

3.3 Air Quality and Greenhouse Gases

Since publication of the Draft Environmental Impact Report (EIR)/Environmental Impact Statement (EIS), the following substantive changes have been made to this section:

- Emissions generated by light-duty gasoline-powered vehicles used during construction were remodeled to include the effects of the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule. The revised emissions results are presented in this Final EIR/EIS.¹
- The San Francisco to San Jose Project Section's (Project Section, or project) impact avoidance and minimization feature (IAMF) to reduce emissions from on-road construction vehicles (AQ-IAMF#5: Reduce Criteria Exhaust Emissions from On-Road Construction Equipment) was clarified.
- The project's IAMF to reduce emissions from concrete batch plants (AQ-IAMF#6: Reduce the Potential Impact of Concrete Batch Plants) was added.
- Section 3.3.4, Methods for Evaluating Impacts, was revised to include additional discussion of Regulation 2 Rule 5 and to clarify the transportation conformity process.
- Refinements were made to the particulate matter (PM) mass emissions inventory to more comprehensively capture emissions reductions that will be achieved through AQ-IAMF#1: Fugitive Dust Emissions.
- The project footprint of the light maintenance facility (LMF) was revised to reflect design modifications since publication of the Draft EIR/EIS, as illustrated on Figures 3.3-7 and 3.3-8. This revision was accounted for in the impact analysis throughout Section 3.3.6, Environmental Consequences.
- To account for the estimated amount of hazardous materials that must be removed from the LMF site and trucked to a disposal site, the air quality study area was extended to include the truck routes in the North Central Coast Air Basin (NCCAB) and the San Joaquin Valley Air Basin (SJVAB). Impacts AQ#1, AQ#2, AQ#3, AQ#4, AQ#7, and AQ#16 were revised to account for truck trips hauling material from the LMF site.
- Analysis about the Diridon Design Variant (DDV), which was included in Section 3.19, Design Variant to Optimize Speed, in the Draft EIR/EIS, was incorporated into this section.
- Statewide operational greenhouse gas (GHG) emissions from electrical generation were revised based on the U.S. Environmental Protection Agency's (USEPA) latest publication of the Emissions and Generation Resource Integrated Database (eGRID) (released January 2020) (USEPA 2020).
- Additional on-site emissions controls to reduce fugitive dust were added to AQ-IAMF#1 in response to public comments.
- A new air quality mitigation measure, AQ-MM#1: Construction Emissions Reductions—Requirements for Use of Zero Emission and/or Near Zero Emission Vehicles and Off-Road Equipment, was added to this Final EIR/EIS to reflect the California High-Speed Rail Authority's (Authority) commitment to electric vehicles. The subsequent mitigation measure was renumbered accordingly.

¹ On May 12, 2021, the National Highway Traffic Safety Administration (NHTSA) issued a notice of proposed rulemaking to repeal the One National Program Rule (49 Code of Federal Regulations Parts 531 and 533) (86 *Federal Register* 25980). This repeal would reverse the effects of the SAFE Rule on light-duty vehicle emission rates. The air quality analysis in this Final EIR/EIS was completed before issuance of this proposed rule and therefore includes the effects of the SAFE Rule on light-duty vehicle emission rates. Repealing SAFE Vehicles Rule would decrease the benefits of the HSR project's VMT reductions by as much as 10 percent for CO₂ emissions in 2040 (CARB 2020d). NHTSA issued its final CAFE standards on March 31, 2022; publication in the Federal Register was not completed as of the time of preparation of this Final EIR/EIS.

- Section 3.3.8, Impact Summary for NEPA Comparison of Alternatives, was updated to reflect changes to the project effects and mitigation measures.
- Section 3.3.9, CEQA Significance Conclusions, was modified to reflect changes to the impact conclusions and mitigation measures.

3.3.1 Introduction

This section describes ambient air quality conditions, including existing pollutant concentrations, meteorology, and locations of sensitive receptors² in the project resource study area (RSA). The section also discusses applicable criteria pollutant and GHG regulations. Critical air quality and GHG issues associated with the project include temporary construction-related emissions, which could exceed local air district and federal General Conformity thresholds designed to achieve regional attainment of federal and state ambient air quality standards. Sensitive receptors adjacent to the project footprint may also be exposed to increased health risks from construction activities. Operation 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 reduce single-occupancy vehicles in 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 permanent operations.

This analysis is supported by the *San Francisco to San Jose Project Section Air Quality and Greenhouse Gases Technical Report* (Authority 2021a, included as Volume 2, Appendix 3.3-A, Air Quality and Greenhouse Gases Technical Report) and, for the San Jose Diridon Station Approach Subsection, the *San Jose to Merced Project Section Air Quality and Greenhouse Gases Technical Report* (Authority 2021b) (Air Quality and Greenhouse Gases Technical Reports).³ The following appendices in Volume 2 of this Final EIR/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 IAMFs incorporated into the project.
- Appendix 2-I, Regional and Local Plans and Policies, provides a list by resource of all applicable regional and local plans and policies.
- Appendix 2-J, 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, summarizes the methodology used to forecast the reduction in vehicle miles traveled (VMT) due to project operations.
- Appendix 3.3-A provides additional technical details on the air quality and GHG analysis.

Primary Air Quality and Greenhouse Gas Impacts

- Temporary construction emissions in excess of air district and federal *de minimis* thresholds
- Temporary construction emission concentrations in excess of ambient air quality standards
- Temporary conflict with air quality plans associated with construction-generated emissions
- Criteria pollutant and greenhouse gas emissions reduction from removal of passenger vehicle and aircraft trips due to project operations

² A receptor is a specific location at which impacts are evaluated.

³ Technical reports for the project evaluate the portions of the HSR alignment between 4th and King Street Station in San Francisco and Scott Boulevard in Santa Clara, while technical reports for the adjacent San Jose to Merced Project Section evaluate the portions of the HSR alignment south of Scott Boulevard to the Project Section terminus at West Alma Avenue south of the San Jose Diridon Station.

- Appendix 3.3-B, Draft General Conformity Determination, provides a discussion of the federal General Conformity requirements and demonstrates how the project complies with the General Conformity requirements.
- Appendix 3.3-C, Changes to Project Benefits Based on 2018 Business Plan, describes how permanent operational benefits of the high-speed rail (HSR) project may change based on the ridership assumptions under the 2018 Business Plan (Authority 2018).

Air quality and GHGs 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. The following Final 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 3.17, Regional Growth, evaluates impacts of building the project alternatives on land consumption and growth-inducing impacts on air quality and global climate change.

3.3.1.1 *Definition of Terminology*

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

- **Air quality**—Describes the amount of air pollution to which the public is exposed.
- **Air pollution**—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 GHGs. TACs are equivalent to the federal hazardous air pollutants (HAP). These pollutants are defined in detail in Chapter 4 of the Air Quality and Greenhouse Gases Technical Reports (Authority 2022a, 2022b), and are as follows:
 - **Criteria pollutants** – Pollutants for which 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 criteria pollutants are ozone (O₃), PM (PM₁₀ is PM smaller than or equal to 10 microns in diameter and PM_{2.5} is PM smaller than or equal to 2.5 microns in diameter), carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), and lead (Pb). The statewide standards established for California also incorporate additional standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles. O₃ is considered a regional pollutant because its precursors (volatile organic compounds [VOC] and nitrogen oxides [NO_x]) affect air quality on a regional scale. Pollutants such as CO, NO₂, SO₂, 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 would be O₃ precursors (VOC and NO_x), CO, PM, and SO₂.⁴
 - **TACs** – Nine mobile source air toxics (MSAT), which are a subset of HAPs that USEPA has identified as having significant contributions from mobile (transportation) sources: acetaldehyde, acrolein, benzene, 1,3-butadiene, diesel particulate matter (DPM) and diesel exhaust organic gases, ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. These pollutants are known or suspected to cause cancer or other serious health and environmental effects. The California Air Resources Board (CARB)

⁴ Pb, sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particulates typically are 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.

and Bay Area Air Quality Management District (BAAQMD) recognize 21 substances as TACs, including four of the USEPA MSATs: benzene, 1,3-butadiene, DPM, and formaldehyde. The BAAQMD (2017a) considers DPM as the surrogate for total diesel exhaust including organic gases. CARB and BAAQMD have not defined a list of TACs specific to mobile sources, but both agencies recognize DPM as a primary pollutant of concern for mobile sources.

- **GHGs** – Gaseous compounds that limit the transmission of Earth’s radiated heat out to space. GHGs include O₃, water vapor, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), 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.

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 Authority would implement the HSR system, including the project, in compliance with all applicable regulations. Refer to the Air Quality and Greenhouse Gases Technical Reports (Authority 2021a, 2021b) for more detailed information on laws, regulations, and orders.

3.3.2.1 Federal

Clean Air Act (42 United States Code § 7401 et seq.) 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 USEPA to establish federal air quality standards, known as national ambient air quality standards (NAAQS), and specifies future dates for achieving compliance. The six criteria pollutants subject to the NAAQS are O₃, PM (PM₁₀ and PM_{2.5}), CO, NO₂, SO₂, 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 the public welfare, which includes 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) (Section 3.3.2.2, State) for reference.

Table 3.3-1 State and Federal Ambient Air Quality Standards

Criteria Pollutant	Averaging Time	California Standards	National Standards ¹	
			Primary	Secondary
Ozone (O ₃)	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/m ³	150 µg/m ³	150 µg/m ³
	Annual mean	20 µg/m ³	None	None
Fine particulate matter (PM _{2.5})	24-hour	None	35 µg/m ³	35 µg/m ³
	Annual mean	12 µg/m ³	12.0 µg/m ³	15.0 µg/m ³
Carbon monoxide (CO)	8-hour	9.0 ppm	9 ppm	None
	1-hour	20 ppm	35 ppm	None
	8-hour (Lake Tahoe)	6 ppm	None	None

Criteria Pollutant	Averaging Time	California Standards	National Standards ¹	
			Primary	Secondary
Nitrogen dioxide (NO ₂)	Annual mean	0.030 ppm	0.053 ppm	0.053 ppm
	1-hour	0.18 ppm	0.100 ppm	None
Sulfur dioxide (SO ₂)	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 (Pb)	30-day average	1.5 µg/m ³	None	None
	Calendar quarter	None	1.5 µg/m ³	1.5 µg/m ³
	3-month average	None	0.15 µg/m ³	0.15 µg/m ³
Sulfates	24-hour	25 µg/m ³	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

µg/m³ = micrograms of pollutant per cubic meter of air

CAAQS = California ambient air quality standards

NAAQS = national ambient air quality standards

ppm = parts per million

SIP = state implementation plan

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 0.12 ppm 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 SIPs.

³ The annual and 24-hour NAAQS for SO₂ 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 a light extinction coefficient of 0.23 per kilometer. The standard is equivalent to visibility of 10 miles where the light extinction is due to particles and the relative humidity is less than 70 percent.

The CAA requires that a state implementation plan (SIP) be prepared for 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 ultimate 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.

General Conformity Rule

Pursuant to CAA Section 176(c) requirements, USEPA enacted the federal General Conformity Rule (40 Code of Federal Regulations [C.F.R.] Parts 5, 51, and 93 Subpart B) and the Transportation Conformity Rule (40 C.F.R. §§ 51.390 and 93 Subpart A) in 1993. The conformity rules mandate that federal actions should not generate emissions that interfere with state and local agencies' SIPs and emission-reduction strategies to attain the NAAQS.

Transportation conformity applies only to projects that would be funded or require approval by the Federal Highway Administration (FHWA) under Title 23 United States Code (U.S.C.) or the Federal Transit Administration under the Federal Transit Act (49 U.S.C. § 1601 et seq.). The

project does not require funding or approval by the FHWA or the Federal Transit Administration. Therefore, transportation conformity does not apply to the project.

The General Conformity Rule applies to the project. Pursuant to 23 U.S.C. Section 327 and a memorandum of understanding (MOU) executed by the FRA and the State of California dated July 23, 2019, the FRA assigned its federal environmental review responsibilities under the National Environmental Policy Act (NEPA) and related statutes to the Authority under a federal program commonly known as NEPA Assignment. Accordingly, the Authority is the NEPA lead agency for this project. Consistent with 23 U.S.C. Section 327 and the NEPA Assignment MOU, FRA retains its obligations to make General Conformity Determinations under the CAA for the project. 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 this Final 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.

The General Conformity Rule (75 *Federal Register* [Fed. Reg.] 17255) applies only to direct and indirect emissions generated by a federal action that are not subject to New Source Review (NSR), for which a federal permitting agency has directly caused or initiated, has continued program responsibility for, or can practically control.⁶ The rule does not include stationary industrial sources requiring air quality permits from local air pollution control agencies. Because the project will likely require 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 it is determined 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.⁷
- 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 (40 C.F.R. § 93.153(b)).

The evaluation of direct and indirect emissions is performed by comparing the change in annual emissions due to the project to the applicable *de minimis* emissions level. If the evaluation indicates that emissions are greater than any general conformity *de minimis* thresholds, FRA must perform a conformity determination.

Mobile Source Air Toxics and Hazardous Air Pollutants

While NAAQS or CAAQS do not exist for MSATs or HAPs, USEPA regulates these pollutants through rules and emission control programs. In February 2007, USEPA finalized a rule (Control

⁶ As defined in the General Conformity Rule (40 C.F.R. § 93.152), "*direct emissions* means those emissions of a criteria pollutant or its precursors that are caused or initiated by the federal action and originate in a nonattainment or maintenance area and occur at the same time and place as the action and are reasonably foreseeable.... *Indirect emissions* means those emissions of a criteria pollutant or its precursors (1) that are caused or initiated by the federal action and originate in the same nonattainment or maintenance area but occur at a different time or place as the action; (2) that are reasonably foreseeable; (3) that the agency can practically control; and (4) for which the agency has continuing program responsibility."

⁷ 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.

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 portable fuel containers (e.g., hand-held 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 would 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, requiring 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 CO₂, CH₄, N₂O, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride (SF₆), 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 Reports [Authority 2021a, 2021b] for additional detail):

- **U.S. Presidential Executive Order (USEO) 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—CO₂, CH₄, N₂O, hydrofluorocarbons, perfluorocarbons, and SF₆—threaten the public health and welfare of current and future generations.
- **Updated Corporate Average Fuel Economy Standards (October 15, 2012–September 3, 2021)**—Requires substantial improvements in fuel economy and reductions in GHG emissions for all light-duty vehicles sold in the United States. 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 (mpg). On August 2, 2018, the National Highway Traffic 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 (SAFE Vehicles Rule). On September 19, 2019, USEPA and NHTSA issued a final action on the One National Program Rule, which is considered Part One 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). California, 22 other states, the District of Columbia, and two cities filed suit against Part One of the SAFE Vehicles 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). On October 28, 2019, the Union of Concerned Scientists, Environmental Defense Fund, and other groups filed a protective petition for review after the federal government sought to transfer the suit to the District of Columbia Circuit Court (*Union of Concerned Scientists v. National Highway Traffic Safety Administration*). The lawsuit filed by California and others is stayed pending resolution of the petition.

USEPA and NHTSA published final rules to amend and establish national CO₂ and fuel economy standards on April 30, 2020 (Part Two of the SAFE Vehicles Rule) (85 Fed. Reg. 24174). The revised rule changes the national fuel economy standards for light-duty vehicles from 50.4 mpg to 40.5 mpg in future years. California, 22 other states, and the District of Columbia filed a petition for review of the final rule on May 27, 2020.

On January 20, 2021, President Joseph Biden issued a USEO directing the USEPA and NHTSA to review the SAFE Vehicles Rule and propose a new rule suspending, revising, or rescinding it. On May 12, 2021, NHTSA issued a notice of proposed rulemaking to repeal the One National Program Rule (49 C.F.R. Parts 531 and 533) (86 Fed. Reg. 25980). On August 10, 2021, USEPA issued a notice of proposed rulemaking to set revised GHG emissions standards for light-duty vehicles (86 Fed. Reg. 43276). On September 3, 2021, NHTSA issued a notice of proposed rulemaking to set revised Corporate Average Fuel Economy standards for model years 2024–2026 light-duty vehicles which would partially revise the SAFE Vehicles Rule (86 Fed. Reg. 49602). USEPA issued its final GHG standards on December 30, 2021 (86 Fed. Reg. 74434). NHTSA issued its final CAFE standards on March 31, 2022.

- ***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.
- ***Final Guidance on Considering Climate Change in NEPA Reviews and Conducting Programmatic NEPA Reviews (August 1, 2016) and Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (June 26, 2019)***—The White House Council on Environmental Quality (CEQ) released final guidance regarding the consideration of GHGs in NEPA documents for federal actions in August 2016 (CEQ 2016). On April 25, 2017, CEQ withdrew the final guidance pursuant to USEO 13783, but noted “the withdrawal of the guidance does not change any law, regulation, or other legally binding requirement” (82 Fed. Reg. 16576). CEQ released new draft guidance on June 26, 2019, which, if finalized, would replace the withdrawn August 2016 guidance (84 Fed. Reg. 30097). The June 2019 guidance directs federal agencies to analyze the direct and reasonably foreseeable indirect GHG emissions when doing so is practicable and not overly speculative. In January 2021, the Biden Administration issued a USEO that withdrew the June 2019 guidance and directed the CEQ to review, revise, and update the August 2016 guidance.

