where berm construction would require concrete work for starter panels and walls, placing of the fill material, placing of the panels and straps, and railbed construction. These activities would require a good amount of diesel-powered construction equipment.

While the intensity of health risks would vary by location, none of project alternatives would result in increased cancer or health hazards, or $PM_{2.5}$ concentrations in excess of BAAQMD, MBARD, or SJVAPCD thresholds.

CEQA Conclusion

The impact would be less than significant under CEQA because the incremental increases in maximum cancer risk and noncancer health hazards would not exceed air district thresholds. Therefore, CEQA does not require mitigation.

Impact AQ#7: Temporary Direct Impacts on Localized Air Quality—Exposure to Asbestos, Lead-Based Paint, and Fungal Spores That Cause Valley Fever

NOA could become airborne as a result of excavating (including cuts and drilling deep foundations for aerial structures) or tunneling through ultramafic and metavolcanic bedrock. Based on information presented in the *San Jose to Merced Project Section Geology, Soils, and Seismicity Technical Report* (Authority 2019b), no ultramafic or metavolcanic bedrock is mapped in the San Jose Diridon Station Approach or San Joaquin Valley Subsections. However, more than half of the alignment in the Pacheco Pass Subsection would involve tunneling through bedrock that may contain zones of ultramafic or metavolcanic bedrock. Similarly, ultramafic rock is present within the Monterey Corridor and Morgan Hill and Gilroy Subsections. While excavation and soil movement in these subsections may disturb NOA, the design-build contractor would prepare a construction management plan that outlines practices for avoiding and minimizing airborne release of NOA (GEO-IAMF#5). Construction contractors would also be required to comply with the BAAQMD’s Asbestos Airborne Toxic Control Measure for Construction and Grading Operations, which requires implementation of dust control measures to limit the potential for airborne asbestos.

The demolition of asbestos-containing materials is subject to the limitations of the National Emissions Standards for Hazardous Air Pollutants (40 C.F.R. Parts 61 and 63) regulations and would require an asbestos inspection. The BAAQMD, MBARD, and SJVAPCD would be consulted before demolition begins. The project would include strict compliance with existing asbestos regulations as part of project design.

Buildings in the air quality RSA might be contaminated with residual Pb, which was used as a pigment and drying agent in oil-based paint until the Lead-Based Paint Poisoning Prevention Act of 1971 prohibited such use. If encountered during structure demolitions and relocations, LBP and asbestos would be handled and disposed of in accordance with applicable standards.

The Authority would require construction contractors to prepare demolition plans with specific provisions for asbestos and LBP abatement for structures slated for demolition or renovation (HMW-IAMF#5). This would minimize the potential exposure of the public and construction workers to these hazardous materials. Implementation of a hazardous materials and waste plan, including procedures for hazardous waste transport, containment, and storage (HMW-IAMF#10), would further minimize potential health impacts on workers and community members during project demolition activities (Section 3.10), Hazardous Materials and Waste.

Alternative 2 requires the most demolition (7.1 million square feet), and therefore has the highest potential to encounter and expose receptors to impacts from asbestos and LBP. Alternative 1 requires the second most demolition (4.3 million square feet), followed by Alternative 3 (4.0 million square feet) and Alternative 4 (2.0 million square feet). The project alternatives would all follow the same construction techniques and comply with the same regulations and standards to minimize exposure to these substances. Refer to the Air Quality and Greenhouse Gases Technical Report (Appendix 3.3-A) for additional information on demolition activities and quantities.

While there are several factors that influence receptor exposure and development of Valley fever, earthmoving activities during construction could release *C. immitis* spores if the spores are present in the soil. Receptors adjacent to the construction area may therefore be exposed to increased risk of inhaling *C. immitis* spores and subsequent development of Valley fever. Dust-control measures are the primary defense against infection (USGS 2000). The project includes all best available fugitive dust control measures (see AQ-IAMF#1), which would avoid dusty conditions and reduce the risk of contracting Valley fever through routine watering and other measures.

Alternative 2 would require the most earthmoving (60.4 million cubic yards and 1,047 acres disturbed), and therefore has the highest potential to encounter and expose receptors to impacts from Valley fever. Alternative 4 requires the second most earthmoving (52.2 million cubic yards and 1,048 acres disturbed), followed by Alternative 3 (58.7 million cubic yards and 870 acres disturbed) and Alternative 1 (51.5 million cubic yards and 813 acres disturbed). The project alternatives would all follow the same construction techniques and comply with the same regulations and standards to minimize exposure to these substances. Refer to the Air Quality and Greenhouse Gases Technical Report (Appendix 3.3-A) for additional information on earthmoving activities and quantities.

CEQA Conclusion

The impact would be less than significant under CEQA because the project design and compliance with existing asbestos and LBP handling and disposal standards would prevent exposure of sensitive receptors to substantial pollutant concentrations with respect to asbestos and LBP. The project includes all best available fugitive dust control measures (AQ-IAMF#1) that would avoid dusty conditions and reduce the risk of contracting Valley fever through routine watering and other measures. Accordingly, the project would not expose receptors to substantial public health risks related to asbestos, LBP, or Valley fever. Therefore, CEQA does not require mitigation.

Impact AQ#8: Temporary Direct Impacts on Localized Air Quality—Exposure to Odors

Sources of odor during construction would include diesel exhaust from construction equipment and asphalt paving. All odors would be localized and generally confined to the immediate area surrounding the construction site. The project would use standard construction techniques, and the equipment odors would be typical of most construction sites. These odors would be temporary and localized, and they would cease once construction activities have been completed. The BAAQMD, MBARD, and SJVAPCD have adopted rules that limit the amount of VOC emissions from cutback asphalt, which would also reduce construction-related odors. The potential for impacts would be the same for all four project alternatives because all four project alternatives would follow the same construction techniques and comply with the same air district rules to limit odors.

CEQA Conclusion

The impact would be less than significant under CEQA because odors generated during construction would not be expected to affect a substantial number of people or result in nuisance complaints. Therefore, CEQA does not require mitigation.

Operations Impacts

Project operations would include HSR maintenance activities and operation of stations and maintenance facilities. Operations and maintenance activities are more fully described in Chapter 2, Alternatives.

Impact AQ#9: Continuous Permanent Direct Impacts on Air Quality in the SFBAAB, NCCAB, and SJVAB

Operation of the project has the potential to reduce long-term air quality emissions in the Northern California region. The project would increase passenger rail ridership, and it is anticipated that people would shift trips from on-road vehicles and aircraft to the HSR system, which is less emissions-intensive than other transportation modes. Criteria pollutant emissions and reductions generated by project operations were quantified for 2015, 2029, and 2040 to capture changes in ridership and regional emission factors.

Table 3.3-22 through Table 3.3-24 summarize the estimated net regional emissions changes due to HSR operations under the medium and high ridership scenarios relative to 2015 Existing and 2029 and 2040 No Project conditions, respectively. From an operations perspective, ridership and associated emissions changes from on-road vehicles, aircraft, and power plants (used to generate electricity to power the HSR system) would be identical among the four project alternatives. These emissions changes would occur throughout the Northern California region. Fugitive dust emissions along the project corridor from train movement would vary by project alternative based on the length of the at-grade track. Similarly, emissions from operation of the stations and maintenance facilities would differ among the alternatives based on which facilities are built and operated. Emissions from the stations and maintenance facilities would occur locally at the building locations, which are predominantly in the BAAQMD. Refer to the Air Quality and Greenhouse Gases Technical Report (Volume 2, Appendix 3.3-A) for detailed emissions results by individual source (e.g., on-road vehicles, stations).

Table 3.3-22 Summary of Regional Criteria Pollutant Emissions Changes from Project Operations (under the Medium and High Ridership Scenarios) Relative to the 2015 Existing Conditions (tons per year)

Emission Source	VOC (tons/yr)		CO (tons/yr)		NO_X (tons/yr)		SO_2 (tons/yr)		PM_{10} (tons/yr)		$PM_{2.5}$ (tons/yr)	
	M	H	M	H	M	H	M	H	M	H	M	H
Indirect Emissions												
On-road vehicles	(17)	(23)	(632)	(858)	(72)	(98)	(2)	(2)	(48)	(66)	(13)	(18)
Aircraft	(40)	(38)	(341)	(326)	(328)	(314)	(35)	(34)	(10)	(9)	(10)	(9)
Power plants	2	2	24	26	12	13	1	2	3	3	3	3
Direct Emissions[1]												
Alternative 1												
Stations[2]	2		24		3		<1		4		1	
Maintenance facilities	2		14		12		<1		2		1	
Train movement[3]									8		1	
Alternative 2												
Stations[2]	2		24		3		<1		4		1	
Maintenance facilities	2		14		12		<1		2		1	
Train movement[3]									16		2	
Alternative 3												
Stations[2]	3		25		3		<1		5		1	
Maintenance facilities	2		14		12		<1		2		1	
Train movement[3]									9		1	
Alternative 4												
Stations[2]	2		24		3		<1		4		1	
Maintenance facilities	2		14		12		<1		2		1	
Train movement[3]									18		3	

Emission Source	VOC (tons/yr)		CO (tons/yr)		NO_X (tons/yr)		SO_2 (tons/yr)		PM_{10} (tons/yr)		$PM_{2.5}$ (tons/yr)	
	M	H	M	H	M	H	M	H	M	H	M	H
Total Emissions[4]												
Alternative 1	(50)	(54)	(911)	(1,120)	(372)	(383)	(35)	(34)	(48)	(65)	(19)	(23)
Alternative 2	(50)	(54)	(911)	(1,120)	(372)	(383)	(35)	(34)	(47)	(64)	(19)	(23)
Alternative 3	(50)	(54)	(910)	(1,119)	(372)	(383)	(35)	(34)	(47)	(63)	(19)	(23)
Alternative 4	(50)	(54)	(911)	(1,120)	(372)	(383)	(35)	(34)	(47)	(63)	(19)	(23)

Parentheses () indicate negative values.
[1] Direct emissions do not depend on ridership; emissions are the same for the medium and high ridership scenarios.
[2] Represents the net emissions effect of the project (i.e., the difference in station operating emissions between existing and existing plus project conditions)
[3] Train movement would only generate fugitive dust emissions.
[4] Total includes indirect and direct emissions.
CO = carbon monoxide
H = high
M = medium
NO_X = nitrogen oxides
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year

Table 3.3-23 Summary of Total Regional Criteria Pollutant Emissions Changes from Project Operations (under the Medium and High Ridership Scenarios) Relative to the 2029 No Project Alternative (tons per year)

Emission Source	VOC (tons/yr)		CO (tons/yr)		NO_X (tons/yr)		SO_2 (tons/yr)		PM_{10} (tons/yr)		$PM_{2.5}$ (tons/yr)	
	M	H	M	H	M	H	M	H	M	H	M	H
Indirect Emissions												
On-road vehicles	(2)	(3)	(157)	(212)	(14)	(18)	(1)	(1)	(36)	(49)	(10)	(13)
Aircraft	(26)	(28)	(216)	(237)	(213)	(233)	(23)	(25)	(6)	(7)	(6)	(7)
Power plants	1	2	20	22	10	11	1	1	2	3	2	2
Direct Emissions[1]												
Alternative 1												
Stations[2]	1		10		1		<1		5		1	
Maintenance facilities	2		11		7		<1		1		<1	
Train movement[3]									8		1	
Alternative 2												
Stations[2]	1		10		1		<1		5		1	
Maintenance facilities	2		11		7		<1		1		<1	
Train movement[3]									16		2	
Alternative 3												
Stations[2]	2		12		1		<1		7		2	
Maintenance facilities	2		11		7		<1		1		<1	
Train movement[3]									9		1	
Alternative 4												
Stations[2]	1		10		1		<1		5		1	
Maintenance facilities	2		11		7		<1		1		<1	
Train movement[3]									18		3	

Emission Source	VOC (tons/yr)		CO (tons/yr)		NO_X (tons/yr)		SO_2 (tons/yr)		PM_{10} (tons/yr)		$PM_{2.5}$ (tons/yr)	
	M	H	M	H	M	H	M	H	M	H	M	H
Total Emissions[4]												
Alternative 1	(23)	(26)	(332)	(406)	(208)	(232)	(22)	(24)	(34)	(47)	(12)	(16)
Alternative 2	(23)	(26)	(332)	(406)	(208)	(232)	(22)	(24)	(34)	(47)	(12)	(16)
Alternative 3	(23)	(26)	(330)	(404)	(208)	(232)	(22)	(24)	(32)	(46)	(12)	(15)
Alternative 4	(23)	(26)	(332)	(406)	(208)	(232)	(22)	(24)	(34)	(47)	(12)	(16)

Parentheses () indicate negative values.
[1] Direct emissions do not depend on ridership; emissions are the same for both ridership scenarios.
[2] Represents the net emissions effect of the project (i.e., the difference in station operating emissions between 2029 No Project and 2029 Plus Project conditions)
[3] Train movement would only generate fugitive dust emissions.
[4] Total includes indirect and direct emissions.
CO = carbon monoxide
H = high
M = medium
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year

Table 3.3-24 Summary of Total Regional Criteria Pollutant Emissions Changes from Project Operations (under the Medium- and High-Ridership Scenarios) Relative to the 2040 No Project Alternative (tons per year)

Emission Source	VOC (tons/yr)		CO (tons/yr)		NO_X (tons/yr)		SO_2 (tons/yr)		PM_{10} (tons/yr)		$PM_{2.5}$ (tons/yr)	
	M	H	M	H	M	H	M	H	M	H	M	H
Indirect Emissions												
On-road vehicles	(3)	(3)	(191)	(247)	(15)	(20)	(1)	(2)	(66)	(83)	(17)	(21)
Aircraft	(55)	(53)	(459)	(440)	(452)	(433)	(49)	(47)	(14)	(13)	(14)	(13)
Power plants	2	2	24	26	12	13	1	2	3	3	3	3
Direct Emissions[1]												
Alternative 1												
Stations[2]	2		19		2		<1		14		4	
Maintenance facilities	2		10		6		<1		1		<1	
Train movement[3]									8		1	
Alternative 2												
Stations[2]	2		19		2		<1		14		4	
Maintenance facilities	2		10		6		<1		1		<1	
Train movement[3]									16		2	
Alternative 3												
Stations[2]	2		21		2		<1		16		4	
Maintenance facilities	2		10		6		<1		1		<1	
Train movement[3]									9		1	
Alternative 4												
Stations[2]	2		19		2		<1		14		4	
Maintenance facilities	2		10		6		<1		1		<1	
Train movement[3]									18		3	

Emission Source	VOC (tons/yr)		CO (tons/yr)		NO_X (tons/yr)		SO_2 (tons/yr)		PM_{10} (tons/yr)		$PM_{2.5}$ (tons/yr)	
	M	H	M	H	M	H	M	H	M	H	M	H
Total Emissions[4]												
Alternative 1	(52)	(50)	(597)	(631)	(447)	(432)	(48)	(46)	(61)	(77)	(24)	(27)
Alternative 2	(52)	(50)	(597)	(631)	(447)	(432)	(48)	(46)	(61)	(77)	(24)	(27)
Alternative 3	(52)	(50)	(596)	(629)	(447)	(432)	(48)	(46)	(60)	(76)	(24)	(27)
Alternative 4	(52)	(50)	(597)	(631)	(447)	(432)	(48)	(46)	(61)	(77)	(24)	(27)

Parentheses () indicate negative values.
[1] Direct emissions do not depend on ridership; emissions are the same for both ridership scenarios.
[2] Represents the net emissions effect of the project (i.e., the difference in station operating emissions between 2040 No Project and 2040 Plus Project conditions)
[3] Train movement would only generate fugitive dust emissions.
[4] Total includes indirect and direct emissions.
CO = carbon monoxide
H = high
M = medium
NO_X = nitrogen oxides
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year

As shown in Table 3.3-22 through Table 3.3-24, project operations under both ridership scenarios would increase criteria pollutant emissions from additional electricity required to power the HSR system, as well as from operation of the stations and maintenance facilities, relative to the 2015 Existing and 2029 and 2040 No Project conditions. Fugitive dust emissions would also increase as a result of train movement over the track. Electricity demands and the associated emissions from power plants would be identical among the alternatives. Fugitive dust emissions from train movement would be slightly greater under Alternative 4 because it would include more at-grade/embankment miles of track compared to the other project alternatives. Station and maintenance facility emissions would be similar among all four alternatives, but slightly higher under Alternative 3, which would include the East Gilroy Station. Because the East Gilroy Station would be entirely new, emissions under existing conditions would be zero and, as a result, net emissions would be greater than the Downtown Gilroy Station (proposed under Alternatives 1, 2, and 4).

While project operations would increase criteria pollutants associated with power plants, train movement, stations, and maintenance facilities, it would result in sizeable emissions reductions from on-road vehicles and aircraft relative to the 2015 Existing and 2029 and 2040 No Project conditions. These emissions benefits would be achieved by reductions in single-occupancy vehicle trips and aircraft activity; with a greater number of people traveling on the HSR system, fewer vehicle and aircraft trips would occur. Since the reductions in on-road vehicles and aircraft activity are directly tied to ridership, there would be no difference in emissions benefits among the project alternatives. Ultimately, the criteria pollutant reductions achieved by changes in on-road vehicles and aircraft activity would more than offset the emissions increase from project operations (electricity, train movement, stations, and maintenance facilities). Long-term operations of all project alternatives and the larger HSR system would, therefore, result in a net reduction in operational emissions from the 2015 Existing and 2029 and 2040 No Project conditions.

CEQA Conclusion

The impact would be less than significant under CEQA for all alternatives because project operations are anticipated to result in a net reduction of criteria pollutant emissions in 2015 relative to existing conditions and in future years relative to the No Project conditions. Project operations would not violate any air quality standard or contribute substantially to an existing or projected air quality violation. Reductions in regional ozone precursors (VOC and NOx) and PM emissions may contribute to reductions in ozone and secondary PM formation, which may result in public health benefits, including reductions in lost workdays, hospital admissions, and certain respiratory and cardiovascular symptoms. Therefore, CEQA does not require mitigation.

Impact AQ#10: Continuous Permanent Direct Impacts on Implementation of an Applicable Air Quality Plan

During operations, all four project alternatives would result in net decreases in all criteria pollutant emissions (VOC, CO, NO_X, SO_2, PM_{10} and $PM_{2.5}$) when compared to 2015 Existing and 2029 and 2040 No Project conditions, as shown in Table 3.3-22 through Table 3.3-24. This would be consistent with the BAAQMD's, MBARD's, and SJVAPCD's air quality plans, as well as the local RTPs. Therefore, project operations would not conflict with or obstruct implementation of applicable air quality plans.

CEQA Conclusion

The impact would be less than significant under CEQA because operations of the project would result in net decreases in all criteria pollutant emissions relative to the 2015 existing conditions. As a result, project operations would not conflict with or obstruct implementation of applicable air quality plans. Therefore, CEQA does not require mitigation.

Impact AQ#11: Continuous Permanent Direct Impacts on Localized Air Quality—Carbon Monoxide Hot Spots (NAAQS Compliance)

Analysts modeled CO concentrations at five intersections identified in the traffic analysis as having the highest station traffic volumes and the worst levels of congestion/delay of those analyzed for the project covered by CMPs. In addition to these locations, the intersection of Monterey Road and Skyway Drive was analyzed under Alternative 4, which would require an at-grade crossing. Alternatives 1 through 3 would not worsen traffic conditions at this or other intersections along the alignment because the alignment and roadways would be grade separated.

The modeled CO concentrations were combined with CO background concentrations and compared with air quality standards. Table 3.3-25 shows the CO hot-spot analysis results, which indicate that CO concentrations are not anticipated to exceed the 1- or 8-hour NAAQS and CAAQS. Traffic volumes would not differ significantly among the project alternatives at the five station intersections; consequently, most of the results presented in Table 3.3-25 are representative of all four project alternatives. The results for Monterey Road/Skyway Drive are only applicable to Alternative 4.

CEQA Conclusion

The impact would be less than significant under CEQA for all alternatives because the project would not create traffic conditions that would result in localized CO hot spots. As a result, the project would not result in CO concentrations in excess of the health protective CAAQS or NAAQS, and as such, would not expose sensitive receptors to significant pollutant concentrations or health effects. Therefore, CEQA does not require mitigation.

Table 3.3-25 Carbon Monoxide Modeling Concentration Results (parts per million)

Intersection	Rec.[1]	1-Hour Concentration[2]						8-Hour Concentration[3]					
		Existing (2015)		Future (2029)		Future (2040)		Existing (2015)		Future (2029)		Future (2040)	
		No Project	Plus Project	No Project	Plus Project	No Project	Plus Project	No Project	Plus Project	No Project	Plus Project	No Project	Plus Project
The Alameda (SR 82)/Taylor Street-Naglee Avenue	1	3.7	3.7	2.9	2.9	2.9	2.9	2.8	2.8	2.2	2.2	2.2	2.2
	2	3.7	3.7	2.8	2.8	2.8	2.9	2.8	2.8	2.2	2.2	2.2	2.2
	3	4.0	4.0	2.9	2.9	2.9	2.9	3.0	3.0	2.2	2.2	2.2	2.2
	4	3.6	3.6	2.8	2.8	2.9	2.9	2.7	2.7	2.2	2.2	2.2	2.2
Autumn Street (SR 82)/West Santa Clara Street (SR 82)	5	3.1	3.2	2.7	2.7	2.8	2.8	2.4	2.4	2.1	2.1	2.2	2.2
	6	3.2	3.2	2.7	2.8	2.7	2.8	2.4	2.4	2.1	2.2	2.1	2.2
	7	2.9	3.0	2.6	2.7	2.8	2.9	2.2	2.3	2.0	2.1	2.2	2.2
	8	3.1	3.2	2.7	2.7	2.8	2.9	2.4	2.4	2.1	2.1	2.2	2.2
Coleman Avenue/I-880 Northbound Ramps	9	3.8	3.9	2.8	2.8	2.8	2.8	2.9	2.9	2.2	2.2	2.2	2.2
	10	4.2	4.3	2.9	3.0	2.9	3.0	3.1	3.2	2.2	2.3	2.2	2.3
	11	4.0	4.0	2.8	2.9	2.9	2.9	3.0	3.0	2.2	2.2	2.2	2.2
	12	4.4	4.5	3.0	3.0	3.0	3.0	3.3	3.3	2.3	2.3	2.3	2.3
Monterey Road (SR 82)/Blossom Hill Road Westbound Ramps (SR 82/CR G10)	13	3.6	3.6	2.8	2.7	2.6	2.9	2.7	2.7	2.2	2.1	2.0	2.2
	14	3.7	3.7	2.9	2.8	2.7	2.9	2.8	2.8	2.2	2.2	2.1	2.2
	15	3.7	3.8	2.9	2.7	2.5	2.9	2.8	2.9	2.2	2.1	1.9	2.2
	16	3.8	3.8	2.9	2.8	2.8	2.9	2.9	2.9	2.2	2.2	2.2	2.2
US 101 Southbound Ramps/Blossom Hill Road	17	4.7	4.6	3.0	3.0	3.0	3.0	3.5	3.4	2.3	2.3	2.3	2.3
	18	5.0	5.1	3.2	3.2	3.2	3.2	3.7	3.8	2.4	2.4	2.4	2.4
	19	4.2	4.3	2.9	2.9	2.9	2.9	3.1	3.2	2.2	2.2	2.2	2.2
	20	4.2	4.3	2.9	2.9	2.9	2.9	3.1	3.2	2.2	2.2	2.2	2.2
Monterey Road/Skyway Drive (Alternative 4 only)	21	3.7	3.7	2.8	2.8	2.8	2.8	2.8	2.8	2.2	2.2	2.2	2.2
	22	4.4	4.4	3.0	3.0	3.0	3.0	3.3	3.3	2.3	2.3	2.3	2.3
	23	3.8	3.8	2.8	2.8	2.8	2.8	2.9	2.9	2.2	2.2	2.2	2.2
	24	4.5	4.5	3.0	3.0	3.0	3.0	3.3	3.3	2.3	2.3	2.3	2.3
State standard (ppm)		20	20	20	20	20	20	9	9	9	9	9	9
Federal standard (ppm)		35	35	35	35	35	35	9	9	9	9	9	9

[1] Consistent with the Caltrans CO Protocol, receptors are located at 3 meters from the intersection, at each of the four corners to represent the nearest location in which a receptor could potentially be located adjacent to a traveled roadway. The modeled receptors indicated are not representative of the actual sensitive receptors. Receptor locations are theoretical and are not reflective of the actual locations shown on Figure 3.3-3 through Figure 3.3-5.
[2] Average 1-hour background concentration between 2015 and 2017 was 2.13 ppm (USEPA 2018a).
[3] Average 8-hour background concentration between 2015 and 2017 was 1.67 ppm (USEPA 2018a).
Caltrans = California Department of Transportation
CO = carbon monoxide
CR = county road
ppm = parts per million
SR = State Route
US = U.S. Highway
USEPA = U.S. Environmental Protection Agency

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Impact AQ#12: Continuous Permanent Direct Impacts on Localized Air Quality—Exposure to Mobile Source Air Toxics

The project would decrease regional VMT and MSAT emissions relative to 2015 Existing and 2029 and 2040 No Project conditions. The HSR system would reduce the number of individual vehicle trips on a regional basis. Because the project would not change the regional traffic mix, the amount of MSATs emitted from highways and other roadways within the RSA would be proportional to the VMT. The regional VMT estimated for the project would be less than the anticipated VMT under 2015 Existing and 2029 and 2040 No Project conditions, and therefore MSAT emissions from regional vehicle traffic would be less for the project. Regionally, the project would be considered a project with "no meaningful MSAT effects" (Tier 1), per FHWA's (2016) MSAT guidance. Reductions in regional MSAT emissions may result in public health benefits, including reductions in lost work days, hospital admissions, and certain respiratory and cardiovascular symptoms.