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 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 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 Contaminants

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

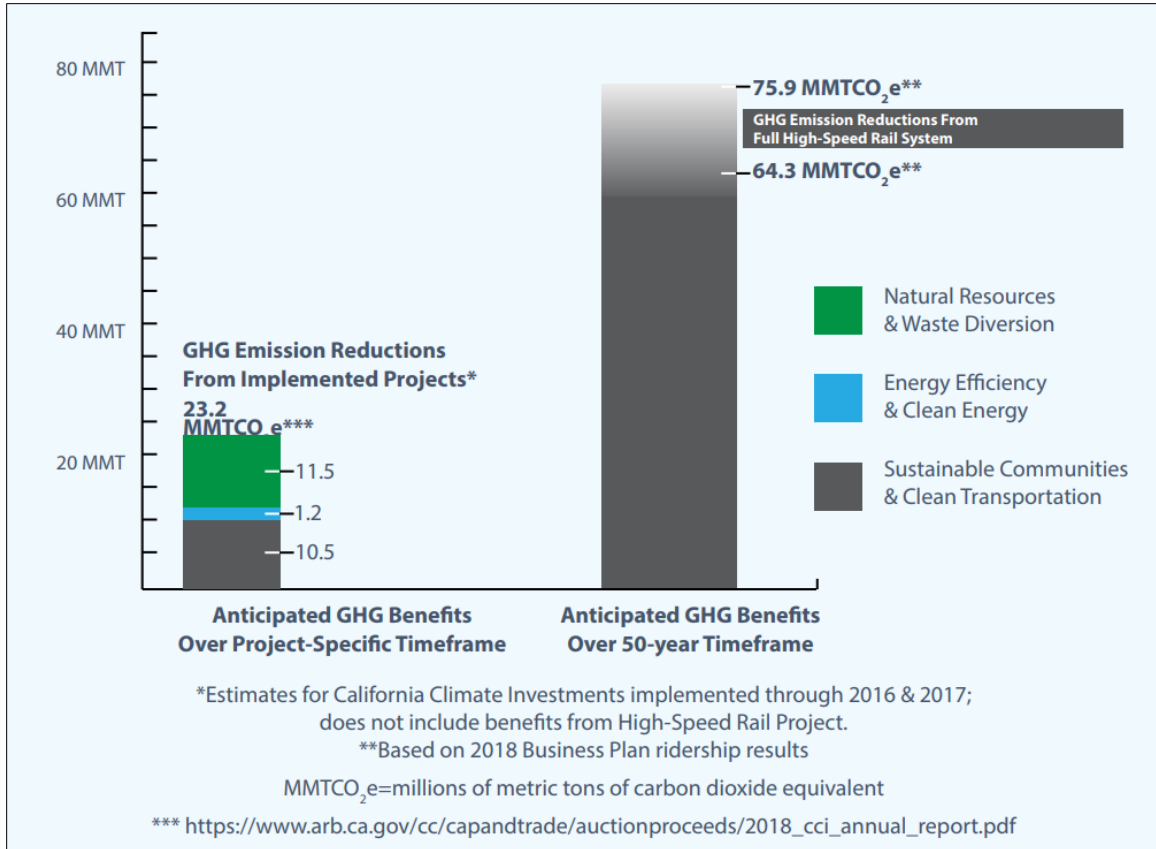
The CARB has adopted two airborne toxic control measures for controlling naturally occurring asbestos (NOA): the *Asbestos Airborne Toxic Control Measure for Surfacing Applications* and the *Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations*. 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 Reports (Authority 2021a, 2021b) for additional details.

- **Assembly Bill (AB) 1493 (2002)**—Requires the CARB to develop and implement regulations to reduce automobile and light-truck GHG emissions, beginning with model year 2009.
- **California Executive Order (EO) S-03-05 (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, the CARB adopted the Climate Change Scoping Plan (AB 32 Scoping Plan) in December 2008 and updated in 2014 and 2017 (CARB 2017a), which outlines measures for meeting the 2020 GHG emissions reduction limit.
- **California Environmental Quality Act (CEQA) Guidelines Amendments to Address Greenhouse Gas Emissions (2009)**—Requires lead agencies to address GHG emissions in determining the significance of environmental effects caused by a project and to consider feasible means to mitigate the significant effects of GHG emissions.

- **EO B-30-15 (2015)**—Establishes a GHG reduction target of 40 percent below 1990 levels by 2030 in the state. As of July 2016, California was on track to meet or exceed the target of reducing GHG to 1990 levels by 2020, which was previously established in the California Global Warming Solutions Act of 2006 (AB 32). EO B-30-15 supports EO S-3-05 but currently is only binding on state agencies.
- **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.
- **Senate Bill (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 the CARB for 2020 and 2035.
- **SB 32 and AB 197 (2016)**—Require the CARB to reduce statewide GHG emissions to at least 40 percent below the 1990 level by 2030. On December 14, 2017, CARB adopted *California’s 2017 Climate Change Scoping Plan*, the strategy for achieving California’s 2030 GHG emissions target (CARB 2017a). 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 lowering emissions. The plan is intended to move 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)**—Revises and extends renewable resource targets for electric power generation 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 a new state goal to achieve carbon neutrality as soon as possible, and no later than 2045, and to achieve and maintain net negative emissions thereafter.
- **CARB 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**—Allocates billions of cap-and-trade dollars to work toward 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, the California HSR system would generate an aggregate reduction in statewide GHG emissions over a 50-year period. Figure 3.3-1 illustrates the estimated aggregate reductions in GHG emissions that would result from the HSR over a 50-year timeframe.



Source: Authority 2018

Figure 3.3-1 Aggregate GHG Emissions Reductions That Would Result from the California HSR Project

3.3.2.3 Regional and Local

This section describes the air management district 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-I 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 is located in the San Francisco Bay Area Air Basin (SFBAAB), which is under the jurisdiction of the BAAQMD. Some truck travel associated with project construction would occur in the NCCAB, which is under the jurisdiction of the Monterey Bay Air Resources District (MBARD), and the SJVAB, which is under the jurisdiction of the 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 BAAQMD, MBARD, and SJVAPCD also administer local regulations.

The BAAQMD, MBARD, and SJVAPCD have adopted advisory emission thresholds to assist 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 the section, to improve air quality, protect public health, and protect the climate. Refer to the San Francisco to San Jose 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

Metropolitan planning organizations are responsible for transportation planning within their local jurisdiction. The project is in the jurisdiction of the Metropolitan Transportation Commission, which 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. Some truck trips associated with project construction would occur within the jurisdictions of two additional metropolitan planning organizations—the Association of Monterey Bay Area Governments and the Merced County Association of Governments—and one regional transportation planning agency, the Council of San Benito County Governments.

Air Quality Plans

State Implementation Plan

As discussed in Section 3.3.2.1, Federal, the CAA requires areas with unhealthy levels of O₃, PM, CO, NO₂, and SO₂ to develop SIPs that describe how an area will attain the NAAQS. SIPs are not single documents. They are a compilation of new and previously submitted plans, programs (e.g., monitoring, modeling, 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 RTP and transportation improvement programs in the RSA are described in detail in the Air Quality and Greenhouse Gases Technical Reports (Authority 2021a, 2021b).

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 municipal operations, community activities, or both include the City and County of San Francisco, the Cities of South San Francisco, Burlingame, Millbrae, Belmont, San Carlos, Redwood City, Atherton, Menlo Park, Palo Alto, Mountain View, Sunnyvale, Santa Clara, and San Jose, and San Mateo County 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 NEPA regulations require a discussion of inconsistencies or conflicts between a proposed undertaking and federal, state, regional, or local plans and laws. Accordingly, this Final 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 and Section 3.3.2.2 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 districts in the state to use in conforming to the required standards.
- State laws and EOs 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 CARB and prepared by the BAAQMD outline strategies for nonattainment areas to achieve attainment with air quality standards.

The Authority, as the lead agency proposing to build 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 HSR project, including this Project Section, 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 (CARB 2017a).

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 build the HSR system to be 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.

A total of 30 plans and 176 policies were reviewed. Volume 2, Appendix 2-I presents the plans and policies by resource. The project alternatives are consistent with 175 policies and inconsistent with 1 policy. Volume 2, Appendix 2-J 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 Metropolitan Transportation Commission 2017)—Plan Bay Area's Target #3. This target requires a 10 percent reduction in health impacts associated with adverse air quality. During construction, both project alternatives would contribute temporarily to existing violations of the PM₁₀ CAAQS and new violations of the PM_{2.5} NAAQS. The NAAQS and CAAQS have been established to protect public health. The existing violations are attributed to emissions from existing sources and would not be caused by the project. The Authority has incorporated all feasible measures for reducing particulate emissions from construction into AQ-IAMF#1, which minimizes health impacts of particulates to the maximum extent feasible, though existing violations of the CAAQS would remain. 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#2. As described in Section 3.3.6.2, Air Quality, project operations would reduce 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. As shown in Table 3.3-2, the RSA for air quality and GHGs encompasses the areas directly and indirectly affected by construction and operations of the project. 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 project footprint 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 SFBAAB for regional impacts during 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) because GHGs mix throughout the atmosphere globally. Figure 3.3-2 illustrates the regional air quality RSA for the project, including the SFBAAB, and the project alternatives.

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

Type	General Definition
Air Quality	
Construction	<p>Local: Localized air quality impacts from construction, such as health effects associated with certain criteria pollutants and DPM emissions, could occur in areas within 1,000 feet of the project footprint and staging areas.</p> <p>Region: Regional air quality impacts from construction, such as health effects from increased O₃ and secondary PM formation, could occur in the SFBAAB, NCCAB, and SJVAB.</p>
Operations	<p>Region and state: The air quality RSA associated with operations of the project is the affected air basin (SFBAAB) and the entire state. The project could impact on-road emissions throughout the SFBAAB 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.</p>
Greenhouse Gases	
Construction and Operations	<p>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.</p>

AB = Assembly Bill

DPM = diesel particulate matter

GHG = greenhouse gas

NCCAB = North Central Coast Air Basin

O₃ = ozone

PM = particulate matter

RSA = resource study area

SB = Senate Bill

SFBAAB = San Francisco Bay Area Air Basin

SJVAB = San Joaquin Valley Air Basin



Source: Authority 2019c, 2019d

MAY 2019

The portion of the RSA corresponding to the truck route in the NCCAB and SJVAB is not shown.

Figure 3.3-2 Regional Air Quality Resource Study Area

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. 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-I) also were considered in this analysis.

As discussed in Section 3.3.1.1, Definition of Terminology, 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 both 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 Reports (Authority 2021a, 2021b) provide additional detail on the analysis, including specific modeling assumptions and outputs.

Construction Impacts

Mass Emissions Modeling

Construction of the project would generate emissions of reactive organic gases (ROG),⁸ NO_x, CO, sulfur oxides (SO_x), PM₁₀, PM_{2.5}, CO₂, CH₄, and N₂O that could result in temporary air quality and GHG effects. Emissions would originate from off-road equipment exhaust, employee and

Methods Used to Analyze Impacts

Construction Impacts

- Mass emissions modeling
- Health risk assessment
- Other localized effects
- Asbestos, lead-based paint, and odors

Operations Impacts

- Mass emissions modeling
- Carbon monoxide hot spots
- Particulate matter hot spots
- Mobile source air toxics
- Operational health risk assessment

⁸ ROG is interchangeable with the USEPA term *volatile organic compounds* (VOC).

haul truck vehicle exhaust (on-road vehicles), site grading and earth movement, on-site concrete batching, demolition, paving, architectural coating, and electricity consumption. 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 (PM₁₀ and PM_{2.5}), and fugitive⁹ off-gassing (of VOC) using a combination of emission factors and methods from the California Emissions Estimator Model (CalEEMod), version 2016.3.2; the 2017 CARB emissions factors (EMFAC) model;¹⁰ and USEPA's AP-42 Compilation of Air Pollutant Emission Factors based on project-specific construction data (e.g., schedule, equipment, truck volumes) provided by the project engineering team (Franchi 2020; Scholz 2018, 2020, 2021). All major design components of the project (at grade, embankment/berm, and viaduct) were quantitatively analyzed and included in the emissions modeling. The analysis also considers emissions generated by heavy-duty trucks used to haul ballast and subballast from regional quarries to the project. All ballast would be hauled from quarries located in the SFBAAB. This project would be a balanced project in terms of earthwork under Alternative A, so fill would not be imported or exported under Alternative A. Fill would be imported under Alternative B. Sources of fill are expected to be local borrow sites within the SFBAAB.

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

Daily and Annual Emissions Estimates

The analysis assumes that construction of the project would occur over multiple phases between 2021 and 2026. As construction is expected to take place later than these dates, these construction emissions estimates are conservative because future emissions rates will be lower due to cleaner and newer equipment. The Authority quantified daily criteria pollutant and GHG emissions generated by construction of each phase using the methods 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 by summing the emissions calculated for each source for each day of construction. Maximum daily emissions were identified based on concurrent construction activity within the BAAQMD, MBARD, and SJVAPCD, consistent with air district requirements (BAAQMD 2017a; Monterey Bay Unified Air Pollution Control District [MBUAPCD] 2008; SJVAPCD 2015a). The highest daily emissions in each construction year were selected as the peak day for analysis purposes. This approach is conservative (i.e., tending to overestimate emissions) and based on available information and, therefore, is not necessarily representative of actual daily emissions during the construction period.

Emissions by Air District and Basin

The project falls under the jurisdiction of three air districts—BAAQMD, MBARD, and SJVAPCD—each of which has adopted its 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.¹¹

Emissions generated by construction that would occur exclusively within one air district were wholly assigned to that air district. The only construction activity that would generate emissions in

⁹ Fugitive means emissions that could not reasonably pass through a vent, stack, or similar opening but are emitted directly to the atmosphere. For example, windblown dust is fugitive PM.

¹⁰ CARB's (2019c, 2020d) SAFE Vehicles Rule adjustment factors were applied to the emission factors for gasoline-powered vehicles.

¹¹ 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 the project 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).

more than one air district is the trucking of hazardous materials to the Kettleman Hills Facility landfill in Kettleman City, California. The emissions estimates for trucking of hazardous materials were apportioned based on the roadway mileage that the trucks would traverse in each of the three air districts.

Health Risk Assessment

Analysts conducted a health risk assessment (HRA) to assess the potential impacts associated with public exposure to DPM and localized PM_{2.5} exhaust. In accordance with BAAQMD guidance, the HRA used diesel PM_{2.5} as a surrogate for DPM because complete emission factors for DPM are not available. The HRA was conducted using the guidelines provided by the California Office of Environmental Health Hazard Assessment (OEHHA) (2015) for the Air Toxics Hot Spots Program and the HRA guidelines developed by the California Air Pollution Control Officers Association (CAPCOA) (CAPCOA 2009). The HRA was only performed for construction of the HSR facilities (e.g., alignment, stations, LMF).

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) considers diesel PM_{2.5} to be a surrogate for DPM, 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).

Air Dispersion Modeling

The USEPA's AERMOD dispersion model was used to quantify annual average PM concentrations at nearby receptor locations for each subsection. The modeling approach follows, where applicable, the OEHHA and CAPCOA methods, but is also consistent with BAAQMD methods, as provided in their guidance documents and based on staff consultation (BAAQMD 2012). The Authority used eight representative meteorological datasets in the analysis, which broadly cover the different meteorological conditions in the RSA. Three types of construction work areas—at grade, embankment, and viaduct—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., at grade vs. embankment) and location. 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)¹² 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. A ratio of 1.0 indicates the level at which adverse noncancer effects are likely to occur. In accordance with OEHHA guidance, inhalation exposure at residences was assumed to occur for 30 years. The parameters used for all exposure scenarios assume exposure begins in the last trimester of pregnancy and progresses through the 30-year period using varying age-specific factors and exposure duration.

¹² Note that the OEHHA, CARB, and BAAQMD have not identified acute health effects from diesel exhaust. Therefore, acute health effects are not included in this analysis.

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. Analysts also modeled all receptors with residential exposure parameters, assuming exposure to construction-generated pollution would begin during the third trimester of gestation. Defining all receptors as residential is conservative because it combines the longest exposure duration (third trimester through end of construction) with the highest age sensitivity factors and exposure frequencies (as defined by OEHHA guidance), yielding a worst-case assessment of potential cancer burden for all other receptor types (e.g., schools). The HRA presented in this section is therefore conservative (i.e., tending to overestimate impacts) 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, Introduction, O₃ is considered a regional criteria pollutant, whereas CO, NO₂, SO₂, and Pb are localized pollutants. PM can be both a local and a regional pollutant, depending on its composition. The primary criteria pollutants of concern generated by the project would be O₃ (including its precursors VOC and NO_x), NO₂, CO, PM, and SO₂.

Potential health effects induced by regional criteria pollutant emissions generated by the project (O₃ precursors and PM) are evaluated using the mass emissions modeling and are discussed further in Section 3.3.6. Localized pollutants (NO₂, CO, PM, and SO₂) generated by a project potentially affect populations near the emissions source. Because these pollutants dissipate with distance, emissions from individual projects can result in direct and material health effects on adjacent sensitive receptors. Accordingly, a quantitative ambient air quality analysis was conducted to assess the potential for construction-generated criteria pollutants to cause new or contribute to existing violations of the NAAQS and CAAQS. The NAAQS and CAAQS are health-protective standards and define the maximum amount of ambient air pollution that can be present without harming public health.