While reductions in regional MSATs are expected because of decreased VMT, localized increases in MSAT emissions could occur near the stations and maintenance facilities, because of additional passenger and employee commute trips. These increases would not be considered to have "higher potential MSAT effects" per FHWA guidance since the anticipated change in local average daily traffic would not exceed the FHWA's MSAT trigger of 140,000 average daily traffic. Locally, the project would be considered a project with "low MSAT effects" (Tier 2), per FHWA's (2016) MSAT guidance. Consistent with this guidance, the magnitude and the duration of potential changes in localized MSAT emissions, and thus health consequences, cannot be reliably quantified because of incomplete or unavailable information in forecasting project-specific health impacts. Even though there may be differences among the project alternatives with respect to localized MSATs, USEPA's vehicle and fuel regulations, coupled with fleet turnover, would cause MSAT reductions over time, thereby offsetting the increase in localized traffic associated with the project.

CEQA Conclusion

The impact would be less than significant under CEQA for all alternatives because the project would not result in an increase in MSAT emissions that would expose sensitive receptors to substantial pollutant concentrations. Consistent with FHWA guidance, the project would have no meaningful regional MSAT impacts and would have a low potential for meaningful localized MSAT impacts. Therefore, CEQA does not require mitigation.

Impact AQ#13: Continuous Permanent Direct Impacts on Localized Air Quality—Particulate Matter Hot Spots (NAAQS Compliance)

Portions of the RSA are designated nonattainment for $PM_{2.5}$ and maintenance for PM_{10}. In accordance with USEPA guidance, if a project meets one of several criteria, it is considered a project of air quality concern, and a quantitative $PM_{10}/PM_{2.5}$ analysis is required. The criteria, along with an evaluation of their applicability to the project alternatives, are as follows:

- *New or expanded highway projects that have a significant number of or significant increase in diesel vehicles*—The project is not a new highway project, nor would it expand an existing highway beyond its current capacity. The HSR system would be electrically powered. While the project would affect traffic conditions on roadways near the stations, it would not measurably affect truck volumes on the affected roadways. Most vehicle trips entering and leaving the station location would be passenger vehicles, which are typically not diesel-powered, except for delivery truck trips to support station activities. Furthermore, the project would improve regional traffic conditions by reducing traffic congestion and regional VMT in the RSA and increasing vehicle speeds.
- *Projects affecting intersections that are at LOS D, E, or F with a significant number of diesel vehicles or those that will degrade to LOS D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project*—The project would not change the existing traffic mix at signalized intersections. Although the maintenance facilities would use diesel vehicles, daily deliveries are not expected to exceed 20 trips. In some cases, the LOS of intersections near the HSR stations or at at-grade crossings (Alternative 4

only) would be degraded to LOS F under the project alternatives. However, the traffic volume increases at the affected intersections would be primarily from passenger cars and transit buses used for transporting people to or from the stations. Passenger cars would be mostly gasoline-powered. Buses operated by VTA are a mix of diesel- and diesel-electric–powered vehicles. Pursuant to the Innovative Clean Transit Regulation, VTA's bus fleet would comprise only zero-emission vehicles by 2040. While diesel-powered buses would still operate as part of VTA's future vehicle fleet until that time, they would not represent a significant (i.e., less than 5 percent) portion of local traffic.

- *New or expanded bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location*—The trains used for the project would be EMUs, powered by electricity, not diesel fuel. Most vehicle trips entering and leaving the stations would be passenger vehicles, which are not typically diesel-powered.[13]

  Alternatives 1, 2, and 4 would not have new or expanded bus or rail passenger terminals or transfer points that would significantly increase the number of diesel vehicles congregating at a single location. Improved bus service at the San Jose Diridon and Downtown Gilroy Stations would not be part of the HSR system. The Authority assumes that bus service levels at these locations would be constant into the future because no operator has a funding plan to deliver more service. VTA would transition to a to zero-emissions bus fleet, which would reduce emissions over time.

  While bus service levels are assumed to be the same with and without the project, the East Gilroy Station under Alternative 3 would be an entirely new transit stop with HSR conditions. The project would generate approximately 107 shuttle/bus trips per day at the East Gilroy Station in the year 2029. These trips would be made by a combination of diesel, diesel-electric, and fully electric buses. While the diesel-powered buses would generate DPM along the bus access route (Leavesley Road) and during passenger loading and unloading, the emissions would be minor, totaling less than 0.0012 pounds of PM_{10} per day. The 107 additional bus trips would represent less than 1.5 percent of average daily traffic on Leavesley Road (Burton 2019]). Accordingly, the East Gilroy Station would not significantly increase the number of diesel vehicles congregating at a single location in the near-term. By 2040, all transit buses at the East Gilroy Station would be zero-emissions vehicles, pursuant to the Innovative Clean Transit Regulation.

- *Projects in, or affecting, locations, areas, or categories of sites that are identified in the $PM_{2.5}$- or PM_{10}-applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation*—The RSA is not in an area identified as sites of violation or possible violation in the USEPA-approved SIP.

As a result, none of the project alternatives were determined to be a project of air quality concern, as defined by 40 C.F.R. Section 93.123(b)(1), and likely would not cause violation of PM_{10}/$PM_{2.5}$ health-protective NAAQS or any localized impact with respect to PM on sensitive receptors during its operations. Thus, CAA 40 C.F.R. Section 93.116 requirements would be met without a quantitative hot-spot analysis.

CEQA Conclusion

The impact would be less than significant under CEQA for all alternatives because the project is not considered to be a project of air quality concern, based on the descriptions in 40 C.F.R. Section 93.123(b)(1). Changes in on-road vehicle operation associated with project operations would not contribute to new or worsened violations of the health-protective NAAQS. As such, localized changes in PM emissions from on-road vehicles would not be expected to contribute a significant level of air pollution such that individuals would be exposed to substantial PM concentrations. Therefore, CEQA does not require mitigation.

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[13] While not a bus or rail terminal, the maintenance facilities would also have diesel vehicles, but these would be limited to 20 or fewer haul vehicles per day. Likewise, locomotives used to support maintenance activities at the MOWF would be used between 24 and 210 hours per year, depending on function.

Impact AQ#14: Continuous Permanent Direct Impacts on Localized Air Quality—Exposure to Diesel Particulate Matter and $PM_{2.5}$ (Health Risk)

Relocated freight service would be the same under all project alternatives and has the potential to create increased inhalation health risks and exposure to $PM_{2.5}$, which may exceed local significance thresholds for cancer and noncancer hazards at analyzed receptor locations adjacent to the relocated track. Health risks to the closest receptors along relocated track sections were estimated using the BAAQMD's rail inventory tool and the methods described in Section 3.3.4.3, Methods for Impacts Analysis.

Table 3.3-26 shows the incremental change in health risks between the project and existing and No Project conditions. The analysis assumes that freight relocation would be complete in 2022. Accordingly, emissions exposure under the relocated freight scenario and No Project conditions was assumed to begin in 2022. Existing conditions reflects the risks that would occur if the freight tracks were not relocated and exposure to emissions began in 2015.

As shown in Table 3.3-26, relocated freight service would generally both decrease and increase cancer and noncancer health risks, relative to existing conditions, depending on location. The decreases would occur primarily because of advancements in locomotive emissions technology and the retirement of older, higher-emitting engines, which would reduce future DPM emission rates. The reduction in future locomotive emission rates is enough to offset the increased risk associated with relocating freight service closer to existing receptors. Where risks would increase, the reduction in locomotive emission rates would not be enough to offset the increased risk associated with relocating freight service closer to existing receptors.

The comparison of relocated risks to No Project conditions accounts for changes in locomotive emission rates because both conditions assume exposure begins in 2022. Accordingly, the comparison reflects the incremental project impact, exclusive of background trends. As shown in Table 3.3-26, relative to No Project conditions, relocating freight service closer to sensitive receptors would increase cancer and noncancer health risks at modeled receptor locations. However, these increases would not exceed BAAQMD thresholds. Table 3.3-26 only evaluates locations where freight would be moved closer to receptors. In many of these locations, receptors on the other side of the track would observe a corresponding health benefit because freight would be moved further away from these receptors.

The San Jose Diridon Station under all alternatives and the Downtown Gilroy Station under Alternatives 1, 2, and 4 would have emergency generators for use in the event of a power outage. The generators would comply with the permitting requirements specified in BAAQMD Regulation 2, Rule 5, which prohibits their operation if cancer or acute hazards exceed air district thresholds. Regulation 2, Rule 5 does not establish any permit restrictions on $PM_{2.5}$ concentrations in the BAAQMD. Accordingly, the Authority only estimated $PM_{2.5}$ exhaust concentrations from emergency generator testing because cancer and hazards would be below air district thresholds.

The East Gilroy Station under Alternative 3 would also operate an emergency generator and would serve diesel-powered buses under 2029 conditions (by 2040, all buses will be net zero emissions per state regulation). Health risks from transit buses are not subject to permit restrictions, and as such, the analysis of health risks at the East Gilroy Station evaluates cancer risk, hazards, and $PM_{2.5}$ concentrations.

The MOWF would operate an emergency generator and use diesel-powered off-road equipment, vehicles, and locomotives to support maintenance and repair activities. The analysis of cancer and noncancer health risks, as well as $PM_{2.5}$ concentrations, at the MOWF includes emissions from all these sources.

Table 3.3-26 Summary of Changes in Cancer and Noncancer Health Risks from Freight Relocation Relative to Existing and No Project Conditions

General Location	Change in Exposure with the Freight Relocation Relative to Exposure under Existing Conditions[1]			Change in Exposure with the Freight Relocation Relative to Exposure under No Project Conditions[2]		
	Cancer	Chronic HI	$PM_{2.5}$ (µg/m³)	Cancer	Chronic HI	$PM_{2.5}$ (µg/m³)
Repositions under Alternatives 1 through 3						
Near Monterey Road and Blanchard Road	(3.9)	<0.0	<0.0	<0.1	<0.1	<0.1
Between Monterey Road and Crowner Avenue	(0.1)	<0.0	<0.0	1.8	<0.1	<0.1
Near Monterey Road and California Avenue	1.2	<0.1	<0.1	3.7	<0.1	<0.1
Near Monterey Road and Ronan Avenue	(0.2)	<0.0	<0.0	0.9	<0.1	<0.1
Near Monterey Road and Leavesley Road	0.0	<0.0	<0.0	0.8	<0.1	<0.1
Near Monterey Road and 1st Street	1.8	<0.1	<0.1	3.3	<0.1	<0.1
Near Monterey Road and W 10th Street	1.3	<0.1	<0.1	2.3	<0.1	<0.1
Repositions under Alternative 3 Only						
Near Pacheco Court and Frazier Lake Road	4.9	<0.1	<0.1	5.0	<0.1	<0.1
Repositions under Alternative 4 Only						
Near Chestnut Street and Asbury Street	(17.2)	<0.0	<0.0	5.2	<0.1	<0.1
Near Harrison Street and Fuller Avenue	(3.9)	<0.0	<0.0	5.6	<0.1	<0.1
Near Cross Way and Northern Road	(1.9)	<0.0	<0.0	0.6	<0.1	<0.1
End of Promme Court	(3.4)	<0.0	<0.0	0.8	<0.1	<0.1
Near Prindiville Drive and Urshan Way	(0.6)	<0.0	<0.0	2.4	<0.1	<0.1
Near Madrone Avenue and Dougherty Avenue	(0.2)	<0.0	<0.0	1.9	<0.1	<0.1
Near Butterfield Blvd and E Dunne Avenue	(0.7)	<0.0	<0.0	0.1	<0.1	<0.1
End of Sister City Way	(0.6)	<0.0	<0.0	0.4	<0.1	<0.1

General Location	Change in Exposure with the Freight Relocation Relative to Exposure under Existing Conditions[1]			Change in Exposure with the Freight Relocation Relative to Exposure under No Project Conditions[2]		
	Cancer	Chronic HI	$PM_{2.5}$ (μg/m³)	Cancer	Chronic HI	$PM_{2.5}$ (μg/m³)
Near Garlic Farms Drive and Travel Park Circle	(0.3)	<0.0	<0.0	0.4	<0.1	<0.1
Near Bolsa Road	0.4	<0.1	<0.1	1.1	<0.1	<0.1
Threshold	**10.0**	**1.0**	**0.3**	**10.0**	**1.0**	**0.3**

Parenthesis () indicate negative values.
[1] Existing conditions reflects the risks that would occur if the freight tracks were not relocated and exposure to emissions began in 2015.
[2] No Project conditions reflects the risks that would occur if the freight tracks were not relocated and exposure to emissions began in 2022.
< = less than
μg/m³ = micrograms per cubic meter
HI = hazard index
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter

Table 3.3-27 shows the results of the health risks analysis at the project stations and the East Gilroy MOWF.[14, 15] Health risks and maximum $PM_{2.5}$ concentrations would be less than BAAQMD's health risk thresholds of significance for all four project alternatives.