The analysis considers both annual and 1-hour to 24-hour impacts of all criteria pollutants, as applicable based on the established air quality standard. Specifically, the pollutants of concern with established annual standards are NO₂,¹³ PM₁₀, and PM_{2.5}. The following pollutants of concern have established 1-hour to 24-hour standards:

- CO (1 hour and 8 hours)
- PM₁₀ and PM_{2.5} (24 hours)
- NO₂ (1 hour)
- SO₂ (1 hour and 24 hours)

Off-site concentrations of pollutants were modeled using the annual mass emissions inventory and the AERMOD dispersion model. A representative maximum emission scenario for 1-hour to 24-hour impacts was developed for each subsection based on maximum activity levels that could take place concurrently. All major design components of the project (at grade, embankment, and

¹³ NO_x is both a regional and localized pollutant. Regional effects (i.e., O₃ formation) take place over long distances and time scales and are not analyzed through a localized ambient air quality analysis. Likewise, because ROG is a regional pollutant, it is not addressed in the localized analysis. Rather, O₃ impacts (through NO_x and ROG emissions) are addressed through a comparison of project emissions to the air district and federal General Conformity *de minimis* thresholds (Tables 3.3-3 and 3.3-4). Localized effects can occur from the conversion of NO_x to NO₂ in the atmosphere, and these effects are assessed through the localized NO₂ analysis to confirm that emissions would not lead to concentrations that exceed the CAAQS or NAAQS.

viaduct) were quantitatively analyzed. The combined effect of emissions from geographically proximate construction was also assessed.

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

The Authority used the *San Francisco to San Jose Project Section Geology, Soils, and Seismicity Technical Report* (Authority 2019e) and the *San Jose to Merced Project Section Geology, Soils, and Seismicity Technical Report* (Authority 2019f) to determine whether 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 odor analysis is qualitative and considered the potential for receptors to be exposed to nuisance odors during construction and operations of the project. The Valley fever analysis is likewise qualitative and considers the potential for receptors to be exposed to *Coccidioides immitis* (*C. immitis*) fungus spores.

Operations Impacts

The following discussion identifies the methods and assumptions used for evaluating operations emissions and impacts on air quality and global climate change. The analysis is based on impact assessment in 2029 (initial Phase 1 operation) and 2040 (Phase 1 operations after initial ridership build-up). Because existing background conditions (e.g., background traffic volumes, trip distribution, vehicle emissions) of 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. 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 and a high ridership scenario. Both scenarios are based on the level of ridership as presented in the Authority's 2016 Business Plan (Authority 2016a).¹⁴ Two ridership scenarios are shown for the No Project conditions because the scenarios assume different background conditions. For example, forecast trends in demographics and travel costs can influence ridership for any HSR scenario. The medium ridership scenario was developed using the "most likely" values of all inputs to the HSR ridership forecasting model, while the high ridership scenario used inputs that result in ridership at the 75th percentile of the range considered in the ridership risk analysis. The *California High-Speed Rail 2016 Business Plan Ridership and Revenue Forecasting: Technical Supporting Document* (Authority 2016b) provides additional detail on the

Operational Emission Sources

- **On-road vehicles**—Displaced vehicle trips from mode shift to passenger rail.
- **Aircraft**—Displaced aircraft trips from mode shift to passenger rail.
- **Power plants**—Electricity generation and distribution to power electrical multiple unit trains.
- **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.
- **Light maintenance facility**—Employee commuting trips, delivery vehicle trips, and off-road maintenance equipment.

¹⁴ As described in Volume 2, Appendix 3.3-C, the Authority Board of Directors adopted the *2018 Business Plan: Connecting California, Expanding Economy, Transforming Travel* (2018 Business Plan) on May 15, 2018 (Authority 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. Since publication of the Draft EIR/EIS, the Authority Board of Directors adopted a Revised 2020 Business Plan on March 25, 2021 (Authority 2021). The Revised 2020 Business Plan forecasts were developed using the same travel forecasting model as the 2016 and 2018 Business Plans, updated for population and employment forecasts. Under both the 2018 Business Plan and the Revised 2020 Business Plan ridership forecasts, the project would achieve the same benefits described in this section, but they would occur at different times and may be less than presented in Section 3.3.6. Nonetheless, the HSR system 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.

travel forecasts and risk analysis. The tables in the impact analysis therefore present two values for operations emissions for each pollutant, corresponding to these two scenarios.

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, operation of the trains would not produce direct emissions from combustion of fossil fuels. However, fugitive dust from the surface surrounding the track would be re-suspended by the trains traveling at high velocities (train movement). The new and expanded stations and LMF would generate local emissions from mobile sources and building operations. Emissions were considered from six sources—on-road vehicles, aircraft, power plants, train movement, stations, and the Brisbane LMF¹⁵—in the analysis of operations air quality impacts, as described in the following subsections.

On-Road Vehicles

Operations of the project would provide expanded passenger rail service between San Francisco and San Jose that would result in reductions in passenger vehicle usage. Reductions in on-road vehicle emissions were evaluated using average daily displaced VMT estimates and the CARB's EMFAC 2017 model. Volume 2, Appendix 3.2-B describes the methodology used to forecast the reduction in VMT due to project operations. 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

Similar to on-road vehicles, operations of the project would reduce aviation demand throughout the state. Based on the HSR ridership forecasts, the Authority estimated the number of aircraft trips removed attributable to the HSR system. The Authority used the Federal Aviation Administration's Aviation Environmental Design Tool (AEDT) to estimate criteria pollutant benefits from the reduced aircraft activity and the associated ground support equipment activity. AEDT calculates emissions from the aircraft engines for all phases of aircraft ground and airborne operation, and the emissions from the ground support equipment used to service each aircraft.

The Authority modeled aircraft GHG reductions using fuel consumption and emission factors from the CARB's 2000–2018 Documentation of California's Greenhouse Gas Inventory (13th Edition) and the accompanying documentation (CARB 2020a). The analysis also accounts for criteria pollutant and GHG benefits from reduced use of aircraft ground support equipment, which were calculated using the CARB'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 eGRID 2018 model. The analysis conservatively assumed the HSR system would be powered by the state's current electric grid, which includes 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 and 100 percent by 2045), the emissions intensity of the statewide electrical grid would be lower when the HSR system would become 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 2016 Policy Directive POLI-PLAN-03 (Authority 2016c), the Authority has adopted a goal to purchase 100 percent of the HSR system's power from renewable energy sources. This goal also

¹⁵ The Authority also may use portable electric generators during routine maintenance activities. Emissions from portable generators have not been quantified because information on the number, size, and locations of generators and the amount of use is not available.

supports the SB 100 policy to require 100 percent renewable energy for supply to electricity end-use customers by 2045.

Train Movement

The entire HSR system, including the project, would use EMU trains, with the power distributed through the overhead contact system. Accordingly, the HSR system would not produce direct emissions from combustion of fossil fuels and associated emissions. However, trains traveling at high velocities, such as those associated with the HSR system, create sideways turbulence and rear wake (also known as induced wind), which resuspend particulates from the surface surrounding the track, resulting in fugitive dust. Re-suspended fugitive dust emissions were estimated using USEPA's (2006a) method for estimating emissions from wind erosion, and using assumptions from Watson (1996).

Stations

The project includes modifications at 4th and King Street, Millbrae, and San Jose Diridon Stations. 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.

Emissions from these sources were estimated using CalEEMod (version 2016.3.2)¹⁶ 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 of building) from the San Jose Diridon Station (McGuire 2017). This approach is conservative because the project stations would be LEED Platinum¹⁷ certified, which would reduce utility consumption per square foot relative to the existing rate. The Authority also estimated vehicle emissions associated with passenger access and employee commutes (Volume 2, Appendix 3.3-A).

The 4th and King Street, Millbrae, and San Jose Diridon 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.

Light Maintenance Facility

As discussed in Chapter 2, the project would require an LMF. The LMF would be constructed in Brisbane, either east of the alignment (Alternative A) or west of the alignment (Alternative B).

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. The Authority also derived emissions from employee commute and delivery trips using CalEEMod and vehicle trip information estimates (Volume 2, Appendix 3.3-A). Emissions from maintenance equipment and vehicle movement at the Brisbane LMF were estimated using a combination of emission factors and methods from CalEEMod and EMFAC2017.

Carbon Monoxide Hot Spots

Traffic around the 4th and King Street, Millbrae, and San Jose Diridon Stations and traffic affected by roadway-rail at-grade crossings may contribute to localized increases in CO, known as *CO hot spots*. The intersection analysis included all intersections affected by station traffic and near at-grade crossings. As discussed in Section 3.3.4.5, Method for Determining Significance under CEQA, the BAAQMD has adopted screening criteria that provide a conservative indication

¹⁶ Analysts adjusted the predicted passenger and employee vehicle emissions to reflect the impact of the SAFE Vehicles Rule, as per CARB (2019a, 2020b) guidance. As discussed in Section 3.3.2.1, the SAFE Vehicles Rule only affects fuel economy and associated emissions from light-duty gasoline vehicles. However, the adjustment factors were conservatively applied to the entire CalEEMod output for on-road mobile, which includes emissions contributions from gasoline and diesel-powered vehicles.

¹⁷ 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 pursuing 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.

of whether project-generated traffic would cause a potential CO hot spot. The Authority applied the BAAQMD criteria and California Department of Transportation (Caltrans) guidance (Garza et al. 1997) to select intersections for analysis, based on traffic data provided by Fehr & Peers (Volume 2, Appendix 3.3-A).

Intersections were selected for analysis by ranking them according to their total peak-hour traffic volumes and delay time. The intersections with the highest total traffic volumes and worst congestion (expressed as delay time) were selected for CO modeling. Analyzing these intersections provides a conservative assessment of potential CO effects because CO concentrations at all other intersections would be lower than those estimated for the selected intersections.

The Authority performed a microscale CO hot-spot analysis at the selected locations to verify that station traffic would not cause or contribute to a violation of the CO CAAQS or NAAQS, using the Caltrans CALINE4 model and guidance (Garza et al. 1997). Analysts adjusted the predicted CO concentrations to reflect the impact of the SAFE Vehicles Rule, per CARB (2020d) guidance. As discussed in Section 3.3.2.1, the SAFE Vehicles Rule only affects fuel economy and associated emissions from light-duty gasoline-fueled vehicles. However, the adjustment factors were conservatively applied to the entire modeled CO concentration, which includes emissions contributions from gasoline- and diesel-powered vehicles.

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 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,¹⁹ portions of the local RSA are classified as either nonattainment or maintenance for the federal PM₁₀ 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 PM₁₀ Nonattainment and Maintenance Areas* (USEPA 2015).²⁰ 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 PM₁₀ (40 C.F.R. Part 93, issued March 10, 2006).

Shifting of Tracks Carrying Freight Trains

The existing Caltrain tracks also are used by Union Pacific Railroad (UPRR) freight trains that are pulled by diesel locomotives. Construction of the project would shift existing tracks by up to 63 feet laterally, depending on the location (though not all shifts would occur near sensitive receptors). Neither UPRR service nor associated emissions from locomotive operation would be affected, relative to 2015 existing conditions. Although the sources of PM emissions would shift 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 under the USEPA definition of projects of air quality concern, would not change. Accordingly, a PM hot-spot analysis was not conducted for freight trains on the shifted tracks because the project would not change the amount of emissions from

¹⁹ Transportation conformity applies only to projects that would be funded or require approval by the FHWA under Title 23 U.S.C. or the Federal Transit Administration under the Federal Transit Act, 49 U.S.C. Section 1601 et seq. The HSR project does not require funding or approval by the FHWA or the Federal Transit Administration. Therefore, transportation conformity does not apply to the project.

²⁰ Although the project is not subject to transportation conformity, the USEPA's 2015 *Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in PM_{2.5} and PM₁₀ Nonattainment and Maintenance Areas* (USEPA 2015) was used in the analysis of localized PM_{2.5} impacts because it is the most appropriate technical guidance available for this purpose. This use of the guidance to assess localized PM_{2.5} impacts for the HSR project does not imply that the project is subject to transportation conformity.

freight locomotives, and thus there would be no effect under the USEPA definition of projects of air quality concern. Potential changes in receptor exposure to DPM and PM_{2.5} are analyzed under the Operations Health Risk Assessment subsection.

Mobile Source Air Toxics

The FHWA's *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents* (2016) advises 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 roadway 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; therefore, a qualitative analysis was conducted.

Operations Health Risk Assessment

Shifting of Tracks Carrying Freight Trains

Construction of the project would shift existing tracks used by UPRR freight trains within the railroad right-of-way. The track shifts would change the distances from the freight trains to certain receptor locations, which would result in increased TAC concentrations at certain receptor locations and corresponding decreases at other locations. Because diesel-related exhaust, specifically DPM, is considered a carcinogenic TAC by the CARB, the Authority conducted an HRA to assess the health risk (i.e., cancer and noncancer risks) associated with changes in track position during project operation.

The BAAQMD maintains an inventory of health risks associated with stationary sources, roadway, and rail sources in the SFBAAB (Winkel 2018). Analysts used the rail component of BAAQMD's inventory to calculate the net effect of health risks associated with moving tracks closer to sensitive receptors. Because the orientation and distance of the shifted track to existing receptors would change throughout the alignment, health risks were estimated at multiple locations to capture the anticipated maximum potential project impacts. The Authority selected locations where the difference in distance to nearby sensitive receptors between the shifted and existing tracks was greatest relative to existing sensitive receptors.

Data from the Peninsula Corridor Joint Powers Board²¹ (2015) and USEPA (2009) were used to account for anticipated growth in freight traffic and changes in locomotive emission rates, respectively. The analysis assumes the track shifts would be complete by 2022, which represents a conservative assumption of the earliest year that operation on the shifted tracks could occur.

²¹ The freight rail traffic growth rate estimated by the Peninsula Corridor Joint Powers Board (PCJPB) is greater than the growth rate used for the analysis in Section 3.2, Transportation, of this Final EIR/EIS, which is based on the 2018 State Rail Plan. The PCJPB growth rate was used for the HRA because it provides a more conservative estimate of health risks.

Diesel Buses

The 4th and King Street, Millbrae, and San Jose Diridon Stations would be served by diesel-powered buses, which generate TACs at idle while loading and unloading passengers. Increased bus service to the passenger rail terminals is not part of the project. The Authority assumes that bus service levels would be constant into the future given that no operator has a funding plan to deliver more service.

Emergency Generators

The 4th and King Street, Millbrae, and San Jose Diridon Stations and the Brisbane LMF 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 302.²² These requirements include providing to BAAQMD information on the facility and the generator engine as well as an HRA for generator operation. Based on these permitting requirements, the generators would not be allowed to operate if they would result in cancer or acute hazard impacts greater than 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 that would result in concentrations more than the BAAQMD's threshold of 0.3 micrograms per cubic meter (µg/m³). Accordingly, PM_{2.5} exhaust concentrations from emergency generator testing were estimated using USEPA's AERMOD dispersion model and emission data from CalEEMod. 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* comprises existing conditions in the SFBAAB, NCCAB, and SJVAB, including the regional attainment status, existing ambient air quality monitoring data, and applicable regulations, as established by USEPA and 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 would cause or contribute 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.

The Authority used the General Conformity Rule *de minimis* thresholds (40 C.F.R. § 93.153(b)) shown in Table 3.3-3 to inform the severity of an effect. Analysts assumed that General Conformity would apply only to construction of the project, because the analysis demonstrates that project operations would decrease regional emissions of criteria pollutants.

²² BAAQMD Regulation 2, Rule 5 (New Source Review of Toxic Air Contaminants) outlines guidance for evaluating TAC emissions and their potential health risks. Section 302 specifies that an Authority to Construct permit or Permit to Operate from the BAAQMD will be denied if any new and modified sources of TAC (which includes generators) over 50 horsepower would result in impacts that would exceed BAAQMD's health risk thresholds of significance (health risks in excess of 10.0 in 1 million or a hazard index of 1.0).

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

Air Basin ¹	Annual Air Pollutant Emissions in Tons per Year ³					
	VOC	NO _x	CO	PM ₁₀	PM _{2.5}	SO ₂
SFBAAB	100	100	None	None	100	100
NCCAB ²	None	None	None	None	None	None
SJVAB	10	10	None	None	100	70

CO = carbon monoxide

NCCAB = North Central Coast Air Basin

NO_x = nitrogen oxides

PM_{2.5} = particulate matter 2.5 microns in diameter or less

PM₁₀ = particulate matter 10 microns in diameter or less

RSA = resource study area

SFBAAB = San Francisco Bay Area Air Basin

SJVAB = San Joaquin Valley Air Basin

SO₂ = sulfur dioxide

VOC = volatile organic compounds

¹ The General Conformity *de minimis* thresholds for criteria pollutants are based on the federal attainment statuses of the SFBAAB, NCCAB, and SJVAB. Although the SFBAAB and SJVAB are in attainment for SO₂, because SO₂ is a precursor for PM_{2.5}, the PM_{2.5} General Conformity *de minimis* thresholds are used.

² The NCCAB is designated attainment for all criteria pollutants. Accordingly, a general conformity analysis is not required and there are no applicable *de minimis* thresholds.

³ Ammonia is also a PM_{2.5} precursor. However, neither construction nor operation of the project would result in material emissions of ammonia, so this EIR/EIS does not evaluate ammonia emissions.

3.3.4.5 Method for Determining Significance under CEQA

For this analysis, the project would result in a significant impact on air quality or climate change if it 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 BAAQMD 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, an air basin currently in nonattainment for the O₃ and PM_{2.5} NAAQS and CAAQS. 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 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 in Section 3.3.4.3, Methods for Impact Analysis, both construction and operations of the project would generate regional O₃ precursors (VOC and NO_x) and PM emissions. The project would also result in localized emissions of CO, NO₂, PM, and SO₂.

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

Regional Criteria Pollutant Emissions

Adverse health effects induced by regional criteria pollutant emissions generated by the project (O₃ precursors and PM) are highly dependent on a multitude of 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, O₃ precursors (VOC and NO_x) contribute to the formation of ground-borne O₃ on a regional scale, where emissions of VOC and NO_x generated in one area may not equate to a specific O₃ 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 O₃ 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 the 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.” SJVAPCD further notes that “[modeling of] 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 would not be “accurate when applied at the local level.” SCAQMD (2015c) 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.”²³ SCAQMD (2015c) also acknowledges that a project emitting NO_x or ROG below their threshold of 10 tons per year “is small enough that its regional impact on ambient ozone levels may not be detected in the regional air quality models” and it would “not be feasible to directly correlate project emissions of VOC or NO_x with specific health impacts from ozone.”

The BAAQMD’s (2017a), MBUAPCD’s (2008), and SJVAPCD’s (2015a) CEQA guidelines contain emissions thresholds used to evaluate the significance of a project’s emissions (Table 3.3-4). If a project’s regional emissions (by air basin) 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 air quality in the basin would be degraded. If the construction or operations 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.

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

Analysis	BAAQMD ¹	MBARD	SJVAPCD
Construction	VOC: 54 lb/day NO _x : 54 lb/day PM ₁₀ : 82 lb/day (engine exhaust only) PM _{2.5} : 54 lb/day (engine exhaust only)	PM ₁₀ : 82 lb/day ²	VOC: 10 tons/year or 100 lb/day ³ NO _x : 10 tons/year or 100 lb/day ³ PM ₁₀ : 15 tons/year or 100 lb/day ³ PM _{2.5} : 15 tons/year or 100 lb/day ³ CO: 100 tons/year or 100 lb/day ^{3,4} SO _x : 27 tons/year or 100 lb/day ^{3,4}
Operation	VOC: 54 lb/day or 10 tons/year NO _x : 54 lb/day or 10 tons/year PM ₁₀ : 82 lb/day or 15 tons/year PM _{2.5} : 54 lb/day or 10 tons/year	VOC: 137 lb/day NO _x : 137 lb/day CO: 550 lb/day PM ₁₀ : 82 lb/day SO ₂ : 150 lb/day	Same as for construction

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

BAAQMD = Bay Area Air Quality Management District

CAAQS = California ambient air quality standards

CEQA = California Environmental Quality Act

CO = carbon monoxide

lb = pounds

MBARD = Monterey Bay Air Resources District

NAAQS = national ambient air quality standards

NO_x = nitrogen oxides

O₃ = ozone

PM_{2.5} = particulate matter that is 2.5 microns in diameter and smaller

PM₁₀ = particulate matter that is 10 microns in diameter and smaller

SJVAPCD = San Joaquin Valley Air Pollution Control District

SO_x = sulfur oxide

SO₂ = sulfur dioxide

VOC = volatile organic compound

²³ For example, SCAQMD’s analysis of their 2012 Air Quality Attainment Plan showed that modeled NO_x and ROG reductions of 432 and 187 tons per day, respectively, only reduced O₃ levels by 9 parts per billion. Analysis of SCAQMD’s Rule 1315 showed that emissions of NO_x and ROG of 6,620 pounds (3.46 tons) per day and 89,180 pounds (44.59 tons) per day, respectively, contributed to 20 premature deaths per year and 89,947 school absences (SCAQMD 2015).

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 O₃ (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 O₃ 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 would 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 Though 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.

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 O₃ precursor emissions below these thresholds would 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 O₃ and secondary PM, which at certain concentrations could lead to increased incidence of specific health consequences. Although these health effects are associated with O₃ and particulate pollution, the effects are a result of cumulative and regional emissions. As such, for projects 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

Criteria Pollutants

Localized criteria pollutant emissions generated by a project potentially affect populations 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. 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, NO₂, and SO₂, 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 measured concentrations of PM₁₀ in most of the RSA already exceed the ambient air quality standards. The potential for the project to worsen these existing violations was determined by comparing the incremental project increase in PM concentrations to the applicable USEPA significant impact levels (SIL) (USEPA 2018f), as recommended by the BAAQMD (Kirk 2016) and SJVAPCD (2015a). This analysis uses the fugitive sources SILs because the construction-related PM emissions are principally from fugitive sources. These SILs are 10.4 µg/m³ and 1.2 µg/m³ for the 24-hour average PM₁₀ and PM_{2.5} concentrations, respectively, and 2.08 µg/m³ and 1.2 µg/m³ for the annual average PM₁₀ and PM_{2.5} concentrations, respectively. Where existing measured concentrations of PM₁₀ already exceed the ambient air quality standards, BAAQMD considers an

incremental increase that does not exceed the SILs not 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, the BAAQMD has 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 congestion management program 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 traffic near the 4th and King Street, Millbrae, and San Jose Diridon Stations would result in a CO hot spot. The health-protective CO CAAQS is used as a quantitative concentration threshold for intersections that operate at a level of service (LOS) worse than the screening criteria.

Diesel Particulate Matter and Localized Particulate Matter

The BAAQMD has adopted separate thresholds to evaluate receptor exposure to DPM emissions. The "substantial" DPM threshold defined by the BAAQMD 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. 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/m³. PM₁₀ from earthmoving activities is expected to be significant without dust control measures. The SJVAPCD also requires dust control measures to reduce fugitive PM_{2.5} and PM₁₀ 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/m³. Neither the MBARD nor the SJVAPCD has 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	Type	Cancer Risk	Hazard Index	PM _{2.5} Concentration (µg/m ³)
BAAQMD	Project	10 per million	1.0	0.3
	Cumulative	100 per million	10.0	0.8
MBARD	Project	10 per million	1.0	None
	Cumulative	None	None	None
SJVAPCD	Project	20 per million	1.0	None
	Cumulative	None	None	None

Source: BAAQMD 2017a; MBUAPCD 2008; SJVAPCD 2015a
 PM_{2.5} = particulate matter that is 2.5 microns in diameter and smaller
 µg/m³ = micrograms of pollutant per cubic meter of air
 BAAQMD = Bay Area Air Quality Management District
 PM_{2.5} = particulate matter 2.5 microns or less in diameter
 MBARD = Monterey Bay Air Resources District
 SJVAPCD = 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 requires the demolition or renovation of asbestos- or LBP-containing building materials to comply with the requirements 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 has established significance thresholds to evaluate operational emissions, but these are only applicable to land use development and stationary source projects. BAAQMD's thresholds were established based on statewide emission reduction goals outlined in AB 32 and do not consider the deeper reductions 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 both project alternatives, because both project alternatives would be within the same air basin. This information provides the context for the environmental analysis and the evaluation of impacts. Refer to the Air Quality and Greenhouse Gases Technical Reports (Authority 2021a, 2021b) 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 Section is located in the SFBAAB. Local meteorological conditions vary greatly throughout the Bay Area because of topography and elevation as well as proximity to local waterbodies. The project would traverse two unique and different meteorological zones in the SFBAAB: the San Francisco Peninsula and the Santa Clara Valley. The following sections describe these two areas, based on information provided by BAAQMD (BAAQMD 2017a).

In addition, trucks associated with construction of the LMF would use State Route (SR) 152 to Interstate (I-) 5 to access the Kettleman Hill landfill in Kettleman City, California. A small portion (approximately 0.1 mile) of SR 152 is located in the NCCAB. I-5 is located in the western portion of the SJVAB. The meteorology of these portions of the NCCAB and SJVAB is also described below, based on information provided by MBARD (MBUAPCD 2008) and SJVAPCD (SJVAPCD 2015a).

San Francisco Peninsula

The San Francisco Peninsula region extends from the Golden Gate to northwest of San Jose, bounded by the San Francisco Bay on the east, and the Pacific Ocean on the west. The Santa Cruz Mountains run up the center of the peninsula, with elevations exceeding 2,000 feet at the southern end, decreasing to 500 feet in South San Francisco. Coastal towns experience a high incidence of cool, foggy weather in the summer. Cities in the southeastern part of the peninsula experience warmer temperatures and fewer foggy days because the marine air layer is blocked by the ridgeline to the west. San Francisco lies at the northern end of the peninsula. Because most of San Francisco's topography is below 200 feet, marine air flows easily across most of the city, making the climate cool and windy.

At the northern end of the peninsula in San Francisco, pollutant emissions are high, especially from motor vehicle congestion. Localized pollutants, such as CO, can build up in urban canyons. Urban canyons are created when streets divide dense blocks of structures, especially skyscrapers, which can inhibit air circulation at the ground level. In most other areas, winds are generally fast enough to carry the pollutants away before they can accumulate. Air pollution potential is highest along the southeastern portion of the peninsula, where the high winds and fog of the marine layer are obstructed, resulting in accumulated concentrations of pollutants. Pollutant transport from upwind sites is common. In the southeastern portion of the peninsula, air pollutant emissions are relatively high because of motor vehicle traffic as well as stationary sources.

Santa Clara Valley

The Santa Clara Valley is bounded by San Francisco Bay to the north and by mountains to the east, south, and west. Temperatures are warm on summer days and cool on summer nights, and winter temperatures are mild. At the northern end of the valley, mean maximum temperatures are 79 degrees Fahrenheit (°F) to 82°F during the summer and 55°F to 59°F during the winter, and mean minimum temperatures range from 55°F to 59°F in the summer to 39°F to 43°F in the winter. Further inland, where the moderating effect of the bay is not as strong, temperature extremes are greater. For example, in San Martin, 27 miles south of Norman Y. Mineta San Jose International Airport, temperatures can be more than 10°F warmer on summer afternoons and more than 10°F cooler on winter nights.

The air pollution potential of the Santa Clara Valley is high. High summer temperatures, stable air, and mountains surrounding the valley combine to promote O₃ formation. In addition to the many local sources of pollution, O₃ precursors from San Francisco, San Mateo, and Alameda Counties are carried by prevailing winds to the Santa Clara Valley. The valley tends to channel pollutants to the southeast. On summer days with low-level inversions, O₃ can be recirculated by southerly drainage flows in the late evening and early morning and by prevailing northwesterlies in the afternoon. 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 truck route along SR 152 falls within the NCCAB in San Benito County. 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 route that the project construction trucks would travel on I-5 lies in the western portion of the SJVAB in Merced, Fresno, and Kings Counties. 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

The federal and state governments have established NAAQS and CAAQS, respectively, for 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 protect public health and the environment within an adequate margin of safety (42 U.S.C. § 7409). The following subsections discuss the principal characteristics and possible health and environmental effects from exposure to the primary criteria pollutants generated by the project. This section also summarizes potential health effects from exposure to TAC and Valley fever.

Ozone and Ozone Precursor Emissions (VOC and NO_x)

O₃, or smog, is a photochemical oxidant that is formed when VOC and NO_x (both by-products of the internal combustion engine) react with sunlight. VOC is a compound 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 NO₂. NO is a colorless, odorless gas formed from atmospheric nitrogen and oxygen when combustion takes place under high temperature, high pressure, or both. NO₂ is a reddish-brown irritating gas formed by the combination of NO and oxygen during combustion and in the atmosphere. In addition to serving as an integral participant in O₃ formation, NO_x also directly acts as an acute respiratory irritant and increases susceptibility to respiratory pathogens.

O₃ 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 O₃ at certain concentrations can make breathing more difficult, cause shortness of breath and coughing,

inflammation and damage the airways, aggregate lung diseases, increase the frequency of asthma attacks, and cause chronic obstructive pulmonary disease (COPD). Studies show associations between short-term O₃ exposure and non-accidental mortality, including deaths from respiratory issues. Studies also suggest long-term exposure to O₃ may increase the risk of respiratory-related deaths (USEPA 2018d). The concentration of O₃ 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 O₃ and a 50 percent decrement in forced airway volume in the most responsive individual. Although the results vary, evidence suggests that sensitive populations (e.g., asthmatics) may be affected on days when the 8-hour maximum O₃ concentration reaches 80 parts per billion (USEPA 2016a). The average background level of O₃ in the Bay Area is approximately 45 parts per billion (BAAQMD 2017b).

In addition to human health effects, O₃ has been tied to crop damage, typically in the form of stunted growth, leaf discoloration, cell damage, and premature death. O₃ can also act as a corrosive and oxidant, resulting in property damage such as the degradation of rubber products and other materials.

Carbon Monoxide

CO is a colorless, odorless, toxic gas produced by incomplete combustion of carbon substances, such as gasoline or diesel fuel. In the RSA, 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. CO at ambient levels has not been associated with ecological effects (CARB 2019a).

Particulate Matter

PM consists of finely divided solids or liquids such as soot, dust, aerosols, fumes, and mists. Two forms of particulates are now generally considered: respirable coarse particles, or PM₁₀, and respirable 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 human health, especially for 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, nonfatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms. Studies show that every 1 µg/m³ reduction in PM_{2.5} results in a 1 percent reduction in mortality rate for individuals over 30 years old (BAAQMD 2017a). Depending on its composition, both PM₁₀ and PM_{2.5} also can affect water quality and acidity, deplete soil nutrients, damage sensitive forests and crops, affect ecosystem diversity, and contribute to acid rain (USEPA 2018e).

Nitrogen Dioxide

NO₂ is formed by the combination of NO and oxygen through internal combustion and in the atmosphere. Exposure to high concentrations of NO₂ aggravate respiratory diseases, such as asthma (USEPA 2016b). In addition, several epidemiological studies have demonstrated associations between NO₂ exposure and premature death, cardiopulmonary effects, decreased lung function and growth in children, emergency room visits for asthma, and intensified allergic responses. Compared to adults, young children and infants tend to be at greater risk because they have higher breathing rates and typically greater outdoor exposure durations. Long-term NO₂ exposure during childhood, the period of rapid lung growth, can lead to smaller lungs at

maturity in these children. Children with asthma also have a greater degree of airway responsiveness when exposed to NO₂ at certain concentrations, compared to adult asthmatics. In adults, the greatest risk from NO₂ exposure is to people who have underlying chronic respiratory disease, such as COPD (CARB 2020b). NO₂ also can reduce visibility and react with water, oxygen, and other chemicals to contribute to acid rain, which can harm sensitive ecosystems (USEPA 2016b).

Sulfur Dioxide

SO₂ is generated by burning of fossil fuels, industrial processes, and natural sources, such as volcanoes. Short-term exposure to SO₂ can harm the respiratory system, making breathing difficult. SO₂ can also affect the environment by damaging foliage and decreasing plant growth (USEPA 2019).

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 MSATs, 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. The 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 2017a). Short-term exposure to DPM can cause acute irritation (e.g., eye, throat, bronchial), neurophysiological symptoms (e.g., lightheadedness, nausea), and respiratory symptoms (e.g., cough, phlegm). The 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 *C. immitis* fungus spores. The spores are found in certain types of soil and become airborne when the soil is disturbed. *C. immitis* is rare in the Bay Area and endemic to the Central Valley (California Department of Public Health 2018). 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 (U.S. Geological Survey 2000). Individuals with symptoms may develop fever, chest pain, respiratory irritation, headaches, and fatigue.

The project would not involve any earth disturbance in the NCCAB or SJVAB. The only activity associated with the project in the NCCAB and SJVAB would be truck travel on SR 152 and I-5. These activities would not be expected to expose humans to *C. immitis*.

Ambient Air Quality

The existing air quality conditions in the RSA can be characterized by measurement data. The BAAQMD operates air quality monitoring stations throughout the SFBAAB. For the purposes of this analysis, three stations were selected to represent conditions along the corridor: San Francisco—Arkansas Street, Redwood City—Barron Avenue, and San Jose—Jackson Street.

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 illustrates the locations of the monitoring stations relative to the project footprint. Between 2015 and 2017, measured CO and NO₂ concentrations did not exceed any federal or state standards at any of the three monitoring locations. However, the federal and state standards for O₃ were exceeded, as were the state standards for PM₁₀ and the federal standard for 24-hour PM_{2.5}.

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 O₃ 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.

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.

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. Residences also are 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 (California Environmental Protection Agency and CARB 2005). Sensitive receptor locations within 1,000 feet of the 4th and King Street, Millbrae, and San Jose Diridon Stations, the East Brisbane LMF site, and the West Brisbane LMF site, are listed in Table 3.3-8 and illustrated on Figure 3.3-4 through Figure 3.3-8, respectively. Residential land uses are the most common sensitive receptors in the RSA. Other sensitive receptor locations in the RSA include schools, hospitals, convalescent homes, and recreational areas.

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.