Table 3.3-27 Maximum Health Risks and $PM_{2.5}$ Concentrations from Project Station and MOWF Operations[1]

Location/Condition	Cancer	Chronic HI	Maximum $PM_{2.5}$ Concentration ($\mu g/m^3$)
2015 Existing/2029 and 2040 No Project[2]			
San Jose Diridon Station	<10	<1.0	<0.1
Downtown Gilroy Station	<10	<1.0	<0.1
2029/2040 Plus Project[3]			
San Jose Diridon Station (Alternatives 1, 2, 3, 4)[4]	<10	<1.0	<0.1
Downtown Gilroy Station (Alternatives 1, 2, 4)[5]	<10	<1.0	<0.1
East Gilroy Station (Alternative 3)	<1	<0.1	<0.1
East Gilroy MOWF (Alternative 3)[6]	3	<0.1	<0.1
Project vs. Existing and No Project Conditions[7]			
San Jose Diridon Station (Alternatives 1, 2, 3, 4)[4]	<10	<1.0	<0.1
Downtown Gilroy Station (Alternatives 1, 2, 4)[5]	<10	<1.0	<0.1
East Gilroy Station (Alternative 3)	<1	<0.1	<0.1
East Gilroy MOWF (Alternative 3)[6]	3	<0.1	<0.1
Threshold	**10**	**1.0**	**0.3**

[1] The Los Banos MOWS is not analyzed because this facility would be located within the SJVAPCD, which does not have a $PM_{2.5}$ threshold. SJVAPCD does not issue permits for projects that create a significant cancer or non-cancer health risk.
[2] The San Jose Diridon and Downtown Gilroy Stations were assumed to operate one emergency generator under existing conditions. The East Gilroy Station does not exist under existing conditions and, as such, existing emissions are assumed to be zero.
[3] The expanded San Jose Diridon Station was assumed to operate three emergency generators with project implementation. The Downtown Gilroy Station was assumed to operate two emergency generators under project conditions. The East Gilroy Station and MOWF were assumed to operate one generator under project conditions.
[4] There would be no difference in operational emissions or health risk between the aerial and at-grade options.
[5] There would be no difference in operational emissions or health risk between the aerial and embankment options.
[6] There are no receptors within 1,000 feet of the South Gilroy MOWF. Accordingly, a health risk assessment is not required, consistent with BAAQMD (2017a) guidance.
[7] Represents the net concentration effect of the project (i.e., the difference in between the existing/No Project and the project condition).
< = less than
$\mu g/m^3$ = micrograms per cubic meter
BAAQMD = Bay Area Air Quality Management District
HI = hazard index
MOWS = maintenance of way siding
MOWF = maintenance of way facility
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SJVAPCD = San Joaquin Valley Air Pollution Control District

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[14] The Los Banos MOWS is not analyzed because this facility would be in the SJVAPCD, which does not have a $PM_{2.5}$ threshold. SJVAPCD does not issue permits for projects that create a significant cancer or noncancer health risk (SJVAPCD Rule 2201). Accordingly, cancer and noncancer health risks from generator operation at the Los Banos MOWS would be less than SJVAPCD's health risk thresholds.

[15] There are no receptors within 1,000 feet of the South Gilroy MOWF. Accordingly, a health risk assessment is not required, consistent with BAAQMD (2017a) guidance.

As shown in Table 3.3-27, health risks and $PM_{2.5}$ concentrations at the maximally exposed receptor locations would be less than BAAQMD's health risk thresholds of significance.

CEQA Conclusion

The impact would be less than significant under CEQA for all alternatives because operations-related DPM and $PM_{2.5}$ concentrations associated with the project would not exceed BAAQMD's cancer and noncancer risk thresholds. Therefore, CEQA does not require mitigation.

Impact AQ#15: Continuous Permanent Direct Impacts on Localized Air Quality—Exposure to Odors

The HSR trains would be powered from the regional electrical grid and operations would not result in potentially odorous emissions. There would be some area source emissions associated with station and maintenance facility operation, such as natural-gas combustion for space and water heating, landscaping equipment emissions, and solvent and paint use during the periodic reapplication of exterior coatings, which would be the same under all four project alternatives. The solvent and paint use would have the potential to be odorous sources to sensitive receptors in some areas. However, any potential odor emissions would occur within an existing commercial and industrial area and would not represent new or unique odors, relative to those under the No Project Alternative.

CEQA Conclusion

The impact would be less than significant under CEQA because odors generated during operations would not be expected to affect a substantial number of people or result in nuisance complaints. Therefore, CEQA does not require mitigation.

3.3.6.2 Greenhouse Gases

Long-term project operations would result in a net reduction of regional and statewide GHG emissions when compared to 2015 Existing and 2029 and 2040 No Project conditions. Project construction would result in the short-term generation of GHG emissions. However, net GHG reductions during operations (because of reduced car and aircraft trips in Northern California and statewide) would offset the increase in construction-related GHG emissions within approximately 2 to 4 years. Accordingly, implementation of the project would result in a net decrease in GHG emissions, which would be beneficial to the RSA and the state of California and would help meet local and statewide GHG reduction goals.

No Project Impacts

As discussed in Section 3.3.6.1, Air Quality, reasonably foreseeable projects throughout Northern California and the San Joaquin Valley would result in emissions from on-road vehicles, aircraft, and power plant sources. The emissions efficiency of on-road vehicles and aircraft would improve in the future, and these improvements would lower total GHG emissions under the No Project Alternative. Additionally, because of the state requirement that an increasing fraction (60 percent by 2030) of electricity generated for the state's power portfolio come from renewable energy sources, it is likely that the emissions from power plant sources in the future would be lower than existing emissions.

Project Impacts

Construction Impacts

Impact AQ#16: Temporary Direct and Indirect Impacts on Global Climate Change—Greenhouse Gas Emissions

Project construction would generate GHG emissions during the 7-year construction period through the use of heavy-duty construction equipment, construction worker vehicles, truck hauling, helicopters, and electricity. Table 3.3-28 summarizes total estimated GHG emissions associated with project construction. Emissions have been amortized over a 25-year project life (although the actual project life would be much longer). The emissions results assume implementation of AQ-IAMF#2 through AQ-IAMF#5 (AQ-IAMF#1 and AQ-IAMF#6 would not affect GHG emissions). Refer to the Air Quality and Greenhouse Gases Technical Report (Volume 2, Appendix 3.3-A) for annual emission results.

Table 3.3-28 Comparison of Total Carbon Dioxide Equivalent Emissions from Construction of the Project Alternatives (metric tons)[1, 2]

Alternative	BAAQMD	MBARD	SJVAPCD
Alternative 1	215,387	15,250	138,967
Total Across All Air Districts	369,604		
Alternative 2	296,323	27,666	138,967
Total Across All Air Districts	462,956		
Alternative 3	221,460	14,400	138,967
Total Across All Air Districts	374,826		
Alternative 4	324,718	34,021	138,967
Total Across All Air Districts	497,706		
Total Amortized GHG Emissions (averaged over 25 years)			
Alternative 1	14,784		
Alternative 2	18,518		
Alternative 3	14,993		
Alternative 4	19,908		
Payback of GHG Emissions (months) for All Alternatives (project vs. 2029 No Project)[3]			
Alternative 1	8 to 11		
Alternative 2	10 to 13		
Alternative 3	8 to 11		
Alternative 4	10 to 14		

[1] Project life is assumed to be 25 years.
[2] Payback periods were estimated by dividing the GHG emissions during construction by the annual GHG emission reduction during project operations.
[3] See Table 3.3-29 for operational GHG emission-reduction data. The range in payback days represents the range of emissions changes based on the medium and high ridership scenarios.
BAAQMD = Bay Area Air Quality Management District
GHG = greenhouse gas
MBARD = Monterey Bay Air Resources District
SJVAPCD = San Joaquin Valley Air Pollution Control District

Table 3.3-28 indicates total amortized GHG construction emissions for the project are estimated to be between 14,784 and 19,908 metric tons carbon dioxide equivalent (CO_2e) per year, with Alternative 4 generating the most emissions, and Alternative 1 generating the least. Most emissions would occur in the BAAQMD (58 percent to 69 percent), followed by SJVAPCD (28 percent to 38 percent), and MBARD (4 percent to 7 percent). The total GHG construction emissions of the project (Alternative 4) would be less than 0.12 percent of the total annual statewide GHG emissions.[16]

Long-term operation of the project would result in a net GHG reduction, relative to the 2015 Existing and 2029 and 2040 No Project conditions. The net GHG reductions achieved by project operations would offset the increase in GHG emissions generated during construction in 8 to 14 months of operations, depending on the alternative.

CEQA Conclusion

The impact would be less than significant under CEQA for all alternatives because emission reductions during operations from reduced auto and aircraft trips would offset the short-term construction-related contribution to increased GHG emissions. Project construction would generate GHG emissions between 2022 and 2028. However, these emissions would be almost fully offset after 8 to 14 months of operations (depending on the ridership scenario and alternative). Shortly following the first year of operations, the project would result in annual emissions reductions and a GHG benefit. Additionally, the project is identified in CARB's AB 32 Scoping Plan and 2017 Scoping Plan Update as a component of a sustainable transportation system, and would be consistent with the state's plan to achieve GHG emissions in the long run. Such GHG reductions would be consistent with statewide goals. Consequently, the project would not impede the state from meeting the statewide GHG emissions reductions target. Therefore, CEQA does not require mitigation.

Operations Impacts

Impact AQ#17: Continuous Permanent Direct and Indirect Impacts on Global Climate Change—Greenhouse Gas Emissions

Project operations have the potential to create long-term GHG impacts through the operation of the stations, maintenance facilities, and new circuit breakers. The project would increase passenger rail ridership, and it is anticipated that people would shift trips from on-road vehicles and aircraft to the HSR system, which is less emissions-intensive than other transportation modes. GHG emissions and reductions generated by project operations were quantified for the 2015, 2029, and 2040 analysis scenarios to capture changes in ridership and regional emission factors.

Table 3.3-29 summarizes the estimated net operational emissions under the medium and high ridership scenarios relative to 2015 Existing and 2029 and 2040 No Project conditions (expressed in terms of CO_2e). From an operations perspective, ridership and associated emissions changes from on-road vehicles, aircraft, and power plants (used to generate electricity to power the HSR system) would be identical among the four project alternatives. Emissions from the operation of the stations and maintenance facilities would differ among the alternatives based on which facilities are built and operated. Emissions from new PG&E circuit breakers would be identical among all project alternatives. Refer to the Air Quality and Greenhouse Gases Technical Report (Volume 2, Appendix 3.3-A) for detailed emissions results by individual source (e.g., on-road vehicles, stations).

[16] A GHG emissions inventory for the project vicinity was not available at the time of the release of this document, so the comparison was made to CARB's 2016 emissions inventory, which estimated that the annual CO_2e emissions in California are about 429 million metric tons (CARB 2018c).