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

Pollutant and Standards	San Francisco— Arkansas Street			Redwood City— Barron Avenue			San Jose— Jackson Street		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
Ozone (O₃)¹									
Maximum 1-hour concentration (ppm)	0.085	0.070	0.087	0.086	0.075	0.115	0.094	0.087	0.121
Maximum 8-hour concentration (ppm)	0.067	0.057	0.054	0.071	0.060	0.086	0.081	0.066	0.088
Number of days standard exceeded ¹									
CAAQS 1-hour (>0.09 ppm)	0	0	0	0	0	2	0	0	3
NAAQS 8-hour (>0.070 ppm)	0	0	0	1	0	2	2	0	4
CAAQS 8-hour (>0.070 ppm)	0	0	0	1	0	2	2	0	4
Carbon Monoxide (CO)²									
Maximum 8-hour concentration (ppm)	1.3	1.1	1.4	1.6	1.1	1.4	1.8	1.4	1.8
Maximum 1-hour concentration (ppm)	1.8	1.7	2.5	3.4	2.2	2.8	2.4	1.9	2.1
Number of days standard exceeded ¹									
NAAQS 8-hour (≥9 ppm)	0	0	0	0	0	0	0	0	0
CAAQS 8-hour (≥9.0 ppm)	0	0	0	0	0	0	0	0	0
NAAQS 1-hour (≥35 ppm)	0	0	0	0	0	0	0	0	0
CAAQS 1-hour (≥20 ppm)	0	0	0	0	0	0	0	0	0
Nitrogen Dioxide (NO₂)¹									
National maximum 1-hour concentration, 98th percentile (ppm)	0.0532	0.0507	0.0586	0.0403	0.0396	0.0462	0.0493	0.0511	0.0675
State maximum 1-hour concentration (ppm)	0.070	0.058	0.073	0.047	0.045	0.067	0.049	0.051	0.067
State annual average concentration (ppm)	0.012	0.010	0.011	0.010	0.009	0.010	0.012	0.011	N/A
Number of days standard exceeded ¹									
NAAQS 1-hour (98th percentile>0.100 ppm)	0	0	0	0	0	0	0	0	0
CAAQS 1-hour (0.18 ppm)	0	0	0	0	0	0	0	0	0

Pollutant and Standards	San Francisco— Arkansas Street			Redwood City— Barron Avenue			San Jose— Jackson Street		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
Annual standard exceeded? ¹									
NAAQS Annual (>0.053 ppm)	No	No	No	No	No	No	No	No	No
CAAQS Annual (>0.030 ppm)	No	No	No	No	No	No	No	No	No
Particulate Matter (PM₁₀)^{1, 2}									
National ³ maximum 24-hour concentration (µg/m ³)	44.7	35.7	75.9	Station does not monitor PM ₁₀			58.8	40.0	69.4
National ³ second-highest 24-hour concentration (µg/m ³)	38.2	27.9	52.7				47.2	35.2	67.3
State ⁴ maximum 24-hour concentration (µg/m ³)	47.0	29.0	77.0				58.0	41.0	69.8
State ⁴ second-highest 24-hour concentration (µg/m ³)	39.0	28.0	53.0				49.3	37.5	67.6
National annual average concentration (µg/m ³)	9.8	8.8	11.0				21.3	17.5	20.7
State annual average concentration (µg/m ³) ⁵	N/A	N/A	22.1				21.9	18.3	21.3
Number of days standard exceeded ¹									
N/AAQS 24-hour (>150 µg/m ³) ⁶	0	0	0	Station does not monitor PM ₁₀			0	0	0
CAAQS 24-hour (>50 µg/m ³) ⁶	N/A	N/A	2				3	0	19
Annual standard exceeded? ¹									
CAAQS Annual (>20 µg/m ³)	N/A	N/A	Yes	Station does not monitor PM ₁₀			Yes	No	Yes
Particulate Matter (PM_{2.5})¹									
National ³ maximum 24-hour concentration (µg/m ³)	35.4	19.6	49.9	34.6	19.5	60.8	49.4	22.6	49.7
National ³ second-highest 24-hour concentration (µg/m ³)	34.3	19.3	49.7	26.0	18.4	57.7	37.0	21.8	46.5
State ⁴ maximum 24-hour concentration (µg/m ³)	35.4	19.6	49.9	34.6	19.5	60.8	49.4	22.7	49.7
State ⁴ second-highest 24-hour concentration (µg/m ³)	34.3	19.3	49.7	26.0	18.4	57.7	37.0	21.8	46.5
National annual average concentration (µg/m ³)	7.9	7.5	9.7	6.0	8.3	9.0	9.9	8.3	9.5
State annual average concentration (µg/m ³) ⁵	7.9	N/A	9.7	6.0	N/A	9.1	10.6	8.4	N/A

Pollutant and Standards	San Francisco— Arkansas Street			Redwood City— Barron Avenue			San Jose— Jackson Street		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
Number of days standard exceeded ¹									
NAAQS 24-hour (>35 µg/m ³)	0	0	7	0	0	6	2	0	6
Annual standard exceeded? ¹									
NAAQS Annual (>12.0 µg/m ³)	No	No	No	No	No	No	No	No	No
CAAQS Annual (>12 µg/m ³)	No	N/A	No	No	N/A	No	No	No	No
Sulfur Dioxide (SO₂)									
National maximum 1-hour concentration (µg/m ³)	Station does not monitor SO ₂			Station does not monitor SO ₂			3.1	1.8	3.6
State maximum 1-hour concentration (µg/m ³)							3.1	1.8	3.6
State maximum 24-hour concentration (µg/m ³)							1.1	0.8	1.1
Number of days standard exceeded									
NAAQS 1-hour (99th percentile>0.75 ppb [196 µg/m ³])	Station does not monitor SO ₂			Station does not monitor SO ₂			0	0	0
CAAQS 1-hour (0.25 ppm [655 µg/m ³])							0	0	0
CAAQS 24-hour (0.04 ppm [105 µg/m ³])							0	0	0

Sources: CARB 2018a; USEPA 2018a

> = greater than

µg/m³ = micrograms of pollutant per cubic meter of air

CAAQS = California ambient air quality standards

N/A = not applicable or there was insufficient or no data available to determine the value

NAAQS = national ambient air quality standards

ppb = parts per billion

ppm = parts per million

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.



Source: Volume 2, Appendix 3.3-A

NOVEMBER 2019

Figure 3.3-3 Monitoring Station Locations

Table 3.3-7 Federal and State Attainment Status 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	Nonattainment
Particulate matter (PM _{2.5})	Nonattainment (moderate)	Nonattainment	Attainment/Unclassified	Attainment	Nonattainment (serious/moderate) ¹	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 2016b; USEPA 2018b

CO = carbon monoxide

NCCAB = North Central Coast Air Basin

NO₂ = nitrogen dioxide

O₃ = ozone

PM₁₀ = 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

SO₂ = sulfur dioxide

¹ The SJVAB is designated serious nonattainment for the 1997 and 2006 PM_{2.5} standards and moderate nonattainment for the 2012 PM_{2.5} standard.

Table 3.3-8 Sensitive Receptor Locations within 1,000 Feet of the 4th and King Street, Millbrae, and San Jose Diridon Stations, and the East and West Brisbane LMF

Receptor	Distance from Facility ^{1,2} (feet)
4th and King Street Station	
Nearest residential receptor	56
San Francisco Tennis Club	234
Mission Creek Park	917
Millbrae Station	
Nearest residential receptor	10
Burlingame Health Care Center	10
Medical offices, 1860 El Camino Real ³	155
Medical and dental offices, 1840 El Camino Real ³	191
Mills-Peninsula Medical Center	448
Magnolia of Millbrae	844
Bayside Manor Park	979
San Jose Diridon Station⁴	
Nearest residential receptor	Alternative A: 36 Alternative B: 33
Arena Green Park	Alternative A: 802 Alternative B: >1,000
Cahill Park	Alternative A: 326 Alternative B: 325
Planned community park	Alternative A: 144 Alternative B: 144
Discovery Dog Park	Alternative A: >1,000 Alternative B: 957
Los Gatos Creek Trail	Alternative A: 527 Alternative B: 527
Sunol Community Day School play area ⁴	Alternative A: 745 Alternative B: 745
Brisbane LMF⁵	
Nearest residential receptor	81
Brisbane Lagoon	0
San Francisco Bay Trail (planned)	0
Brisbane Community Park	22
Korean First Presbyterian Church	Alternative A: 67 Alternative B: 57

Receptor	Distance from Facility ^{1,2} (feet)
Brisbane Skate Park and Basketball Courts	480
Brisbane City Hall Dog Park	484
Old Quarry Road Park and Trail	374
Little Hollywood Park	590
San Bruno Mountain State and County Park	607
Crocker Park Recreational Trail	Alternative A: 685 Alternative B: 481
Visitation Valley Community Center	685
Iglesia El Espiritu Santo	834
Visitation Valley Branch Library	885
Visitation Chinese Baptist Church	980
Enchantment Institute (private school)	986

Sources: Volume 2, Appendix 3.3-A; Authority 2019c, 2019d, 2021b; CPAD 2016

> = greater than

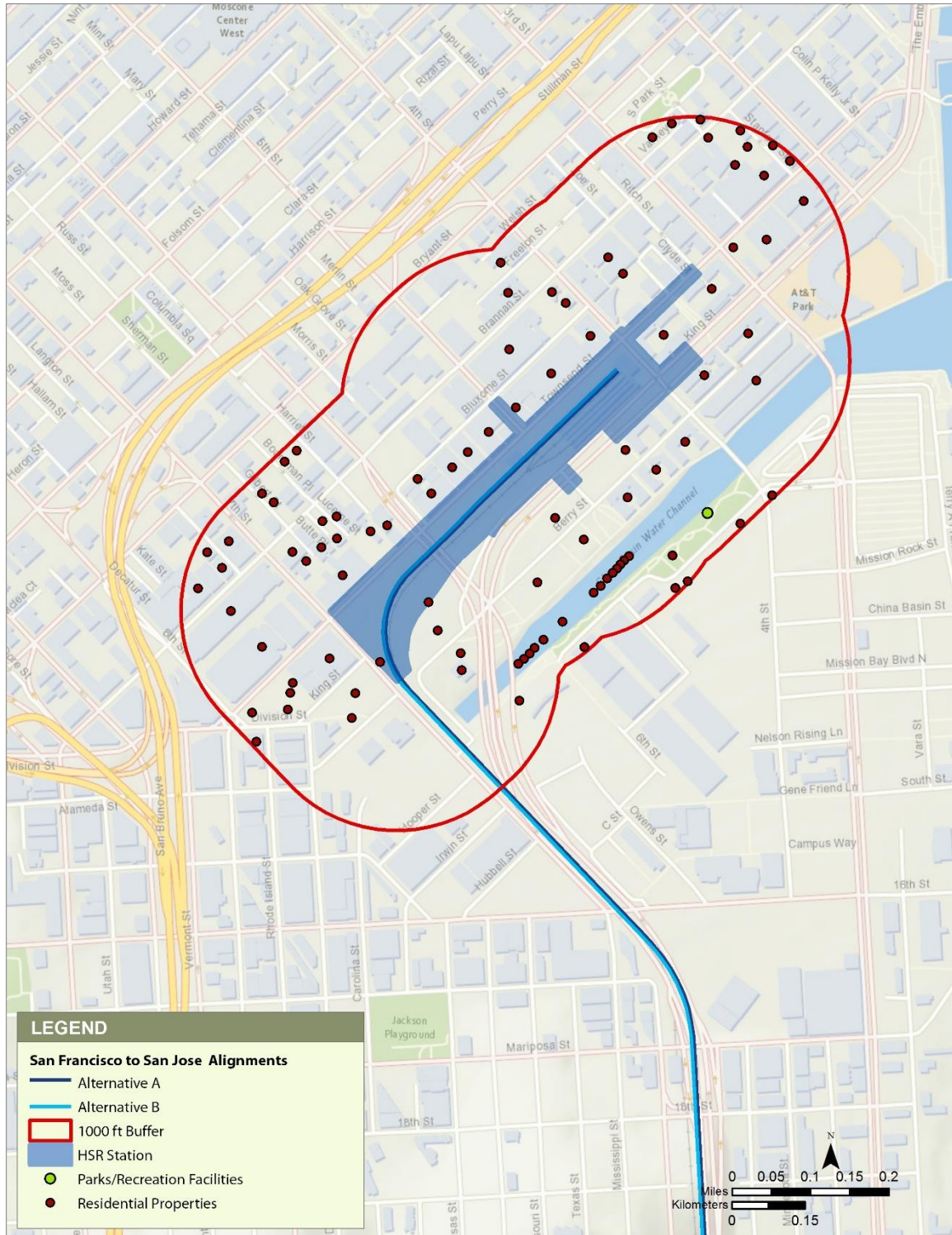
LMF = light maintenance facility

¹ Distances are measured from the facility site perimeter. Distances from facility buildings are greater.

² Distances apply to both alternatives unless noted otherwise.

³ Nearest health care–related offices to Millbrae Station; representative of several health care–related offices along El Camino Real.

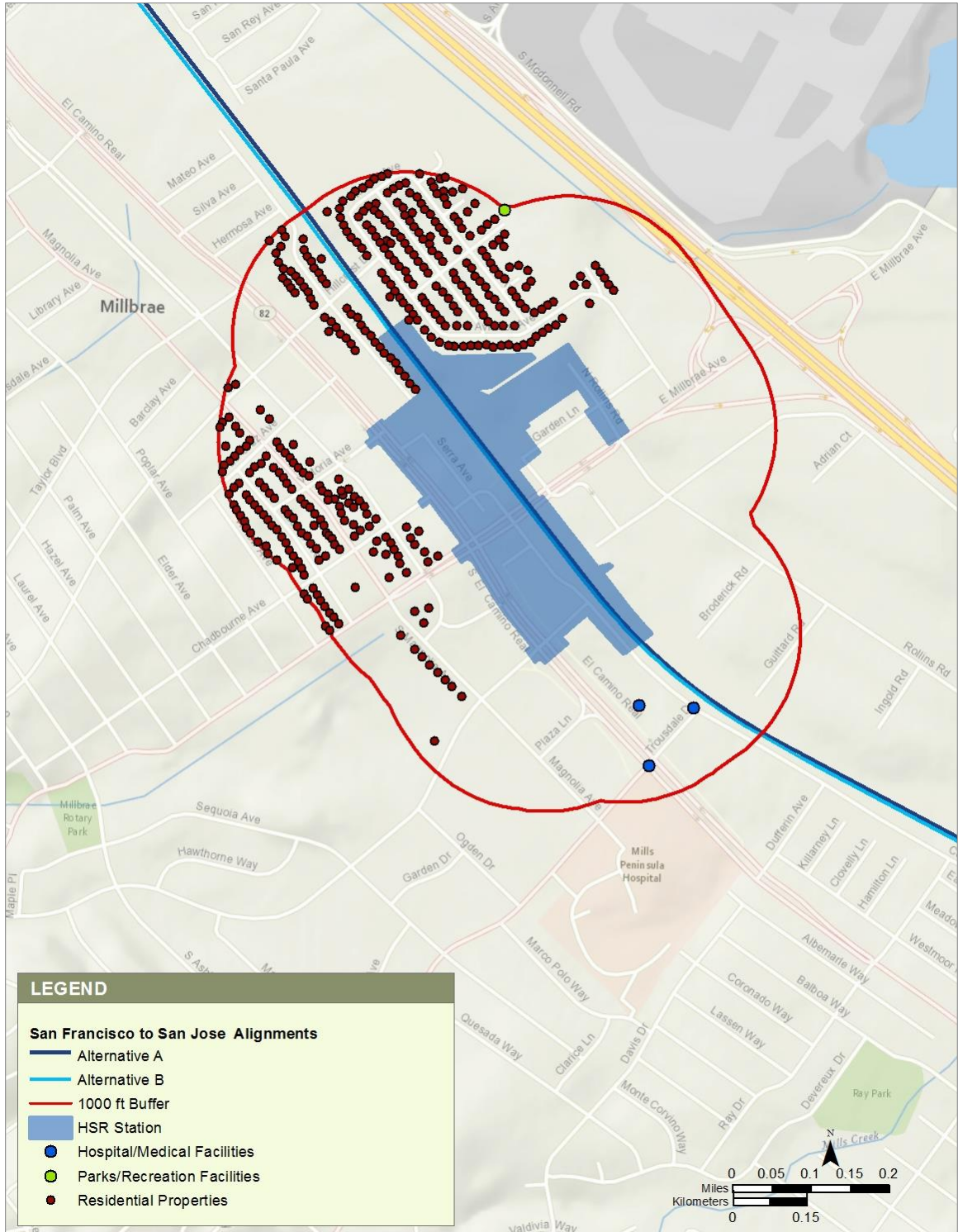
⁴ The Sunol Community Day School is closed but is considered a parks and recreational facility for the purposes of this analysis, as grassy areas and playfields remain accessible.⁵ Zero value indicates that the receptor abuts the LMF site perimeter.



Sources: Authority 2019c; CPAD 2016

NOVEMBER 2019

Figure 3.3-4 Sensitive Receptors within 1,000 Feet of the 4th and King Street Station



Sources: Authority 2019c; CPAD 2016

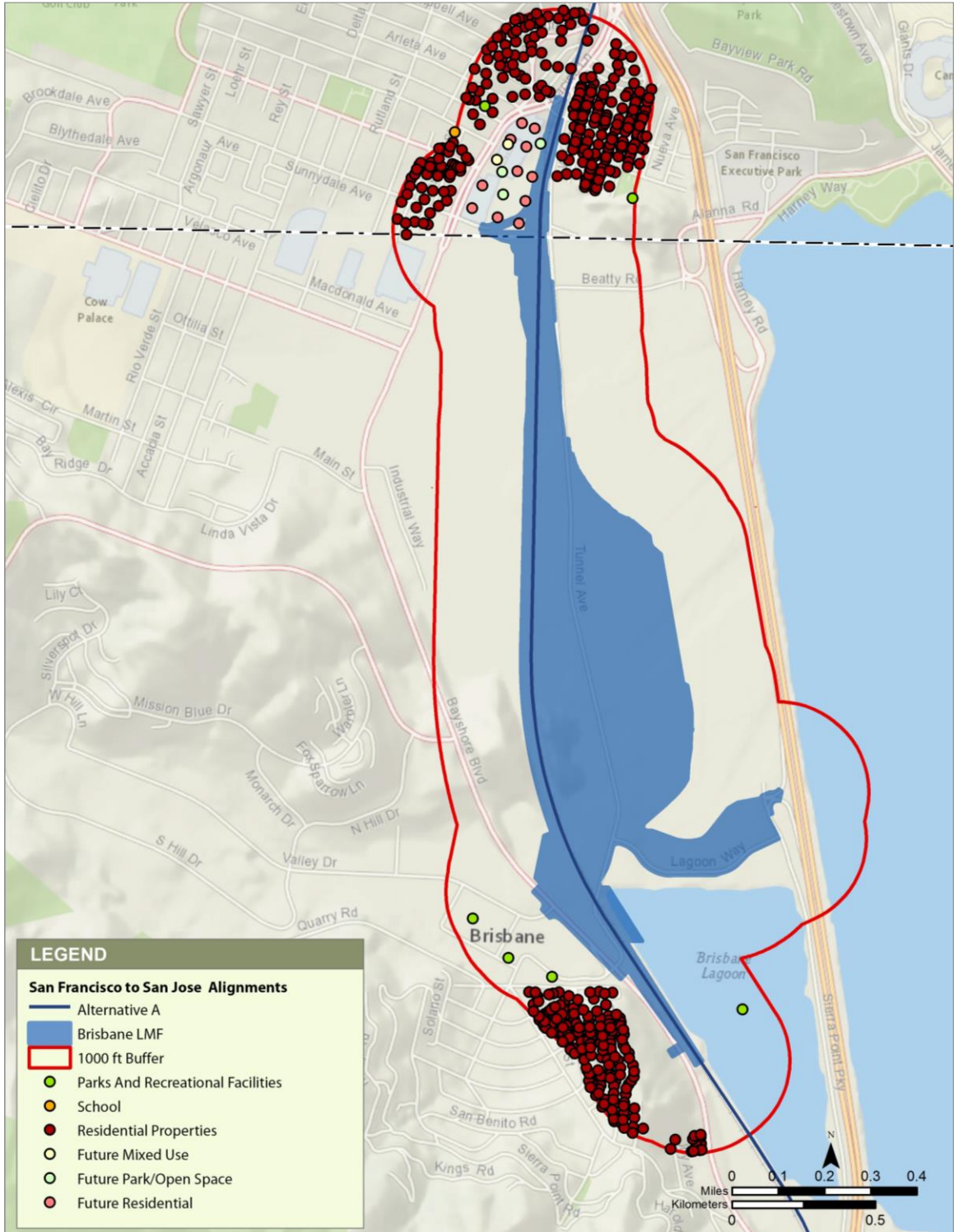
Figure 3.3-5 Sensitive Receptors within 1,000 Feet of the Millbrae Station



Sources: Authority 2019d; CPAD 2016

MARCH 2020

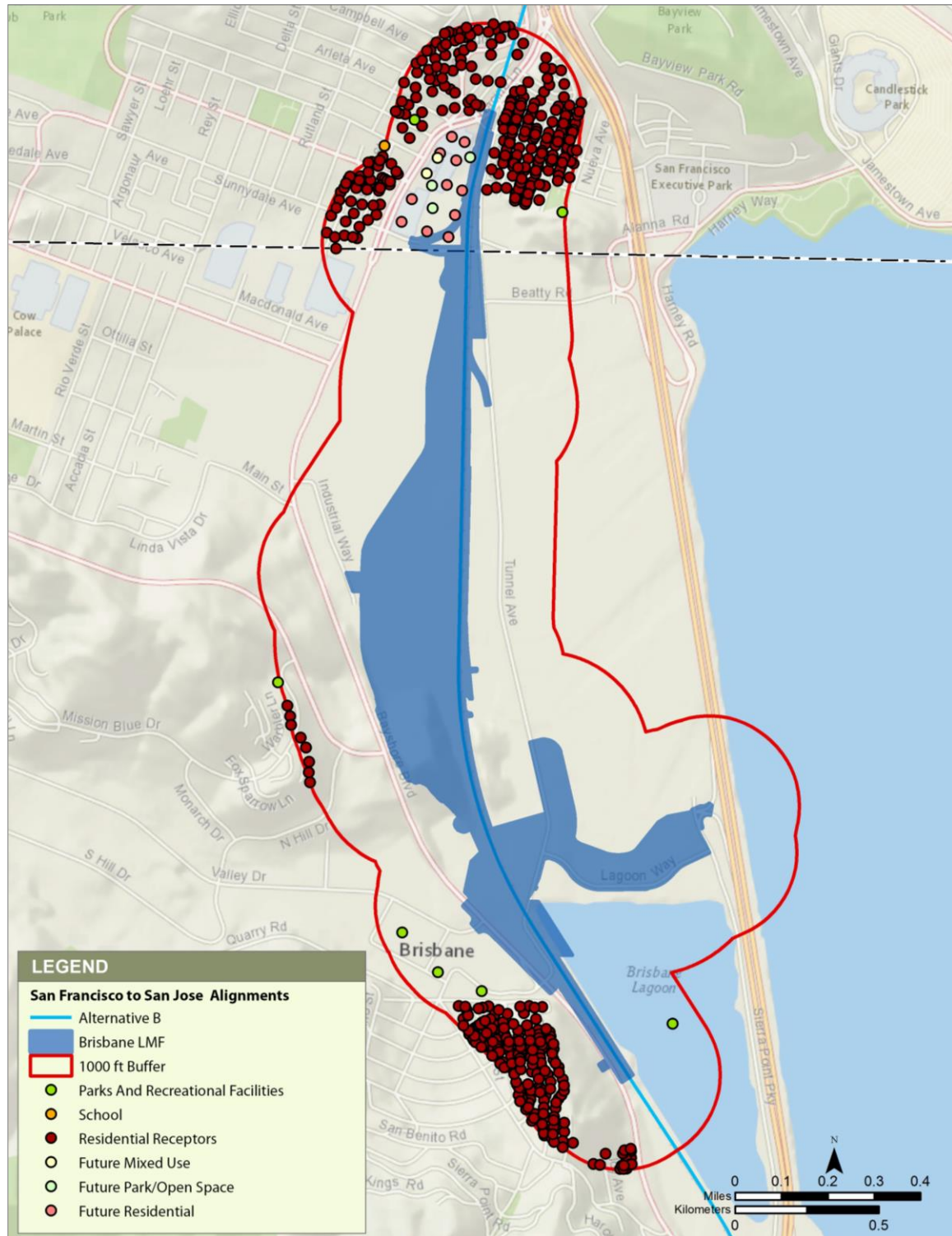
Figure 3.3-6 Sensitive Receptors within 1,000 Feet of the San Jose Diridon Station



Sources: Appendix 3.3-A; CPAD 2016

MARCH 2021

Figure 3.3-7 Sensitive Receptors within 1,000 Feet of the East Brisbane LMF (Alternative A)



Sources: Volume 2, Appendix 3.3-A; CPAD 2016

MARCH 2021

Figure 3.3-8 Sensitive Receptors within 1,000 Feet of the West Brisbane LMF (Alternative B)

Air Quality Plans

As discussed in Section 3.3.2.3, Regional and Local, the CARB and local air districts 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
BAAQMD	
2001 San Francisco Bay Area Ozone Attainment Plan for the 1-Hour National Ozone Standard (BAAQMD 2001)	<p>In a March 30, 2001, <i>Federal Register</i> notice (66 Fed. Reg. 17379), USEPA proposed to make a finding that the Bay Area has not attained the national 1-hour O₃ 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.</p> <p>The revised 2001 Ozone Attainment Plan included the necessary changes to address USEPA's disapproval of the prior plan. In addition, to address the requirements triggered by 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.</p>
2017 Clean Air Plan (BAAQMD 2017b)	<p>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.</p>
MBARD	
2005 Report on Attainment of the California Particulate Matter Standards in the Monterey Bay Region	<p>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.</p>
2007 Federal Maintenance Plan for Maintaining the National Ozone Standard in the Monterey Bay Region	<p>This plan presents the strategy for maintaining the NAAQS for O₃ in the NCCAB. The NCCAB attained the 8-hour NAAQS in 2014.</p>
2012–2015 Air Quality Management Plan	<p>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 O₃ standard.</p>
SJVAPCD	
2007 PM ₁₀ Maintenance Plan and Request for Redesignation	<p>On September 25, 2008, USEPA redesignated the San Joaquin Valley to attainment for the PM₁₀ NAAQS and approved the 2007 PM₁₀ Maintenance Plan.</p>

Plan	Status
2007 8-Hour Ozone Plan	<p>On May 5, 2010, USEPA reclassified the 8-hour O₃ 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.</p> <p>The 2007 8-hour Ozone Plan contained a comprehensive and exhaustive list of regulatory and incentive-based measures to reduce emissions of O₃ 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 O₃ standard of 75 parts per billion.</p>
2013 Plan for the Revoked 1-Hour Ozone Standard	<p>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 O₃ standard for areas including the SJVAB.</p>
2015 Plan for the 1997 PM _{2.5} Standard	<p>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.</p>
2016 Moderate Area Plan for the 2012 PM _{2.5} Standard	<p>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</p>
2016 Plan for the 2008 8-Hour Ozone Standard ¹	<p>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 O₃ standard.</p>
2018 PM _{2.5} Plan	<p>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.</p>

Sources: BAAQMD 2001, 2017b; 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

O₃ = ozone

PM = particulate matter

PM₁₀ = 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 of Criteria Pollutants

An emissions inventory is an accounting of the total emissions from all sources in a particular geographic area over a specified 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 emissions inventory for each county and air basin in the state. The inventory consists 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 2015 air pollutant inventory data, mobile source emissions account for 85 percent and 79 percent of the SFBAAB's CO and NO_x emission inventory, respectively. Area-wide sources account for more than 87 percent and 22 percent of the SFBAAB's PM and total organic gas emissions, respectively. Stationary sources account for 89 percent of the SFBAAB's SO_x emissions. In San Benito County in the NCCAB, area sources represent most VOC emissions and the majority of PM₁₀ and PM_{2.5} emissions, and mobile sources represent the majority of NO_x and CO emissions. In Merced, Fresno, and Kings Counties in the SJVAB, area sources represent most VOC, PM₁₀, and PM_{2.5} emissions, and mobile sources represent most NO_x and CO emissions (CARB 2020c).

3.3.5.2 Greenhouse Gases

The CARB 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, interstate aviation, waterborne vessels, and rail operations. The next-largest contributor to emissions was the industrial sector (23 percent), followed by electricity generation (16 percent, including in-state and imports) (CARB 2020a).

3.3.6 Environmental Consequences

3.3.6.1 Overview

This section discusses the potential impacts on air quality and climate change (as GHG emissions) that could result from the No Project Alternative and 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 operations. For this resource topic, the DDV would result in different levels of impacts for Alternative A (with and without the DDV) for certain subtopics. Where different levels of impacts would occur, Alternative A's impacts with and without the DDV are noted. Unless so noted, Alternative A with and without the DDV would result in the same level of impact.

3.3.6.2 Air Quality

Construction and operations of the project alternatives 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, exposure of sensitive receptors to pollutant concentrations, and elevated health risks. Impacts of emissions from construction truck trips in the NCCAB and SJVAB also are assessed.

No Project Impacts

The population of the Bay Area and the 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 the San Joaquin Valley to accommodate the population increase would continue under the No Project conditions and result in associated direct and indirect impacts on air quality and GHGs. The No Project conditions consider the effects 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 HSR system is not built. Under the No Project conditions, 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 built to achieve equivalent capacity and relieve this increased pressure (Authority 2012). Planned and other reasonably foreseeable projects anticipated to be built by 2040, including residential, commercial, industrial, recreational, and transportation projects, could contribute to regional air quality conditions. A full list of anticipated future development projects is provided in Volume 2 in Appendix 3.18-A, Cumulative Nontransportation Plans and Projects, and Appendix 3.18-B, Cumulative 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 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 conditions 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 (SO₂, PM₁₀, 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 SO₂ 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 Condition—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

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)
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 2019g
 CO = carbon monoxide
 NO_x = nitrogen oxides
 PM_{2.5} = particulate matter 2.5 microns or less in diameter
 PM₁₀ = particulate matter 10 microns or less in diameter
 SO₂ = sulfur dioxide
 VOC = volatile organic compound
 yr = year
 Sum of individual values may not equal total due to rounding.

Table 3.3-11 Estimated Statewide Emissions, No Project Condition—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 2019g
 CO = carbon monoxide
 NO_x = nitrogen oxides
 PM_{2.5} = particulate matter 2.5 microns or less in diameter
 PM₁₀ = particulate matter 10 microns or less in diameter
 SO₂ = sulfur dioxide
 VOC = volatile organic compound
 yr = year
 Sum of individual values may not equal total due to rounding.

Project Impacts

Construction Impacts

Construction of either project alternative would include earthwork and excavation, station construction, track work, and railway systems construction. Chapter 2 provides descriptions of construction activities.

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

The predominant pollutants associated with construction of either project alternative are fugitive dust (PM₁₀ and PM_{2.5}) from earthmoving activities and combustion pollutants, particularly O₃ 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 and Table 3.3-13 present construction emissions from Alternatives A and B, respectively, in the SFBAAB in tons per year and pounds per day. The tables reflect the impact of the SAFE Vehicles Rule (CARB 2020d). 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 will minimize fugitive dust emissions through a dust control plan. The fugitive dust control plan will outline measures such as washing vehicles before exiting the construction site, watering unpaved surfaces, limiting vehicle travel speed, installing wind breaks, suspending dust-generating activities during high wind events, and posting a publicly visible sign with the telephone number and person to contact at the Authority regarding dust complaints.
- AQ-IAMF#2 will 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, which has a lower VOC content than that required by BAAQMD rules.
- AQ-IAMF#3 will minimize exhaust emissions from off-road equipment with renewable diesel fuel. Renewable diesel is produced from nonpetroleum renewable resources and waste products and generates substantially fewer emissions than traditional diesel per gallon combusted.
- AQ-IAMF#4 will 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 will minimize exhaust emissions from on-road trucks by requiring the average fleet mix of trucks used to haul construction materials to operate a model year 2010 engine or newer.
- AQ-IAMF#6 will minimize fugitive dust emissions from concrete batching through typical control measures, such as water sprays, enclosures, hoods, and other suitable technology.

Table 3.3-12 Construction-Related Criteria Pollutant Emissions in the SFBAAB under Alternative A¹

Activities	Tons per year										Maximum Pounds per day ²									
	VOC	NO _x	CO	SO ₂	PM ₁₀			PM _{2.5}			VOC	NO _x	CO	SO ₂	PM ₁₀			PM _{2.5}		
					Exhaust	Dust	Total	Exhaust	Dust	Total ³					Exhaust	Dust	Total	Exhaust	Dust	Total ³
General conformity threshold ⁴	100	100	-	100	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-
BAAQMD CEQA threshold	-	-	-	-	-	-	-	-	-	-	54	54	-	-	82	-	-	54	-	-
2021																				
Emissions	2	35	51	0	0	24	24	0	6	6	40	699*	1,237	5	4	464	468	4	108	112
Exceeds general conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2022																				
Emissions	4	97	121	1	0	58	59	1	14	15	40	912*	1,201	5	5	487	491	5	115	119
Exceeds general conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2023																				
Emissions	4	94	114	1	0	59	60	1	14	15	32	854*	899	5	4	473	477	4	111	115
Exceeds general conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2024																				
Emissions	4	91	120	0	0	62	63	0	14	15	43	981*	1,401	5	4	610	614	4	121	125
Exceeds general conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2025																				
Emissions	5	104*	145	0	1	56	57	4	12	16	53	1,592*	1,377	7	18	610	614	18	134	140
Exceeds general conformity threshold?	No	Yes*	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2026																				
Emissions	0	0	0	0	0	0	0	0	0	0	2	61	72	0	0	48	48	0	14	14
Exceeds general conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	No	-	-	No	-	-	No	-	-

Sources: CAPCOA 2017; CARB 2018b; USEPA 1998, 2006b, 2011; Scholz 2018, 2020, 2021

- = no threshold
 BAAQMD = Bay Area Air Quality Management District
 CEQA = California Environmental Quality Act
 CO = carbon monoxide
 IAMF = impact avoidance and minimization feature
 Values less than 0.5 are rounded to zero.

NAAQS = national ambient air quality standards
 NO_x = nitrogen oxides
 O₃ = ozone
 PM = particulate matter
 PM_{2.5} = particulate matter 2.5 microns or less in diameter

PM₁₀ = particulate matter 10 microns or less in diameter
 SFBAAB = San Francisco Bay Area Air Basin
 SO₂ = sulfur dioxide
 VOC = volatile organic compound

Exceedances of thresholds are shown in **bolded underline with an asterisk (*)**.

¹ Emissions results include air quality IAMFs.

² Presents the highest emissions estimate during a single day of construction in each year, based on concurrent construction activities.

³ Total PM₁₀ and PM_{2.5} emissions consist of the exhaust and fugitive dust emissions. Sum of annual values may not equal total due to rounding. Sum of daily values may not equal total 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 O₃ NAAQS and a moderate nonattainment area for the PM_{2.5} NAAQS. Although the project vicinity is in attainment for SO₂, because SO₂ is a precursor for PM_{2.5}, the PM_{2.5} general conformity *de minimis* thresholds are used.