Table 3.3-29 Summary of Statewide Greenhouse Gas Emissions Changes from Project Operations (under the Medium and High Ridership Scenarios) Relative to Existing, 2029, and 2040 No Project Conditions (metric tons CO_2e per year)

Source/Alternative	Medium	High
Existing Plus Project Emissions Relative to 2015 Existing Conditions		
Indirect Emissions		
On(road vehicles	(1,068,252)	(1,468,722)
Aircraft	(700,302)	(673,761)
Power plants[1]	376,928	414,621
Direct Emissions[2]		
Alternative 1	11,248	
Alternative 2	11,248	
Alternative 3	11,450	
Alternative 4	11,248	
Total Emissions[3]	**(1,380,176)**	**(1,716,412)**
2029 Plus Project Emissions Relative to 2029 No Project Conditions		
Indirect Emissions		
On(road vehicles	(448,990)	(274,927)
Aircraft	(455,629)	(503,715)
Power plants[1]	321,836	354,020
Direct Emissions[2]		
Alternative 1	8,913	
Alternative 2	8,913	
Alternative 3	9,617	
Alternative 4	8,913	
Total Emissions[3]	**(573,166)**	**(415,006)**
2040 Plus Project Emissions Relative to 2040 No Project Conditions		
Indirect Emissions		
On(road vehicles	(493,192)	(1,107,479)
Aircraft	(973,283)	(936,397)
Power plants[1]	376,928	414,621

Source/Alternative	Medium	High
Direct Emissions[2]		
Alternative 1	12,763	
Alternative 2	12,763	
Alternative 3	13,463	
Alternative 4	12,763	
Total Emissions[3]	**(1,076,084)**	**(1,615,792)**

Parenthesis () indicate negative values.
[1] The HSR system is analyzed as if it would be powered by the state's current electric grid. This is a conservative assumption because of the state requirement that an increasing fraction of electricity (60 percent by 2030 and 100 percent by 2045) generated for the state's power portfolio come from renewable energy sources. As such, the emissions from power plants are expected to be lower in the future than the emissions estimated for this analysis. Furthermore, under the 2013 Policy Directive POLI-PLAN-03, the Authority has adopted a goal to purchase 100 percent of the HSR system's power from renewable energy sources.
[2] Sum of station, maintenance facility, and SF_6 circuit breaker emissions. Represents the net emissions effect of the project (i.e., the difference in operating emissions between existing or No Project conditions and the project condition).
[3] The total includes the indirect and direct emissions for the alternative (Alternative 3) with the greatest total emissions. Totals may not add up exactly because of rounding.
CO_2e = carbon dioxide equivalent
HSR = high-speed rail
SF_6 = sulfur hexafluoride

As shown in Table 3.3-29, project operations under both the medium and high ridership scenarios would increase indirect GHG emissions from additional electricity required to power the HSR system, as well as direct GHG emissions from operation of the stations, maintenance facilities, and new circuit breakers, relative to the 2015 Existing and 2029 and 2040 No Project conditions. Electricity demands and the associated emissions from power plants would be identical among the alternatives. Direct emissions from stations, maintenance facilities, and new circuit breakers would likewise be virtually identical among the alternatives; Alternative 3 would result in slightly greater station emissions from operation of the East Gilroy Station, but the overall difference would not be meaningful in the context of the total emission reductions shown in Table 3.3-29.

While project operations would increase GHG associated with power plants, stations, maintenance facilities, and new circuit breakers, it would result in emissions reductions from on-road vehicles and aircraft, relative to the 2015 Existing and 2029 and 2040 No Project conditions. Reductions in single-occupancy vehicles trips and aircraft activity achieve these emissions benefits; with a greater number of people traveling on the HSR system, fewer vehicle and aviation miles would occur. Because the reductions in on-road vehicles and aircraft activity are directly tied to ridership, there would be no difference in emissions benefits among the alternatives. Ultimately, the GHG reductions achieved by changes in on-road vehicles and aircraft activity would more than offset the emissions increase from project operations (electricity, stations, maintenance facilities, and circuit breakers). Long-term operation of all project alternatives and the larger HSR system would, therefore, result in a net reduction in operational emissions from the 2015 Existing and 2029 and 2040 No Project conditions. These emissions benefits would begin accumulating after construction emissions are offset, which as noted above, would occur within 8 to 14 months of project operations.

As described in Section 3.3.4.5, Methods for Determining Significance under CEQA, for projects to have a less-than-significant impact under CEQA on an individual and cumulative basis, the project must comply with an approved Climate Change Action Plan and demonstrate that it would not impede the state from meeting the statewide 2020 GHG emissions target. The HSR project is discussed in CARB's AB 32 Scoping Plan and 2017 Scoping Plan update as a key strategy to meet California's long-term air quality and climate objectives (CARB 2008). As indicated in Table 3.3-29, all project alternatives would result in a net reduction in GHG emissions relative to the 2015 Existing conditions, 2029 No Project conditions, and 2040 No Project conditions, taking into account emissions during project construction, helping to meet the state's GHG reduction goals.

The project is committed to using 100 percent renewable energy for electricity and the HSR system would run on electricity (thus offsetting vehicle fossil fuel emissions); therefore, the project would also help the state meet its 2045 goal of carbon neutrality in EO B-55-18.

CEQA Conclusion

The impact would be less than significant under CEQA for all alternatives because project operations would result in net statewide reductions of GHG emissions as travel modes shift away from on-road vehicles and aircraft trips to the HSR, which would avoid significant impacts from GHGs on the environment. Additionally, the HSR project is discussed in CARB's AB 32 scoping plan and 2017 Scoping Plan Update and would help the state attain its long-term GHG reductions goals as identified in AB 32, SB 32, and EO B-55-18. Consequently, the project would not impede the state from meeting the statewide GHG emissions reductions targets. Therefore, CEQA does not require mitigation.

3.3.7 Mitigation Measures

Construction emissions of VOC and NO_X would exceed BAAQMD thresholds under all project alternatives. Construction PM_{10} emissions generated under Alternatives 1, 2, and 4 would also exceed MBARD's threshold of significance. SJVAPCD's annual thresholds for NO_X, CO, and PM_{10} would be exceeded under all alternatives during project construction. Construction exceedances of adopted thresholds could impede implementation of applicable air quality plans. Accordingly, there would be a significant impact under CEQA associated with project construction in the BAAQMD, MBARD, and SJVAPCD.

Construction activities would not exceed applicable local air district health risk thresholds or criteria; however, they would exceed state and federal ambient air quality standards. Construction of all alternatives would lead to new violations of the PM_{10} and $PM_{2.5}$ CAAQS and NAAQS, as well as potentially contribute to existing PM_{10} and $PM_{2.5}$ violations through exceedances of the SIL. Alternatives 1, 2, and 4 would also violate the 1-hour NO_2 NAAQS and CAAQS.

Table 3.3-30 outlines mitigation measures that would be implemented to address impacts on air quality during project construction. As discussed above, there would be no significant impacts under CEQA associated with project operations; therefore, no mitigation measures are required for project operations.

Table 3.3-30 Summary of Required Mitigation for Project Construction by Alternative

Mitigation Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4
AQ-MM#1: Offset Project Construction Emissions in the San Francisco Bay Area Air Basin	X	X	X	X
AQ-MM#2: Offset Project Construction Emissions in the North Central Coast Air Basin	X	X	None[1]	X
AQ-MM#3: Offset Project Construction Emissions in the San Joaquin Valley Air Basin	X	X	X	X

[1] Mitigation in the NCCAB is not required for Alternative 3 because construction of Alternative 3 would not exceed MBARD's PM_{10} threshold. Refer to Table 3.3-13.

AQ-MM#1: Offset Project Construction Emissions in the San Francisco Bay Area Air Basin

Prior to issuance of construction contracts, the Authority would enter into a memorandum of understanding (MOU) with the Bay Area Clean Air Foundation (Foundation), a public nonprofit and supporting organization for the BAAQMD, to reduce VOC and NO_X to the required levels. The required levels in the SFBAAB are as follows:

1. For emissions in excess of the General Conformity *de minimis* thresholds (NO_X): net zero.
2. For emissions not in excess of *de minimis* thresholds but above the BAAQMD's daily emission thresholds (VOC and NO_X): below the appropriate CEQA threshold levels.

The mitigation offset fee amount would be determined at the time of mitigation to fund one or more emissions reduction projects within the SFBAAB. The Foundation would require an additional administrative fee of no less than five percent. The mitigation offset fee would be determined by the Authority and the Foundation based on the type of projects available at the time of mitigation. When the CEQA threshold is exceeded, these funds may be spent to reduce either VOC or NO_X emissions ("O_3 precursors"). When the General Conformity threshold is exceeded, these funds may be spent to reduce O_3 precursors, provided this is allowed by the federal CAA provisions addressing General Conformity. This fee is intended to fund emissions reduction projects to achieve reductions, with the estimated tonnage of emissions offsets required starting in 2022. Documentation of payment would be provided to the Authority or its designated representative.

The MOU would include details regarding the annual calculation of required offsets the Authority must achieve, funds to be paid, administrative fee, and the timing of the emissions reductions projects. Acceptance of this fee by the Foundation would serve as an acknowledgment and commitment by the Foundation to: (1) implement an emissions reduction project(s) within a timeframe to be determined based on the type of project(s) selected after receipt of the mitigation fee designed to achieve the emission reduction objectives; and (2) provide documentation to the Authority or its designated representative describing the project(s) funded by the mitigation fee, including the amount of emissions reduced (tons per year) in the SFBAAB from the emissions reduction project(s). To qualify under this mitigation measure, the specific emissions reduction project(s) must result in emission reductions in the SFBAAB that are real, surplus, quantifiable, enforceable, and would not otherwise be achieved through compliance with existing regulatory requirements or any other legal requirement. Pursuant to 40 C.F.R. Section 93.163(a), the necessary reductions must be achieved (contracted and delivered) by the applicable year in question. Funding would need to be received prior to contracting with participants and should allow enough time to receive and process applications to fund and implement off-site reduction projects prior to commencement of project activities being reduced. This would roughly equate to 1 year prior to the required mitigation; additional lead time may be necessary depending on the level of off-site emission reductions required for a specific year.

This mitigation measure would be effective in offsetting emissions generated during project construction through the funding of emission-reduction projects. It is BAAQMD's experience that implementation of an MOU is feasible mitigation that effectively achieves actual emission reductions. The Authority has undergone extensive coordination with BAAQMD to confirm the feasibility of an MOU. Based on the performance of current incentive programs and reasonably foreseeable future growth, BAAQMD has confirmed that enough emissions reduction credits would be available to offset emissions generated by the project for all years in excess of the BAAQMD's thresholds and General Conformity *de minimis* threshold (Kirk 2018).

The implementation of this mitigation measure would not be expected to affect air quality in the BAAQMD because purchasing emissions offsets would not result in any physical change to the environment, and therefore would not result in other secondary environmental impacts. In addition to VOC and NO_X, the implementation of emission-reduction projects could result in reductions of other criteria pollutants and/or GHGs. However, this would be a secondary effect of this mitigation measure and is not a required outcome to mitigate any impacts of the project.

AQ-MM#2: Offset Project Construction Emissions in the North Central Coast Air Basin

Prior to issuance of construction contracts, the Authority would enter into an MOU with the MBARD to reduce PM_{10} to the required levels. The required levels in the NCCAB are as follows:

- For emissions above the MBARD's daily emission thresholds (PM_{10}): below the appropriate CEQA threshold levels.

The mitigation offset and administrative fee amount would be determined at the time of mitigation. The fee would be determined by the Authority and MBARD and based on the type of projects available at the time of mitigation. This fee is intended to fund emissions reduction projects to achieve reductions with the estimated tonnage of emissions offsets required. Documentation of payment would be provided to the Authority or its designated representative.

The MOU would include details regarding the annual calculation of require offsets, funds to be paid, administrative fee, and the timing of the emissions reductions project. Acceptance of this fee by the MBARD would serve as an acknowledgment and commitment by the MBARD to: (1) implement an emissions reduction project(s) within a timeframe to be determined based on the type of project(s) selected after receipt of the mitigation fee to achieve the emission reduction objectives; and (2) provide documentation to the Authority or its designated representative describing the project(s) funded by the mitigation fee, including the amount of emissions reduced (tons per year) in the NCCAB from the emissions reduction project(s). To qualify under this mitigation measure, the specific emissions reduction project(s) must result in emission reductions in the NCCAB that are real, surplus, quantifiable, enforceable, and would not otherwise be achieved through compliance with existing regulatory requirements or any other legal requirement. Funding would need to be received prior to contracting with participants and should allow enough time to receive and process applications to fund and implement off-site reduction projects prior to commencement of project activities requiring offset. This would roughly equate to 1 year prior to the required mitigation; additional lead time may be necessary depending on the level of off-site emission reductions required for a specific year.

This mitigation measure would be effective in offsetting emissions generated during project construction through the funding of emission-reduction projects. It is MBARD's experience that implementation of an MOU is feasible mitigation that effectively achieves actual emission reductions. The Authority has undergone extensive coordination with the MBARD to confirm the feasibility of an MOU. Based on the performance of current incentive programs and reasonably foreseeable future growth, the MBARD has confirmed that enough emissions reduction credits would be available to offset emissions generated by the project for all years in excess of the MBARD's threshold (Frisbey 2019).

The implementation of this mitigation measure would not be expected to affect air quality in the MBARD because purchasing emissions offsets would not result in any physical change to the environment, and therefore would not result in other secondary environmental impacts. In addition to PM_{10}, the implementation of emission-reduction projects could result in reductions of other criteria pollutants, GHGs, or both. However, this would be a secondary effect of this mitigation measure and is not a required outcome to mitigate any impacts of the project.

AQ-MM#3: Offset Project Construction Emissions in the San Joaquin Valley Air Basin

On June 19, 2014, the SJVAPCD and the Authority entered an MOU that establishes the framework for fully mitigating to net-zero construction emissions of NOx, VOC, PM_{10}, and $PM_{2.5}$ from the entire HSR project within the SJVAB (Authority and SJUVAPCD 2014). Emissions generated by construction of the portion of the project within the SJVAB are subject to this MOU and, therefore, must be offset to net zero. Pursuant to the MOU, the Authority and the SJVAPCD would enter into a Voluntary Emissions Reduction Agreement (VERA) to cover the portion of the project approved and funded for construction within the SJVAB. The project-level VERA must be executed prior to commencement of construction and the mitigation fees and offsets delivered and achieved according to the requirements of the VERA and MOU.