Table 3.3-13 Construction-Related Criteria Pollutant Emissions in the SFBAAB under Alternative B^{1,2}

Activities	Tons per year										Maximum Pounds per day ³									
	VOC	NO _x	CO	SO ₂	PM ₁₀			PM _{2.5}			VOC	NO _x	CO	SO ₂	PM ₁₀			PM _{2.5}		
					Exhaust	Dust	Total	Exhaust	Dust	Total ⁴					Exhaust	Dust	Total	Exhaust	Dust	Total ⁴
General conformity threshold ⁵	100	100	-	100	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-
BAAQMD CEQA threshold	-	-	-	-	-	-	-	-	-	-	54	54	-	-	82	-	-	54	-	-
2021																				
Emissions	2/2	39/39	57/57	0/0	0/0	27/27	27/27	0/0	6/6	7/7	47/47	835*/835*	1454/1454	5/5	5/5	596/596	601/601	4/4	135/135	140/140
Exceeds general conformity threshold?	No/No	No/No	-/-	No/No	-/-	-/-	-/-	-/-	-/-	No/No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2022																				
Emissions	5/5	115*/115*	156/156	1/1	1/1	74/74	75/75	1/1	17/17	18/18	53/53	1,111*/1,111*	1458/1458	7/7	6/6	637/637	643/643	5/5	145/145	150/150
Exceeds general conformity threshold?	No/No	Yes/Yes	-/-	No/No	-/-	-/-	-/-	-/-	-/-	No/No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2023																				
Emissions	5/5	119*/121*	143/149	1/1	1/1	73/74	73/74	1/1	17/17	18/18	36/36	947*/947*	1,033/1,033	5/5	4/4	549/549	553/553	4/4	128/128	132/132
Exceeds general conformity threshold?	No/No	Yes/Yes	-/-	No/No	-/-	-/-	-/-	-/-	-/-	No/No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2024																				
Emissions	5/5	122*/121*	149/160	1/1	0/0	76/77	76/77	0/0	17/17	17/18	46/46	1,070*/1,070*	1,468/1,468	5/5	5/5	647/647	651/651	5/5	129/129	134/134
Exceeds general conformity threshold?	No/No	Yes/Yes	-/-	No/No	-/-	-/-	-/-	-/-	-/-	No/No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2025																				
Emissions	5/5	113*/106*	163/154	1/1	1/1	65/61	65/62	4/4	13/13	17/16	55*/55*	1,645*/1,645*	1,384/1,384	8/8	18/18	643/643	650/650	18/18	142/142	148/148
Exceeds general conformity threshold?	No/No	Yes/Yes	-/-	No/No	-/-	-/-	-/-	-/-	-/-	No/No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	Yes	Yes	-	-	No	-	-	No	-	-
2026																				
Emissions	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	2/2	14/12	82/68	0/0	0/0	6/6	7/6	0/0	2/1	2/2
Exceeds general conformity threshold?	No/No	No/No	-/-	No/No	-/-	-/-	-/-	-/-	-/-	No/No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	No	-	-	No	-	-	No	-	-

Sources: CAPCOA 2017; CARB 2018b; USEPA 1998, 2006b, 2011; Scholz 2018, 2020,2021

- = no threshold
 BAAQMD = Bay Area Air Quality Management District
 CEQA = California Environmental Quality Act
 CO = carbon monoxide
 I = Interstate

IAMF = impact avoidance and minimization feature
 NAAQS = national ambient air quality standards
 NO_x = nitrogen oxides
 O₃ = ozone
 PM = particulate matter

PM_{2.5} = particulate matter 2.5 microns or less in diameter
 PM₁₀ = particulate matter 10 microns or less in diameter
 SFBAAB = San Francisco Bay Area Air Basin
 SO₂ = sulfur dioxide
 VOC = volatile organic compound

Values less than 0.5 are rounded to zero.

Exceedances of thresholds are shown in **bolded underline with an asterisk (*)**.

¹ Emissions are presented for Alternative B (Viaduct to I-880) first, followed by Alternative B (Viaduct to Scott Boulevard).

² Emissions results include air quality IAMFs.

³ Presents the highest emissions estimate during a single day of construction in each year, based on concurrent construction activities.

⁴ Total PM₁₀ and PM_{2.5} emissions consist of the exhaust and fugitive dust emissions. Sum of annual values may not equal total due to rounding. Sum of daily values may not equal total 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.

⁵ 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 O₃ NAAQS and a moderate nonattainment area for the PM_{2.5} NAAQS. Although the project vicinity is in attainment for SO₂, because SO₂ is a precursor for PM_{2.5}, the PM_{2.5} general conformity *de minimis* thresholds are used.

Even with incorporation of project features (IAMFs), both project alternatives would result in a temporary impact on regional air quality during construction because increased VOC (under Alternative B only) and NO_x emissions (under both alternatives) would exceed the BAAQMD's CEQA thresholds. Construction emissions of NO_x also would exceed the General Conformity *de minimis* threshold under Alternative B.²⁵ Construction emissions of exhaust PM would not exceed the BAAQMD's CEQA thresholds for either alternative. Construction emissions of CO, PM, SO₂, and VOC would not exceed the General Conformity thresholds for either alternative.

The BAAQMD's thresholds were established to prevent emissions from new projects in the SFBAAB from contributing to CAAQS or NAAQS violations. Because construction emissions of VOC (under Alternative B only) and NO_x would exceed these thresholds, the project would contribute a significant level of regional air pollution within the SFBAAB. Construction of the project 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 would cause or aggravate acute or chronic health outcomes (e.g., asthma, lost work days, premature mortality). 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 O₃ 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.

Alternatives A and B would result in comparable levels of total emissions, with somewhat greater emissions under Alternative B. Construction emissions would be similar for both alternatives for the San Francisco to South San Francisco, San Bruno to San Mateo, and Mountain View to Santa Clara Subsections; the LMF; and the HSR stations. Construction emissions for the northern portion of the San Mateo to Palo Alto Subsection under Alternative B would be somewhat higher than under Alternative A because Alternative B includes construction of the passing tracks and associated modifications to the existing Hayward Park, Hillsdale, Belmont, and San Carlos Stations. Construction emissions for the southern portion of the San Mateo to Palo Alto Subsection would be similar for both alternatives. For the San Jose Diridon Station Approach Subsection, construction emissions would be somewhat higher for Alternative B than for Alternative A because Alternative B includes construction of the viaduct. The amount of construction effort for the DDV would be approximately the same as Alternative A without the DDV and thus the amount of construction-period criteria pollutant and TAC emissions would be approximately the same for Alternative A with the DDV and without the DDV. Emissions would be slightly higher for Alternative B (Viaduct to Scott Boulevard) than for Alternative B (Viaduct to I-880) because of the greater length of viaduct construction.

The BAAQMD does not have CEQA thresholds for mass emissions of fugitive PM or total (exhaust plus fugitive) PM, CO, or SO₂; 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: Temporary Direct Impacts on Localized Air Quality—Exposure to Asbestos and Lead-Based Paint discusses the conclusions of the modeled ambient air concentrations.

²⁵ Although Table 3.3-12 shows that Alternative A in 2025 would have NO_x emissions of 104 tons, which is greater than the General Conformity threshold of 100 tons, Table 3.3-12 includes emissions associated with construction of the San Jose Diridon Station Approach Subsection. The General Conformity Determination presented in Appendix 3.3-B does not include the San Jose Diridon Station Approach Subsection, which is analyzed as part of the general conformity determination for the San Jose to Merced Project Section. When the San Jose Diridon Station Approach Subsection is excluded from Table 3.3-12 for purposes of conformity evaluation (see Table 6 of Appendix 3.3-B), all emissions under Alternative A are less than the applicable General Conformity thresholds. Under Alternative B, NO_x emissions exceed the General Conformity threshold both with and without the San Jose Diridon Station Approach Subsection.

CEQA Conclusion

The impact would be significant under CEQA for both project alternatives because construction could result in temporary exceedance of BAAQMD's ROG (under Alternative B only) and NO_x (under either alternative) thresholds. Project features (AQ-IAMF#1 through AQ-IAMF#6) will minimize air quality impacts through the best available on-site controls to reduce construction emissions. However, even with these features, exceedances of BAAQMD's VOC (under Alternative B only) and NO_x thresholds would still occur and the project would contribute a significant level of regional VOC (under Alternative B only) and NO_x pollution within the SFBAAB. Mitigation measures (AQ-MM#1 and AQ-MM#2) to address this impact are identified in Section 3.3.9. Section 3.3.7 describes the measure in detail.

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

Construction-related activities within the NCCAB would consist only of trucks traveling the portion of SR 152 that lies within the NCCAB. As described under Impact AQ#1, exhaust-related emissions in the NCCAB will be minimized through use of renewable diesel fuel and model year 2010 or newer on-road engines, as required by AQ-IAMF#3 and AQ-IAMF#5.

Table 3.3-14 and Table 3.3-15 present construction emissions from Alternatives A and B, respectively, in the NCCAB. Emissions are in tons per year and pounds per day and include AQ-IAMF#3 and AQ-IAMF#5. The table does not reflect the impact of the SAFE Vehicles Rule (CARB 2019c) because the rule applies only to light-duty vehicles. There are no applicable General Conformity *de minimis* thresholds because the NCCAB is designated as attainment of the federal standards for all criteria pollutants; therefore, a general conformity analysis is not required. Neither project alternative would result in construction emissions above MBARD's PM₁₀ threshold.

The MBARD's PM₁₀ threshold was established to prevent emissions from new projects in the NCCAB from contributing to CAAQS or NAAQS violations. Because construction-related PM₁₀ emissions would not exceed this threshold, the project alternatives would not contribute a significant level of regional PM pollution within the NCCAB. Moreover, neither project alternative would 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 PM₁₀ 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). Although project construction would contribute to existing and future air pollution, average daily project-generated emissions represent less than one ten-thousandth of one percent of NCCAB PM₁₀ emissions (CARB 2020c). 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 PM₁₀ CAAQS.

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 MBUAPCD (2008) guidance.

CEQA Conclusion

The impact would be less than significant for both project alternatives because emissions would not exceed MBARD's PM₁₀ threshold. As such, the project alternatives would not contribute a significant level of PM₁₀ pollution such that regional air quality within the NCCAB would be degraded. Therefore, CEQA does not require mitigation.

Table 3.3-14 Construction-Related Criteria Pollutant Emissions in the NCCAB under Alternative A¹

Activities	Tons per year										Maximum Pounds per day ²									
	VOC	NO _x	CO	SO ₂	PM ₁₀			PM _{2.5}			VOC	NO _x	CO	SO ₂	PM ₁₀			PM _{2.5}		
					Exhaust	Dust	Total	Exhaust	Dust	Total ³					Exhaust	Dust	Total	Exhaust	Dust	Total ³
General conformity threshold ⁴	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBARD CEQA threshold	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	82	-	-	-
2021																				
Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exceeds general conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2022																				
Emissions	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0
Exceeds general conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2023																				
Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0
Exceeds general conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2024																				
Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exceeds general conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2025																				
Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exceeds general conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2026																				
Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exceeds general conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-

Sources: CAPCOA 2017; CARB 2018b; USEPA 1998, 2006b, 2011; Scholz 2018, 2020, 2021

- = no threshold

CEQA = California Environmental Quality Act

CO = carbon monoxide

IAMF = impact avoidance and minimization feature

MBARD = Monterey Bay Air Resources District

Values less than 0.005 ton per year or 0.05 pound per day are rounded to zero.

¹ Emissions results include air quality IAMFs.

² Presents the highest emissions estimate during a single day of construction in each year, based on concurrent construction activities.

³ Total PM₁₀ and PM_{2.5} emissions consist of the exhaust and fugitive dust emissions. Sum of annual values may not equal total due to rounding. Sum of daily values may not equal total 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 NCCAB. The NCCAB is designated an attainment area for all NAAQS.

NAAQS = national ambient air quality standards

NCCAB = North Central Coast Air Basin

NO_x = nitrogen oxides

O₃ = ozone

PM = particulate matter

PM_{2.5} = particulate matter 2.5 microns or less in diameter

PM₁₀ = particulate matter 10 microns or less in diameter

SO₂ = sulfur dioxide

VOC = volatile organic compound

Table 3.3-15 Construction-Related Criteria Pollutant Emissions in the NCCAB under Alternative B^{1,2}

Activities	Tons per year										Maximum Pounds per day ²									
	VOC	NO _x	CO	SO ₂	PM ₁₀			PM _{2.5}			VOC	NO _x	CO	SO ₂	PM ₁₀			PM _{2.5}		
					Exhaust	Dust	Total	Exhaust	Dust	Total ³					Exhaust	Dust	Total	Exhaust	Dust	Total ³
General conformity threshold ⁴	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBARD CEQA threshold	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	82	-	-	-
2021																				
Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exceeds general conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2022																				
Emissions	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0
Exceeds general conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2023																				
Emissions	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0
Exceeds general conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2024																				
Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exceeds general conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2025																				
Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exceeds general conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2026																				
Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exceeds general conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-

Sources: CAPCOA 2017; CARB 2018b; USEPA 1998, 2006b, 2011; Scholz 2018, 2020, 2021

- = no threshold
 CEQA = California Environmental Quality Act
 CO = carbon monoxide
 IAMF = impact avoidance and minimization feature
 MBARD = Monterey Bay Air Resources District

NAAQS = national ambient air quality standards
 NCCAB = North Central Coast Air Basin
 NO_x = nitrogen oxides
 O₃ = ozone
 PM = particulate matter

PM_{2.5} = particulate matter 2.5 microns or less in diameter
 PM₁₀ = particulate matter 10 microns or less in diameter
 SO₂ = sulfur dioxide
 VOC = volatile organic compound

Values less than 0.005 ton per year or 0.05 pound per day are rounded to zero.

¹ Emissions results include air quality IAMFs.

² Presents the highest emissions estimate during a single day of construction in each year, based on concurrent construction activities.

³ Total PM₁₀ and PM_{2.5} emissions consist of the exhaust and fugitive dust emissions. Sum of annual values may not equal total due to rounding. Sum of daily values may not equal total 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 NCCAB. The NCCAB is designated an attainment area for all NAAQS.

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

Construction-related activities within the SJVAB would consist only of trucks traveling the portion of SR 152 that lies within the SJVAB and I-5. As described under Impact AQ#1, exhaust-related pollutants will be minimized through use of renewable diesel fuel, and model year 2010 or newer on-road engines, as required by AQ-IAMF#3 and AQ-IAMF#5. Table 3.3-16 and Table 3.3-17 present construction emissions from Alternatives A and B, respectively, in the SJVAB in tons per year and pounds per day. The emissions presented reflect inclusions of AQ-IAMF#3 and AQ-IAMF#5. The tables do not reflect the impact of the SAFE Vehicles Rule (CARB 2019c) because the rule applies only to light-duty vehicles.

SJVAPCD's thresholds were established to prevent emissions from new projects in the SJVAB from contributing to CAAQS or NAAQS violations. Because construction emissions would not exceed these thresholds, the project would not contribute a significant level of regional air pollution within the SJVAB. Moreover, project construction would not conflict with the *2016 Plan for the 2008 8-Hour Ozone Standard*, *2013 Plan for the Revoked 1-Hour Ozone Standard*, and the *2007 Ozone Plan* (SJVAPCD 2007b, 2013, 2016a). Similarly, because construction emissions would not exceed the General Conformity thresholds, a conformity analysis is not required.

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., asthma, cardiopulmonary effects, premature mortality). Although construction of the project would contribute to existing and future air pollution, project-generated construction emissions would represent approximately 0.009 percent of SJVAB NO_x emissions (CARB 2020c). (Of the criteria pollutants, project NO_x emissions would represent the highest proportion of its respective SJVAPCD threshold.) 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). However, it is known that public health would continue to be affected in the SJVAB as long as the region does not attain the CAAQS or NAAQS.

CEQA Conclusion

The impact would be less than significant for both project alternatives because emissions would not exceed SJVAPCD's thresholds. As such, the project alternatives would not contribute a significant level of pollution such that regional air quality within the SJVAPCD would be degraded. Therefore, CEQA does not require mitigation.

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Table 3.3-16 Construction-Related Criteria Pollutant Emissions in the SJVAB¹ for Alternative A

Activities	Tons per year										Maximum Pounds per day ²									
	VOC	NO _x	CO	SO ₂	PM ₁₀			PM _{2.5}			VOC	NO _x	CO	SO ₂	PM ₁₀			PM _{2.5}		
					Exhaust	Dust	Total	Exhaust	Dust	Total ³					Exhaust	Dust	Total	Exhaust	Dust	Total ³
General conformity threshold ⁴	10	10	-	70	-	-	100	-	-	70	-	-	-	-	-	-	-	-	-	-
SJVAPCD CEQA threshold	10	10	100	27	-	-	15	-	-	15	100 ⁵	100 ⁵	100 ⁵	100 ⁵	-	-	100 ⁵	-	-	100 ⁵
2021																				
Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exceeds general conformity threshold?	No	No	No	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	No	No	No	-	-	No	-	-	No	No	No	No	No	-	-	No	-	-	No
2022																				
Emissions	0.07	5.60	0.79	0.03	0.03	0.70	0.72	0.02	0.19	0.22	0.62	46.64	6.56	0.25	0.22	5.80	6.02	0.21	1.60	1.80
Exceeds general conformity threshold?	No	No	No	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	No	No	No	-	-	No	-	-	No	No	No	No	No	-	-	No	-	-	No
2023																				
Emissions	0.03	2.51	0.35	0.01	0.01	0.32	0.33	0.01	0.09	0.10	0.45	45.19	6.28	0.24	0.20	5.80	6.00	0.19	1.60	1.79
Exceeds general conformity threshold?	No	No	No	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	No	No	No	-	-	No	-	-	No	No	No	No	No	-	-	No	-	-	No
2024																				
Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exceeds general conformity threshold?	No	No	No	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	No	No	No	-	-	No	-	-	No	No	No	No	No	-	-	No	-	-	No
2025																				
Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exceeds general conformity threshold?	No	No	No	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	No	No	No	-	-	No	-	-	No	No	No	No	No	-	-	No	-	-	No
2026																				
Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exceeds general conformity threshold?	No	No	No	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	No	No	No	-	-	No	-	-	No	No	No	No	No	-	-	No	-	-	No

Sources: CAPCOA 2017; CARB 2018b; USEPA 1998, 2006b, 2011; Scholz 2018, 2020, 2021

- = no threshold

CEQA = California Environmental Quality Act

CO = carbon monoxide

IAMF = impact avoidance and minimization feature

NAAQS = national ambient air quality standards

Values less than 0.005 ton per year or 0.05 pound per day are rounded to zero.