This mitigation measure would be effective in offsetting emissions generated during construction of the project through the funding of emission-reduction projects. It is SJVAPCD's experience that implementation of a VERA is feasible mitigation that effectively achieves actual emission reductions. Based on the performance of current incentive programs and reasonably foreseeable future growth, the SJVAPCD has confirmed that enough emissions reduction credits would be available to offset emissions generated by the project for all years in excess of the SJVAPCD's thresholds and the General Conformity *de minimis* threshold ().

The implementation of this mitigation measure would not be expected to affect air quality in the SJVAPCD because purchasing emissions offsets would not result in any physical change to the environment, and therefore would not result in other secondary environmental impacts. In addition to NO_X and PM_{10}, the implementation of emission-reduction projects could result in reductions of other criteria pollutants, GHGs, or both. However, this would be a secondary effect of this mitigation measure and is not a required outcome to mitigate any impacts of the project.

3.3.8 Impact Summary for NEPA Comparison of Alternatives

As described in Section 3.1.5.4, the effects of project actions under NEPA are compared to the No Project condition when evaluating the impact of the project on the resource. The determination of effect was based on the context and intensity of the change that would be generated by construction and operations of the project. Table 3.3-31 compares the impacts of the project alternatives and is followed by a summary of the impacts.

Temporary construction activity for all four project alternatives would generate NO_X emissions in excess of the General Conformity *de minimis* thresholds in the SFBAAB and SJVAB. Many factors influence the extent and magnitude of activity that would be required for construction, including the number and type of existing structures to be demolished, the amount of imported and exported dirt required during grading, and the number of traction power substations constructed. The combination of these factors is similar among Alternatives 2 and 4 and Alternatives 1 and 3 in the SFBAAB. The construction approach in the SJVAB would the same among all four project alternatives and the extent of the NO_X exceedance in the SJVAB would be the same.

On-site project features (AQ-IAMF#2 through AQ-IAMF#5) would minimize NO_X emissions in the SFBAAB and SJVAB by requiring the cleanest reasonably available equipment and control measures to limit criteria pollutant emissions from construction equipment, vehicles, and concrete batch plants. An MOU (AQ-MM#1) and VERA (AQ-MM#3) would offset remaining NO_X emissions in excess of the General Conformity *de minimis* thresholds generated in the SFBAAB and SJVAB to net zero, respectively. The Authority and FRA have agreed to collaborate on the development of General Conformity Determination. As a part of this collaboration, the Authority has developed and provide to FRA a Draft General Conformity Determination and supporting information, as well as the Authority's proposed approach for achieving general conformity (refer to Volume 2, Appendix 3.3-B, Federal General Conformity Determination).

Temporary construction activity for all four project alternatives would result in emissions that are below the BAAQMD, MBARD, and SJVAPCD's significant cancer risk thresholds; 10 in one million for BAAQMD and MBARD and 20 in one million for SJVAPCD. In addition, the hazard index threshold of one for all three air districts would not be exceeded. However, construction of all four project alternatives would lead to new violations of the PM_{10} and $PM_{2.5}$ CAAQS and NAAQS, as well as potentially contribute to existing PM_{10} and $PM_{2.5}$ violations through exceedances of the SIL. Alternatives 1, 2, and 4 would also violate the 1-hour NO_2 NAAQS and CAAQS. On-site project features (AQ-IAMF#1 through AQ-IAMF#6) that require the cleanest reasonably available equipment and control measures would reduce concentrations, but exceedances of the applicable NAAQS would still occur. In general, the extent of the impact (i.e., the magnitude of the exceedance above the standard) is greatest under Alternative 4 and lowest under Alternative 3, but concentrations would vary by location and construction activity.

Demolition activities during project construction could encounter asbestos and LBP. Alternative 2 requires the most demolition (7.1 million square feet), and therefore has the highest potential to encounter and expose receptors to impacts from asbestos and LBP. Alternative 1 requires the second most demolition (4.3 million square feet), followed by Alternative 3 (4.0 million square feet) and Alternative 4 (2.0 million square feet). However, project design and compliance with existing asbestos and LBP handling and disposal standards would prevent exposure of sensitive receptors to pollutant concentrations with respect to asbestos and LBP. Similarly, the potential for the project to expose receptors to increased risk of Valley fever would be addressed through fugitive dust controls (AQ-IAMF#1). Odors generated during construction are not expected to result in nuisance complaints.

Table 3.3-31 Comparison of Project Alternative Impacts for Air Quality and Greenhouse Gases

Impact	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Air Quality				
Impact AQ#1: Temporary Direct and Indirect Impacts on Air Quality within the SFBAAB	Temporary construction activity would generate NO_X emissions in excess of the General Conformity *de minimis* threshold. Maximum annual NO_X emissions of 106 tons would occur in 2024. Annual construction emissions peak in 2024 due to concurrent construction of all four subsections within the SFBAAB, as well as construction of the Gilroy MOWF, San Jose Diridon Station, and Downtown Gilroy Station. Emissions of all other pollutants would be below the respective General Conformity *de minimis* thresholds.	Same as Alternative 1. Maximum annual NO_X emissions of 155 tons would occur in 2024, which is the year with the greatest amount of total construction activity in the SFBAAB.	Same as Alternative 1. Maximum annual NO_X emissions of 114 tons would occur in 2024, which is the year with the greatest amount of total construction activity in the SFBAAB.	Same as Alternative 1. Maximum annual NO_X emissions of 156 tons would occur in 2024, which is the year with the greatest amount of total construction activity in the SFBAAB.
Impact AQ#2: Temporary Direct and Indirect Impacts on Air Quality within the NCCAB	Temporary construction activity would generate criteria pollutants, but those emissions would not degrade air quality resources in the NCCAB because the RSA is considered attainment for all criteria pollutants and there are no federally regulated General Conformity *de minimis* thresholds.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.

Impact	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Impact AQ#3: Temporary Direct and Indirect Impacts on Air Quality within the SJVAB	Temporary construction activity would generate NO_X emissions in excess of the General Conformity *de minimis* threshold, which could degrade air quality resources in the SJVAB. Maximum annual NO_X emissions of 56 tons would occur in 2024. Annual construction emissions peak in 2024 due to concurrent construction of the two subsections within the SJVAB, as well as construction of the Los Banos MOWS. Emissions of all other pollutants would be below the respective General Conformity *de minimis* thresholds.	Same as Alternative 1. Maximum annual NO_X emissions of 56 tons would occur in 2024, which is the year with the greatest amount of total construction activity in the SJVAB.	Same as Alternative 1. Maximum annual NO_X emissions of 56 tons would occur in 2024, which is the year with the greatest amount of total construction activity in the SJVAB.	Same as Alternative 1. Maximum annual NO_X emissions of 56 tons would occur in 2024, which is the year with the greatest amount of total construction activity in the SJVAB.
Impact AQ#4: Temporary Direct Impacts on Implementation of an Applicable Air Quality Plan	Emissions of NO_X from temporary construction activity in excess of the General Conformity *de minimis* thresholds could impede implementation of ozone plans in the SFBAAB and SJVAB.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Impact AQ#5: Temporary Direct Impacts on Localized Air Quality—Criteria Pollutants	Temporary construction activity would violate the 1-hour NO_2 CAAQS and NAAQS, annual PM_{10} CAAQS, annual $PM_{2.5}$ CAAQS and NAAQS, and 24-hour $PM_{2.5}$ NAAQS. Emissions concentrations would also exceed the 24-hour and annual PM_{10} SIL and 24-hour and annual $PM_{2.5}$ SIL.	Same as Alternative 1.	Temporary construction activity would violate the annual PM_{10} CAAQS, annual $PM_{2.5}$ CAAQS and NAAQS, and 24-hour $PM_{2.5}$ NAAQS. Emissions concentrations would also exceed the 24-hour and annual PM_{10} SIL and 24-hour and annual $PM_{2.5}$ SIL.	Temporary construction activity would violate the 1-hour NO_2 CAAQS and NAAQS, annual and 24-hour PM_{10} CAAQS, annual $PM_{2.5}$ CAAQS and NAAQS, and 24-hour $PM_{2.5}$ NAAQS. Emissions concentrations would also exceed the 24-hour and annual PM_{10} SIL and 24-hour and annual $PM_{2.5}$ SIL.

Impact	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Impact AQ#6: Temporary Direct Impacts on Localized Air Quality—Exposure to Diesel Particulate Matter and $PM_{2.5}$ (Health Risk)	Temporary construction activity would not generate DPM or $PM_{2.5}$ concentrations in excess of established health risk thresholds. The maximum increase in potential cancer risk (5.0 per million) would occur in the San Joaquin Valley Subsection.	Same as Alternative 1. The maximum increase in potential cancer risk (5.0 per million) would occur in the Monterey Corridor and San Joaquin Valley Subsection.	Same as Alternative 1. The maximum increase in potential cancer risk (9.4 per million) would occur in the Morgan Hill and Gilroy Subsection.	Same as Alternative 1. The maximum increase in potential cancer risk (6.1 per million) would occur in the Monterey Corridor Subsection.
Impact AQ#7: Temporary Direct Impacts on Localized Air Quality—Exposure to Asbestos, Lead-Based Paint, and Fungal Spores That Cause Valley Fever	Project design and compliance with existing asbestos and LBP handling and disposal standards, as well as fugitive dust control practices, would prevent exposure of sensitive receptors to substantial pollutant concentrations. There would be limited potential for exposure of sensitive receptors to asbestos or LBP associated with demolition of 4.3 million square feet. There would be limited potential for exposure of sensitive receptors to Valley fever associated with movement of 51.5 million cubic yards of soil and disturbance of 813 acres.	Same as Alternative 1. There would be limited potential for exposure of sensitive receptors to asbestos or LBP associated with demolition of 7.1 million square feet. There would be limited potential for exposure of sensitive receptors to Valley fever associated with movement of 60.4 million cubic yards of soil and disturbance of 1,047 acres.	Same as Alternative 1. There would be limited potential for exposure of sensitive receptors to asbestos or LBP associated with demolition of 4.0 million square feet. There would be limited potential for exposure of sensitive receptors to Valley fever associated with movement of 58.7 million cubic yards of soil and disturbance of 870 acres.	Same as Alternative 1. There would be limited potential for exposure of sensitive receptors to asbestos or LBP associated with demolition of 2.0 million square feet. There would be limited potential for exposure of sensitive receptors to Valley fever associated with movement of 52.2 million cubic yards of soil and disturbance of 1,048 acres.
Impact AQ#8: Temporary Direct Impacts on Localized Air Quality—Exposure to Odors	There would be limited potential for odors generated by construction to affect sensitive receptors or result in nuisance complaints.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.

Impact	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Impact AQ#9: Continuous Permanent Direct Impacts on Air Quality within the SFBAAB, NCCAB, and SJVAB	Long-term operation of the HSR system would reduce regional criteria pollutant emissions, relative to No Project conditions, resulting in a regional and local air quality benefit. Annual reductions would range from 23 to 54 tons of VOC, 332 to 1,120 tons of CO, 208 to 447 tons of NO_X, 22 to 48 tons of SO_2, 34 to 77 tons of PM_{10}, and 12 to 27 tons of $PM_{2.5}$, depending on the ridership scenario.	Same as Alternative 1. Annual reductions would range from 23 to 54 tons of VOC, 332 to 1,120 tons of CO, 208 to 447 tons of NO_X, 22 to 48 tons of SO_2, 34 to 77 tons of PM_{10}, and 12 to 27 tons of $PM_{2.5}$, depending on the ridership scenario.	Same as Alternative 1. Annual reductions would range from 23 to 54 tons of VOC, 330 to 1,119 tons of CO, 208 to 447 tons of NO_X, 22 to 48 tons of SO_2, 32 to 76 tons of PM_{10}, and 12 to 27 tons of $PM_{2.5}$, depending on the ridership scenario.	Same as Alternative 1. Annual reductions would range from 23 to 54 tons of VOC, 332 to 1,120 tons of CO, 208 to 447 tons of NO_X, 22 to 48 tons of SO_2, 34 to 77 tons of PM_{10}, and 12 to 27 tons of $PM_{2.5}$, depending on the ridership scenario.
Impact AQ#10: Continuous Permanent Direct Impacts on Implementation of an Applicable Air Quality Plan	Emissions reductions from project operations would support implementation of air quality plans and attainment of regional air quality goals.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Impact AQ#11: Continuous Permanent Direct Impacts on Localized Air Quality—Carbon Monoxide Hot Spots (NAAQS Compliance)	Increased traffic would not result in localized CO hot spots or exceedances of the CO NAAQS or CAAQS.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Impact AQ#12: Continuous Permanent Direct Impacts on Localized Air Quality—Exposure to Mobile Source Air Toxics	Operation of the HSR system would result in a regional MSAT reduction and benefit. Increased station traffic would have a low potential for meaningful localized MSAT impacts.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Impact AQ#13: Continuous Permanent Direct Impacts on Localized Air Quality—Particulate Matter Hot Spots (NAAQS Compliance)	The project is not considered to be a project of air quality concern, based on the descriptions as indicated in 40 C.F.R. Section 93.123(b)(1).	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.

Impact	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Impact AQ#14: Continuous Permanent Direct Impacts on Localized Air Quality—Exposure to Diesel Particulate Matter and $PM_{2.5}$ (Health Risk)	Emissions of DPM and $PM_{2.5}$ from relocated freight service and station and maintenance facility operation would not expose sensitive receptors to pollutant health risks in exceedance of BAAQMD's thresholds.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Impact AQ#15: Continuous Permanent Direct Impacts on Localized Air Quality—Exposure to Odors	Emissions-generated odors would be limited and would not be expected to affect a substantial number of people.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Greenhouse Gases				
Impact AQ#16: Temporary Direct and Indirect Impacts on Global Climate Change—Greenhouse Gas Emissions	GHG emissions generated during temporary construction of 14,784 metric tons CO_2e per year would be offset by reductions achieved through project operations in 8 to 11 months (relative to 2029 No Project conditions).	GHG emissions generated during temporary construction of 18,518 metric tons CO_2e per year would be offset by reductions achieved through project operations in 10 to 13 months (relative to 2029 No Project conditions).	GHG emissions generated during temporary construction of 14,993 metric tons CO_2e per year would be offset by reductions achieved through project operations in 8 to 11 months (relative to 2029 No Project conditions).	GHG emissions generated during temporary construction of 19,908 metric tons CO_2e per year would be offset by reductions achieved through project operations in 10 to 14 months (relative to 2029 No Project conditions).
Impact AQ#17: Continuous Permanent Direct and Indirect Impacts on Global Climate Change—Greenhouse Gas Emissions	Long-term operation of the HSR system would reduce GHG emissions, relative to No Project conditions, resulting in a statewide and regional GHG benefit. Annual reductions would range from 1.1 million metric tons CO_2e to 1.6 million metric tons CO_2e, depending on the ridership scenario.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.

BAAQMD = Bay Area Air Quality Management District
C.F.R. = Code of Federal Regulations
CAAQS = California ambient air quality standards
CO = carbon monoxide
CO_2e = carbon dioxide equivalent
DPM = diesel particulate matter
GHG = greenhouse gases
HSR = high-speed rail
LBP = lead-based paint
MOWS = maintenance of waysiding
MOWF = maintenance of way facility
MSAT = mobile source air toxics
NAAQS = national ambient air quality standards
NCCAB = North Central Coast Air Basin
NO_2 = nitrogen dioxide
NO_X = nitrogen oxides
PM_{10} = particulate matter smaller than or equal than 10 microns in diameter
$PM_{2.5}$ = particulate matter smaller than or equal than 2.5 microns in diameter
RSA = resource study area
SFBAAB = San Francisco Bay Area Air Basin
SIL = significant impact level
SJVAB = San Joaquin Valley Air Basin
SO_2 = sulfur dioxide
VOC = volatile organic compound

During operations, none of the project alternatives would generate emissions in excess of the General Conformity *de minimis* thresholds, because all alternatives would reduce criteria pollutant emissions, resulting in a regional air quality benefit. Indirect emissions from electricity consumption to power the trains would be equal for all four project alternatives, as would the emissions benefits from reduced on-road vehicle and aircraft activity. Direct emissions of wind-induced dust would be emitted from train movement, with Alternative 4 resulting in the highest dust emissions. Station operation would also generate criteria pollutant emissions from mobile (e.g., employee commute vehicles) and area (e.g., architectural coatings) sources. The East Gilroy Station, under Alternative 3, would emit slightly more emissions compared to the Downtown Gilroy Station under Alternatives 1, 2, and 4. Therefore, although Alternative 3 would result in a slightly lower reduction in criteria pollutants than the other project alternatives, the overall difference would not be meaningful in the context of the total emission reductions, and all four project alternatives would result in comparable air quality benefits. The project alternatives would not conflict with any air quality plans or obstruct attainment of any air quality standards during operations.

Increased station traffic would be similar among all four project alternatives and would not worsen traffic conditions to an extent that would result in localized CO or PM hot spots. Likewise, consistent with FHWA guidance, changes in local traffic conditions would have a low potential for meaningful MSAT impacts. Relocated freight service and station and maintenance facility operation would not generate DPM or $PM_{2.5}$ concentrations in excess of BAAQMD's cancer and noncancer risk thresholds. Odors generated during operations would be very limited and would not be expected to result in nuisance complaints.

Similar to criteria pollutants, construction of all four project alternatives would generate GHG emissions. Total amortized GHG construction emissions would range between 14,784 and 19,908 metric tons CO_2e per year, with Alternative 4 generating the most emissions, and Alternative 1 generating the least. Emissions reductions during long-term project operations would offset construction-related GHGs within 8 to 14 months (compared to 2029 operations). The overall change in GHG emissions would be approximately the same under all alternatives. As a result, none of the project alternatives would result in net adverse global climate change impacts from GHG emissions. Rather, the reductions achieved by the project would be a GHG benefit.

3.3.9 CEQA Significance Conclusions

As described in Section 3.1.5.4, the impacts of project actions under CEQA are evaluated against thresholds to determine whether a project action would result in no impact, a less-than-significant impact, or a significant impact. Table 3.3-32 identifies the CEQA significance determinations for each impact discussed in Section 3.3.6. A summary of the significant impacts, mitigation measures, and factors supporting the significance conclusion after mitigation follows the table.

Table 3.3-32 CEQA Significance Conclusions and Mitigation Measures for Air Quality and Greenhouse Gases

CEQA Impacts	Impact Description and CEQA Level of Significance before Mitigation	Mitigation Measure	CEQA Level of Significance after Mitigation
Air Quality			
Impact AQ#1: Temporary Direct and Indirect Impacts on Air Quality within the SFBAAB	Significant for all alternatives. Construction-related VOC and NO_X emissions would exceed BAAQMD's thresholds.	AQ-MM#1: Offset Project Construction Emissions in the SFBAAB	Less than Significant
Impact AQ#2: Temporary Direct and Indirect Impacts on Air Quality within the NCCAB	Significant for Alternatives 1, 2, and 4. Construction-related PM_{10} emissions would exceed MBARD's threshold.	AQ-MM#2: Offset Project Construction Emissions in the NCCAB	Less than Significant
	Less than significant for Alternative 3. Construction-related PM_{10} emissions would not exceed MBARD's threshold.	No mitigation measures are required	N/A
Impact AQ#3: Temporary Direct and Indirect Impacts on Air Quality within the SJVAB	Significant for all alternatives. Construction-related NO_X, CO, and PM_{10} emissions would exceed SJVAPCD's thresholds	AQ-MM#3: Offset Project Construction Emissions in the SJVAB	Less than Significant (NO_X and PM_{10}) Significant and Unavoidable (CO)
Impact AQ#4: Temporary Direct Impacts on Implementation of an Applicable Air Quality Plan	Significant for all alternatives. Project construction would generate VOC, NO_X, and PM emissions that could conflict with air quality attainment plans for ozone and PM.	AQ-MM#1: Offset Project Construction Emissions in the SFBAAB AQ-MM#2: Offset Project Construction Emissions in the NCCAB AQ-MM#3: Offset Project Construction Emissions in the SJVAB	Less than Significant
Impact AQ#5: Temporary Direct Impacts on Localized Air Quality—Criteria Pollutants	Significant for all alternatives. Construction-related criteria pollutant concentrations would violate the NO_2, $PM_{2.5}$, and PM_{10} NAAQS and CAAQS. Construction would also contribute to existing violations of the PM_{10} and $PM_{2.5}$ ambient air quality standards.	None available[1]	Significant and Unavoidable

CEQA Impacts	Impact Description and CEQA Level of Significance before Mitigation	Mitigation Measure	CEQA Level of Significance after Mitigation
Impact AQ#6: Temporary Direct Impacts on Localized Air Quality—Exposure to Diesel Particulate Matter and $PM_{2.5}$ (Health Risk)	Less than significant for all alternatives. Construction-related DPM and $PM_{2.5}$ concentrations would not exceed adopted air district health risk thresholds.	No mitigation measures are required	N/A
Impact AQ#7: Temporary Direct Impacts on Localized Air Quality—Exposure to Asbestos, Lead-Based Paint, and Fungal Spores That Cause Valley Fever	Less than significant for all alternatives. Project design and compliance with existing asbestos and LBP handling and disposal standards would prevent exposure of sensitive receptors to substantial pollutant concentrations. The project would implement fugitive dust controls to reduce risk of Valley fever.	No mitigation measures are required	N/A
Impact AQ#8: Temporary Direct Impacts on Localized Air Quality—Exposure to Odors	Less than significant for all alternatives. Odors generated during construction would not be expected to affect a substantial number of people or result in nuisance complaints.	No mitigation measures are required	N/A
Impact AQ#9: Continuous Permanent Direct Impacts on Air Quality within the SFBAAB, NCCAB, and SJVAB	Less than significant for all alternatives. Long-term operation of the HSR system would reduce criteria pollutant emissions relative to No Project conditions, resulting in a regional and local air quality benefit.	No mitigation measures are required	N/A
Impact AQ#10: Continuous Permanent Direct Impacts on Implementation of an Applicable Air Quality Plan	Less than significant for all alternatives. Emissions reductions from project operations would support implementation of air quality plans and attainment of regional air quality goals.	No mitigation measures are required	N/A
Impact AQ#11: Continuous Permanent Direct Impacts on Localized Air Quality—Carbon Monoxide Hot Spots (NAAQS Compliance)	Less than significant for all alternatives. Increased traffic would not result in localized CO hot spots or exceedances of the CO CAAQS or NAAQS.	No mitigation measures are required	N/A

CEQA Impacts	Impact Description and CEQA Level of Significance before Mitigation	Mitigation Measure	CEQA Level of Significance after Mitigation
Impact AQ#12: Continuous Permanent Direct Impacts on Localized Air Quality—Exposure to Mobile Source Air Toxics	Less than significant for all alternatives. Operations of the HSR system would result in a regional MSAT reduction and benefit. Increased station traffic would have a low potential for meaningful localized MSAT impacts.	No mitigation measures are required	N/A
Impact AQ#13: Continuous Permanent Direct Impacts on Localized Air Quality—Particulate Matter Hot Spots (NAAQS Compliance)	Less than significant for all alternatives. Changes in on-road vehicle operation would not expose sensitive receptors to substantial pollutant concentrations of PM.	No mitigation measures are required	N/A
Impact AQ#14: Continuous Permanent Direct Impacts on Localized Air Quality—Exposure to Diesel Particulate Matter and $PM_{2.5}$ (Health Risk)	Less than significant for all alternatives. Emissions of DPM and $PM_{2.5}$ from relocated freight service and station and maintenance facility operation would not expose sensitive receptors to substantial pollutant concentrations since health risks would not exceed thresholds.	No mitigation measures are required	N/A
Impact AQ#15: Continuous Permanent Direct Impacts on Localized Air Quality—Exposure to Odors	Less than significant for all alternatives. Odors generated by project operations would not be expected to affect a substantial number of people or result in nuisance complaints.	No mitigation measures are required	N/A
Greenhouse Gases			
Impact AQ#16: Temporary Direct and Indirect Impacts on Global Climate Change—Greenhouse Gas Emissions	Less than significant for all alternatives. GHG emissions generated during temporary construction would be offset by reductions achieved through project operations in 8 to 14 months.	No mitigation measures are required	N/A

CEQA Impacts	Impact Description and CEQA Level of Significance before Mitigation	Mitigation Measure	CEQA Level of Significance after Mitigation
Impact AQ#17: Continuous Permanent Direct and Indirect Impacts on Global Climate Change—Greenhouse Gas Emissions	Less than significant for all alternatives. Long-term operation of the HSR system would reduce GHG emissions relative to No Project conditions, resulting in a statewide and regional GHG benefit.	No mitigation measures are required	N/A

[1] While AQ-MM#1 through AQ-MM#3 would offset VOC, NO_X, and PM emissions, as required, these offsets could occur regionally throughout the SFBAAB, NCCAB, and SJVAPCD. Accordingly, the emission reductions achieved by these offsets may not contribute to enough localized reductions to avoid a project-level violation of the AAQS or SIL.
BAAQMD = Bay Area Air Quality Management District
CAAQS = California ambient air quality standards
CO = carbon monoxide
DPM = diesel particulate matter
GHG = greenhouse gases
HSR = high-speed rail
LBP = lead-based paint
MBARD = Monterey Bay Resources District
MSAT = mobile source air toxics
N/A = not applicable
NAAQS = national ambient air quality standards
NCCAB = North Central Coast Air Basin
NO_2 = nitrogen dioxide
NO_X = nitrogen oxides
PM_{10} = particulate matter smaller than or equal than 10 microns in diameter
$PM_{2.5}$ = particulate matter smaller than or equal than 2.5 microns in diameter
SFBAAB = San Francisco Bay Area Air Basin
SIL = significant impact level
SJVAB = San Joaquin Valley Air Basin
SJVAPCD = San Joaquin Valley Air Pollution Control District
VOC = volatile organic compound

3.3.9.1 Impact AQ#1: Temporary Direct and Indirect Impacts on Air Quality within the SFBAAB

All alternatives would have a significant impact on air quality under CEQA during project construction because regional VOC and NO_X emissions would exceed the BAAQMD's CEQA thresholds, as shown in Table 3.3-12. Impacts associated with fugitive dust emissions would be minimized through implementation of a dust control plan (AQ-IAMF#1) and BMPs at new concrete batch plants (AQ-IAMF#6). The contractor would use low-VOC paints to limit the emissions of VOCs, which contribute to O_3 formation (AQ-IAMF#2). Exhaust-related pollutants would be reduced through use of renewable diesel, Tier 4 off-road engines, and model year 2010 or newer on-road engines, as required by AQ-IAMF#3 through AQ-IAMF#5. These project features would minimize air quality impacts and associated public health consequences through application of all best available on-site controls to reduce construction emissions; however, even with these measures, project construction would result in exceedances of BAAQMD's regional VOC and NOx thresholds.

The Authority would further implement mitigation measures to offset the impacts on air quality resources. Specifically, the Authority would implement AQ-MM#1 to offset VOC and NO_X emissions to below BAAQMD's CEQA thresholds. BAAQMD thresholds are based on emissions levels identified under the New Source Review (NSR) program (BAAQMD 2017a). The NSR program is a permitting program that was established by Congress as part of the CAA amendments to ensure that air quality is not significantly degraded by new sources of emissions. The NSR program requires that stationary sources receive permits before starting construction or use of the equipment. By permitting large stationary sources, the NSR program assures that new emissions would not slow regional progress toward attaining the NAAQS. Because BAAQMD's thresholds were established to prevent emissions from new projects in the SFBAAB from contributing to CAAQS or NAAQS violations, offsetting emissions below the threshold levels would avoid potential conflicts with the ambient air quality plans, and would ensure that project construction would not contribute a significant level of air pollution such that regional air quality within the SFBAAB would be degraded. Accordingly, with implementation of AQ-MM#1, the impact would be less than significant.

3.3.9.2 Impact AQ#2: Temporary Direct and Indirect Impacts on Air Quality within the NCCAB

Alternatives 1, 2, and 4 would have a significant impact under CEQA because construction would result in PM_{10} emissions that would exceed the MBARD's CEQA threshold, as shown in Table 3.3-13. Implementation of a dust control plan (AQ-IAMF#1) would minimize impacts associated with fugitive dust emissions. Exhaust-related PM_{10} would be reduced through use of renewable diesel, Tier 4 off-road engines, and model year 2010 or newer on-road engines (AQ-IAMF#3 through AQ-IAMF#5). These project features would minimize air quality impacts and associated public health consequences through application of all best available on-site controls to reduce construction emissions. However, even with these measures, exceedances of air district thresholds would still occur.

The Authority would therefore implement mitigation measures to offset the impacts on air quality resources. Specifically, the Authority would implement AQ-MM#2 to offset remaining PM_{10} emissions to below MBARD's CEQA threshold. Similar to BAAQMD, MBARD's PM_{10} threshold is based on emissions levels identified under the NSR program and have been adopted to prevent emissions from new projects in the NCCAB from contributing to CAAQS and NAAQS violations (MBUAPCD 2008). Because MBARD's threshold was established to prevent emissions from new projects in the NCCAB from contributing to CAAQS or NAAQS violations, offsetting emissions below the threshold levels would avoid potential conflicts with the ambient air quality plans, and would ensure that project construction would not contribute a significant level of air pollution such that regional air quality within the NCCAB would be degraded. Accordingly, the impact would be less than significant.

3.3.9.3 Impact AQ#3: Temporary Direct and Indirect Impacts on Air Quality within the SJVAB

All alternatives would have a significant impact under CEQA because construction would result in NO_X, CO, and PM_{10} emissions that would exceed the SJVAPCD's CEQA thresholds, as shown in Table 3.3-14. Implementation of a dust control plan (AQ-IAMF#1) and BMPs at new concrete batch plants (AQ-IAMF#6) would minimize impacts associated with fugitive dust emissions. The contractor would use low-VOC paints to limit the emissions of VOCs, which contribute to O_3 formation (AQ-IAMF#2). Exhaust-related pollutants would be reduced through use of renewable diesel, Tier 4 off-road engines, and model year 2010 or newer on-road engines, as required by AQ-IAMF#3 through AQ-IAMF#5. These project features would minimize air quality impacts and associated public health consequences through application of all best available on-site controls to reduce construction emissions. However, even with these measures, exceedances of air district thresholds would still occur.

The Authority would therefore implement mitigation to offset the impacts on air quality resources. Specifically, the Authority would implement AQ-MM#3 to fully offset (i.e., to net zero) all emissions of VOC, NOx, and PM within the SJVAPCD, pursuant to the Authority's MOU with the air district for the entire HSR project within the SJVAB. Offsetting VOC, NO_X, and PM_{10} emissions to net zero would avoid potential conflicts with the ambient air quality plans, and would ensure that project construction would not contribute a net increase in emissions or degraded regional air quality.

Pursuant to SJVAPCD's *Guidance for Assessing and Mitigating Air Quality Impacts* (SJVAPCD 2015a), emissions offsets procured through AQ-MM#3 could not be used to mitigate CO impacts. While CO has more direct and localized impacts than regional pollutants like VOC and NOx, SJVAPCD has adopted a threshold that considers basin-wide effects of CO emissions with respect to attainment of the ambient air quality standards. The ability of a region to attain and subsequently maintain the ambient air quality standards is based on cumulative emissions contributions for sources throughout the air basin. Translating project-generated CO emissions to the resultant number of basin-wide days of attainment or nonattainment cannot be estimated using available models with a high degree of accuracy. However, as discussed under Impact AQ#5, dispersion modeling conducted for the project demonstrates that construction-generated CO concentrations would not cause new localized violations of the CO CAAQS or NAAQS. While the project-level dispersion modeling indicates that project construction in the SJVAB would not lead to violations of the ambient air quality standards, because mass emissions would exceed SJVAPCD's threshold, this impact is conservatively concluded significant and unavoidable.

3.3.9.4 Impact AQ#5: Temporary Direct Impacts on Localized Air Quality—Criteria Pollutants

All alternatives would have a significant impact under CEQA because construction would lead to new violations of the PM_{10} and $PM_{2.5}$ CAAQS and NAAQS, as well as potentially contribute to existing PM_{10} and $PM_{2.5}$ violations through exceedances of the SIL. Alternatives 1, 2, and 4 would also violate the 1-hour NO_2 NAAQS and CAAQS. Project features would minimize air quality impacts (AQ-IAMF#1 through AQ-IAMF#6), although emissions concentrations would still violate the ambient air quality standards and exceed the SIL. These project features represent all best available on-site controls to reduce construction emissions, and no additional mitigation is available.[17] Therefore, the impact would be significant and unavoidable.

The NAAQS and CAAQS are set to protect public health and the environment within an adequate margin of safety. Some individuals exposed to pollutant concentrations that exceed the CAAQS or NAAQS may experience certain acute and/or chronic health conditions. Studies have linked particulate pollution to problems such as premature death in people with heart or lung disease, nonfatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms (e.g., coughing) (USEPA 2019c). Studies have linked NO_2 pollution to the aggravation and/or development of certain respiratory diseases (e.g., asthma), leading to respiratory symptoms (e.g., coughing), hospital admissions, and visits to emergency rooms (USEPA 2019d).

There are no models capable of performing a project-specific correlation of project-generated NO_2 or PM emissions to specific health consequences (e.g., increase cases of asthmas). Models that quantify changes in ambient pollution and resultant health effects were developed to support regional planning and policy analysis and have limited sensitivity to small changes in criteria pollutant concentrations induced by individual projects. Accordingly, translating project-generated NO_2 or PM emissions to the locations where specific health effects could occur or the resultant number of additional days of nonattainment cannot be estimated with a high degree of accuracy.

While there is no available tool to individually model project-level NO_2 or PM health effects, USEPA (2018c) has developed an approach for estimating the average human health impacts related to emissions of direct $PM_{2.5}$ and $PM_{2.5}$ precursors (NOx and SO_2).[18] These benefit per ton metrics have been developed for 17 emission sectors (e.g., mobile sources) using nationwide photochemical modeling and demographic input parameters. All estimates are based on a

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[17] While AQ-MM#1 through AQ-MM#3 would offset VOC, NO_X, and PM emissions, as required, these offsets could occur regionally throughout the SFBAAB, NCCAB, and SJVAPCD. Accordingly, the emission reductions achieved by these offsets may not contribute to enough localized reductions to avoid a project-level violation of the AAQS or SIL.

[18] Conversion of NOx to NO_2 occurs in the atmosphere through various reactions. Due to the complex chemistry governing NO_2 and other pollution formation (e.g., ozone), USEPA was not able to derive best practicable technology values for secondary pollutants. USEPA's best practicable technology estimates are therefore only applicable to direct $PM_{2.5}$ and $PM_{2.5}$ precursors (NOx and SO_2) (with no secondary formation).

national-scale study and do not account for location-specific meteorology, geographic distribution of receptors, or photochemistry, all of which can affect pollutant dispersion and exposure. The resultant health effects are therefore reflective of national averages and may not be exact when applied to the project-level. Nevertheless, the best practicable technology estimates can provide a general order-of-magnitude characterization of potential health consequences associated with project-generated direct PM and precursors to PM (with no secondary formation).

Table 3.3-33 presents the estimated incidence (i.e., cases) of health effects based on the construction inventory for Alternative 4. Alternative 4 would generate the most emissions of all project alternatives, and therefore represents the alternative with the greatest potential health burden. The estimates were developed by multiplying total project-generated $PM_{2.5}$ and $PM_{2.5}$ precursor (NOx and SO_2) emissions across all air districts (in average tons per year) by the relevant incidence per-ton metric from the USEPA (2018c).[19]

Table 3.3-33 Estimated Incidence of Health Endpoints Based on Total Directly Emitted NO_X, SO_X, and $PM_{2.5}$ Emissions during Construction of Alternative 4

Health endpoint	Incidence (cases per year)[1]
Premature mortality	4
Respiratory emergency room visits	1
Acute bronchitis	3
Lower respiratory symptoms	33
Upper respiratory symptoms	49
Minor restricted activity days	1,426
Work loss days	241
Asthma exacerbation	57
Cardiovascular hospital admissions	<1
Respiratory hospital admissions	<1
Non-fatal heart attacks (Peters)	2
Non-fatal heart attacks (All others)	<1

Source: USEPA 2018c
[1] Calculated by multiplying total project-generated $PM_{2.5}$ and $PM_{2.5}$ precursor (NOx and SO_2) emissions across all air districts (in average tons per year) by the relevant incidence per-ton metric from the USEPA (2018c). USEPA's metrics are based on national data and do not account for any location-specific variables that may influence exposure to project-generated emissions. The results presented above are presented for informational purposes only. Because this is a scaled analysis based on national data, actual changes in health outcomes due to project emissions could be higher or lower than presented due to intervening effects of location of emissions, meteorology, and photochemistry.
< = less than
NO_X = nitrogen oxides
SO_2 = sulfur dioxide
$PM_{2.5}$ = particulate matter smaller than or equal than 2.5 microns in diameter
USEPA = U.S. Environmental Protection Agency

[19] Analysis does not include PM emissions from demolition and earthmoving activities as there are no applicable incidence per-ton metrics from the EPA for these sources. Demolition and earthmoving activities represent approximately 13 percent of total construction-generated $PM_{2.5}$ emissions.

As discussed above, caution should be exercised when reviewing these results as they are based on national averages and do not account for any location-specific variables that may influence exposure to project-generated emissions. This analysis is only presented for informational purposes and has no bearing on the impact determination, which is based on a comparison of emissions concentrations to the ambient air quality standards. It is also important to consider the magnitude of project-generated emissions and potential health risks relative to ambient conditions. Construction-generated $PM_{2.5}$ emissions in the SFBAAB, NCCAB, and SJVAB represent less than one-tenth of one percent of each air basins' respective $PM_{2.5}$ emissions inventories (CARB 2017; BAAQMD 2017b). The SFBAAB and SJVAB do not currently attain the $PM_{2.5}$ NAAQS or CAAQS. Certain individuals residing in areas that do not meet the CAAQS or NAAQS, or in locations adjacent to ambient sources of particulate pollution, could be exposed to PM concentrations that cause or aggravate acute and/or chronic health conditions (e.g., asthmas, lost work days, premature mortality), regardless of project construction.