¹ Emissions results include air quality IAMFs.

² Presents the highest emissions estimate during a single day of construction in each year, based on concurrent construction activities.

³ Total PM₁₀ and PM_{2.5} emissions consist of the exhaust and fugitive dust emissions. Sum of annual values may not equal total due to rounding. Sum of daily values may not equal total 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 designated an extreme nonattainment area for the O₃ NAAQS, a serious/moderate nonattainment area for the PM_{2.5} NAAQS, and a serious maintenance area for the PM₁₀ NAAQS. Although the project vicinity is in attainment for SO₂, because SO₂ 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 Ambient Air Quality Analysis (dispersion modeling) to confirm this conclusion (SJVAPCD 2015a).

NO_x = nitrogen oxides

O₃ = ozone

PM = particulate matter

PM_{2.5} = particulate matter 2.5 microns or less in diameter

PM₁₀ = particulate matter 10 microns or less in diameter

SJVAB = San Joaquin Valley Air Basin

SJVAPCD = San Joaquin Valley Air Pollution Control District

SO₂ = sulfur dioxide

VOC = volatile organic compound

Table 3.3-17 Construction-Related Criteria Pollutant Emissions in the SJVAB¹ for Alternative B

Activities	Tons per year										Maximum Pounds per day ²									
	VOC	NO _x	CO	SO ₂	PM ₁₀			PM _{2.5}			VOC	NO _x	CO	SO ₂	PM ₁₀			PM _{2.5}		
					Exhaust	Dust	Total	Exhaust	Dust	Total ³					Exhaust	Dust	Total	Exhaust	Dust	Total ³
General conformity threshold ⁴	10	10	-	70	-	-	100	-	-	70	-	-	-	-	-	-	-	-	-	-
SJVAPCD CEQA threshold	10	10	100	27	-	-	15	-	-	15	100 ⁵	100 ⁵	100 ⁵	100 ⁵	-	-	100 ⁵	-	-	100 ⁵
2021																				
Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exceeds general conformity threshold?	No	No	No	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	No	No	No	-	-	No	-	-	No	No	No	No	No	-	-	No	-	-	No
2022																				
Emissions	0.08	6.06	0.85	0.03	0.03	0.75	0.78	0.03	0.21	0.23	0.62	46.64	6.56	0.25	0.22	5.80	6.02	0.21	1.60	1.80
Exceeds general conformity threshold?	No	No	No	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	No	No	No	-	-	No	-	-	No	No	No	No	No	-	-	No	-	-	No
2023																				
Emissions	0.06	5.87	0.82	0.03	0.03	0.75	0.78	0.03	0.21	0.23	0.45	45.19	6.28	0.24	0.20	5.80	6.00	0.19	1.60	1.79
Exceeds general conformity threshold?	No	No	No	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	No	No	No	-	-	No	-	-	No	No	No	No	No	-	-	No	-	-	No
2024																				
Emissions	0.05	4.95	0.68	0.03	0.02	0.63	0.65	0.02	0.17	0.19	0.45	45.79	6.33	0.24	0.21	5.80	6.01	0.20	1.60	1.79
Exceeds general conformity threshold?	No	No	No	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	No	No	No	-	-	No	-	-	No	No	No	No	No	-	-	No	-	-	No
2025																				
Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exceeds general conformity threshold?	No	No	No	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	No	No	No	-	-	No	-	-	No	No	No	No	No	-	-	No	-	-	No
2026																				
Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exceeds general conformity threshold?	No	No	No	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	No	No	No	-	-	No	-	-	No	No	No	No	No	-	-	No	-	-	No

Sources: CAPCOA 2017; CARB 2018b; USEPA 1998, 2006b, 2011; Scholz 2018, 2020, 2021

- = no threshold
 CEQA = California Environmental Quality Act
 CO = carbon monoxide
 IAMF = impact avoidance and minimization feature
 NAAQS = national ambient air quality standards
 Values less than 0.005 ton per year or 0.05 pound per day are rounded to zero.

NO_x = nitrogen oxides
 O₃ = ozone
 PM = particulate matter
 PM_{2.5} = particulate matter 2.5 microns or less in diameter

PM₁₀ = particulate matter 10 microns or less in diameter
 SJVAB = San Joaquin Valley Air Basin
 SJVAPCD = San Joaquin Valley Air Pollution Control District
 SO₂ = sulfur dioxide
 VOC = volatile organic compound

¹ Emissions results include air quality IAMFs.

² Presents the highest emissions estimate during a single day of construction in each year, based on concurrent construction activities.

³ Total PM₁₀ and PM_{2.5} emissions consist of the exhaust and fugitive dust emissions. Sum of annual values may not equal total due to rounding. Sum of daily values may not equal total 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 designated an extreme nonattainment area for the O₃ NAAQS, a serious/moderate nonattainment area for the PM_{2.5} NAAQS, and a serious maintenance area for the PM₁₀ NAAQS. Although the project vicinity is in attainment for SO₂, because SO₂ 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 Ambient Air Quality Analysis (dispersion modeling) to confirm this conclusion (SJVAPCD 2015a).

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

Emissions from project construction in the SFBAAB would be temporary, occurring for approximately 6 years, from 2021 through 2026. Emissions from project construction in the NCCAB and SJVAB would be temporary, occurring for approximately 2 years under Alternative A, from 2022 through 2023, and for approximately 3 years under Alternative B, from 2022 through 2024. 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 BAAQMD thresholds and federal General Conformity 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 in nonattainment areas for the NAAQS. Construction emissions generated within these nonattainment areas are subject to USEPA's General Conformity thresholds. As discussed under Impact AQ#1, under Alternative B,²⁷ annual NO_x emissions would exceed the General Conformity *de minimis* thresholds in the SFBAAB, even with all feasible on-site controls, as required by AQ-IAMF#1 through AQ-IAMF#6. Construction emissions of all other pollutants would be less than the applicable General Conformity thresholds.

The BAAQMD, MBARD, and SJVAPCD have also developed project-level emissions thresholds. These thresholds prevent new projects from contributing to CAAQS or NAAQS violations, which support implementation of regional air quality plans prepared to attain CAAQS and NAAQS. Construction emissions from Alternative A (with or without the DDV) and Alternative B (with either design option) would exceed the BAAQMD's CEQA threshold for NO_x. Construction emissions from Alternative B (with either design option) would exceed the BAAQMD's CEQA threshold for VOC. Exceedances of adopted thresholds could conflict with applicable air quality plans. These exceedances would occur despite stringent on-site emissions controls, including fugitive dust control practices (AQ-IAMF#1), 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 of model year 2010 or newer on-road engines (AQ-IAMF#5). Construction emissions would not exceed the MBARD or SJVAPCD thresholds for any criteria pollutant.

CEQA Conclusion

The impact would be significant under CEQA for both project alternatives because construction could result in emissions that exceed BAAQMD thresholds, as shown in Table 3.3-12 and Table 3.3-13. 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 will require to reduce construction emissions. Mitigation measures to address this impact are identified in Section 3.3.9. Section 3.3.7 describes the measures in detail.

Impact AQ#5: Temporary Direct Impacts on Localized Air Quality in the SFBAAB—Criteria Pollutants²⁸

Construction of the project has the potential to cause elevated criteria pollutant concentrations. These elevated concentrations may cause or contribute to exceedances of the NAAQS and

²⁷ Although Table 3.3-12 shows that Alternative A in 2025 would have NO_x emissions of 104 tons, which is greater than the General Conformity threshold of 100 tons, Table 3.3-12 includes emissions associated with construction of the San Jose Diridon Station Approach Subsection. The General Conformity Determination presented in Appendix 3.3-B does not include the San Jose Diridon Station Approach Subsection, which is analyzed as part of the general conformity determination for the San Jose to Merced Project Section. When the San Jose Diridon Station Approach Subsection is excluded from Table 3.3-12 for purposes of conformity evaluation (see Table 6 of Appendix 3.3-B), all emissions under Alternative A are less than the applicable General Conformity thresholds. Under Alternative B, NO_x emissions exceed the General Conformity threshold both with and without the San Jose Diridon Station Approach Subsection.

²⁸ Refinements were made to the PM mass emissions inventory to more comprehensively capture emissions reductions that will be achieved through AQ-IAMF#1. The following fugitive dust emissions reductions were assumed based on best management practices (Western Governors' Association 2006): PM from ground disturbance (i.e., scraping and grading activities), 61 percent, PM from unpaved vehicle travel (i.e., re-entrained road dust), 55 percent, and PM from demolition, 36 percent. These revisions were made for the air quality analysis, as reported in Tables 3.3-12 through 3.3-17 of this Final EIR/EIS. Concentration modeling for localized PM was performed prior to the refinement. Accordingly, the PM results shown in Tables 3.3-18 through 3.3-21 in this impact are conservative.

CAAQS and affect local air quality and public health. The criteria pollutants of concern with established annual standards are NO₂, PM₁₀, and PM_{2.5}. The criteria pollutants of concern with established 1- to 24-hour standards are the following:

- CO (1 hour and 8 hours)
- PM₁₀ and PM_{2.5} (24 hours)
- NO₂ (1 hour)
- SO₂ (1 hour and 24 hours)

The increase in pollutant concentrations associated with project construction²⁹ was added to the background concentration to estimate the ambient air pollutant concentration for comparison to the applicable NAAQS and CAAQS for all pollutants to determine whether construction would cause an ambient air quality violation. The analysis considers both the incremental project-related contribution and the total pollutant concentration; only the total pollutant concentration, which reflects the incremental project contribution plus the background concentration, is compared to the CAAQS and NAAQS. However, pre-project background concentrations of PM₁₀ along portions of the project alignment already exceed the CAAQS. For such cases, the BAAQMD recommends comparing the incremental project-related increase in PM₁₀ concentrations to the USEPA SILs to analyze the potential for the project to worsen existing PM₁₀ violations (Kirk 2016).

Pollutant concentrations associated with construction truck travel in the NCCAB and SJVAB were not modeled because estimated emissions are well below the NCCAB significance threshold and SJVAPCD screening thresholds for dispersion modeling, as shown in Table 3.3-18 through Table 3.3-21. No on-site project construction activity would occur in the NCCAB or SJVAB.

Table 3.3-18 through Table 3.3-21 show the project's maximum concentration impact, the project's maximum impact plus background, and the 1- to 24-hour criteria pollutant air quality standards, for Alternatives A and B. Similarly, Table 3.3-22 and Table 3.3-23 show the project's maximum impact, the project's maximum impact plus background, and the annual criteria pollutant air quality standards, for Alternatives A and B, respectively. The tables assume AQ-IAMF#1 through AQ-IAMF#5.

Tables 3.3-18, 3.3-20, 3.3-22, and 3.3-23 show that pollutant concentrations with construction of either project alternative would exceed both the 24-hour and annual CAAQS for PM₁₀ because the background values already exceed the PM₁₀ CAAQS. Because the background values exceed the standard, the project-related construction PM₁₀ contributions were compared to the USEPA SILs. The 1- to 24-hour project construction contributions (Tables 3.3-18 and 3.3-20) would exceed the PM₁₀ SIL at locations in all subsections along the alignment except the San Mateo to Palo Alto and Mountain View to Santa Clara Subsections. The annual project construction contributions (Tables 3.3-22 and 3.3-23) would exceed the SIL at all locations along the alignment. The SIL would not be exceeded at the stations or the Brisbane LMF.

Tables 3.3-19 and 3.3-21 show that pollutant concentrations with construction of either project alternative would exceed the 24-hour NAAQS for PM_{2.5} in the San Jose Diridon Station Approach Subsection. Tables 3.3-22 and 3.3-23 show that pollutant concentrations with construction of either project alternative would exceed the 24-hour CAAQS for PM_{2.5} in the San Jose Diridon Station Approach Subsection.

The modeled concentrations presented in Tables 3.3-18 through 3.3-23 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 Reports (Authority 2021a, 2021b) for detailed concentration results by individual construction activity type (e.g., at grade, embankment, and viaduct). Exceedances of CAAQS, SIL (for PM₁₀ only), or NAAQS are shown in **bolded underline with an asterisk (*)**.

²⁹ Pb emissions were not evaluated because equipment and vehicles emit only negligible quantities of Pb.

Table 3.3-18 Criteria Pollutant Concentration Effects from Construction of Alternative A ($\mu\text{g}/\text{m}^3$)¹ Compared to 1- to 24-hour California Ambient Air Quality Standards

Construction Area	CO				NO ₂		SO ₂		PM ₁₀		SO ₂	
	Project 1-hour ²	Total 1-hour ³	Project 8-hour ²	Total 8-hour ⁴	Project 1-hour ²	Total 1-hour ⁵	Project 24-hour ²	Total 24-hour ⁶	Project 24-hour ^{2,7}	Total 24-hour ^{7,8}	Project 1-hour ²	Total 1-hour ⁹
San Francisco to South San Francisco Subsection												
4th and King Street Station	207	3,071	76	1,680	37	174	0.07	2.97	9.7	78.7*	0.47	9.9
4th and King Street Station to Chavez Street (at grade)	39	2,903	17	1,621	21	158	0.02	2.92	5.3	74.3*	0.12	9.5
Chavez Street to Salinas Avenue (at grade)	74	2,938	25	1,629	40	177	0.03	2.93	9.4	78.4*	0.24	9.6
Salinas Avenue to Linden Avenue (at grade)	47	2,911	37	1,641	25	162	0.02	2.92	9.0	78.0*	0.15	9.6
Brisbane LMF	237	3,101	62	1,666	12	149	0.06	3.00	0.8	69.8*	0.29	9.7
Combined ¹⁰	246	3,110	97	1,701	58	195	0.09	2.99	22.8*	91.8*	0.60	10.0
San Bruno to San Mateo Subsection												
Millbrae Station	181	3,045	51	1,655	29	166	0.05	2.95	6.5	75.5*	0.37	9.8
Linden Avenue to Peninsula Avenue (at grade)	49	2,913	15	1,619	29	166	0.02	2.92	8.4	78.4*	0.21	9.6
Linden Avenue to Peninsula Avenue (embankment)	31	2,895	10	1,614	19	156	0.02	2.92	5.7	74.7*	0.14	9.5
Peninsula Avenue to Ninth Avenue (at grade)	73	2,937	19	1,623	47	184	0.03	2.93	8.3	77.3*	0.33	9.7
Peninsula Avenue to Ninth Avenue (embankment)	72	2,936	19	1,623	45	182	0.03	2.93	8.5	77.5*	0.32	9.7
Combined ¹⁰	230	3,094	66	1,670	58	195	0.07	2.97	14.9*	83.9*	0.58	10.0

Construction Area	CO				NO ₂		SO ₂		PM ₁₀		SO ₂	
	Project 1-hour ²	Total 1-hour ³	Project 8-hour ²	Total 8-hour ⁴	Project 1-hour ²	Total 1-hour ⁵	Project 24-hour ²	Total 24-hour ⁶	Project 24-hour ^{2,7}	Total 24-hour ^{7,8}	Project 1-hour ²	Total 1-hour ⁹
San Mateo to Palo Alto Subsection												
At grade	78	3,973	19	1,852	42	132	0.02	2.92	8.5	<u>77.5*</u>	0.25	9.7
Embankment	28	3,923	6.9	1,840	16	106	0.01	2.91	3.3	<u>72.3*</u>	0.12	9.5
Mountain View to Santa Clara Subsection												
San Antonio Road to Lawrence Expressway (at grade)	68	2,817	18	2,080	44	172	0.21	3.11	8.2	<u>77.2*</u>	0.34	9.7
Lawrence Expressway to Scott Boulevard (at grade)	18	2,767	11	2,073	11	139	0.02	2.92	5.1	<u>74.1*</u>	0.09	9.5
San Jose Diridon Station Approach Subsection												
Embankment	173	2,922	92	2,154	68	196	0.1	3	<u>49.9*</u>	<u>118.9*</u>	0.4	10
At grade	62	2,812	32	2,095	38	166	0.1	3	<u>18.1*</u>	<u>87.1*</u>	0.2	10
Diridon Station	45	2,795	19	2,081	13	141	<0.1	3	3.7	<u>72.7*</u>	0.1	10
Combined ¹⁰	218	2,967	111	2,173	81	209	0.1	3	<u>53.7*</u>	<u>122.7*</u>	1	10
Threshold												
SIL (µg/m ³) ^{7,11}	2,000	-	500	-	N/A	-	-	-	10.4	-	7.8	-
CAAQS (µg/m ³)	-	23,000	-	10,000	-	339	-	105	-	50	-	655

Sources: AERMOD version 18081; CARB 2018a; USEPA 2018f

< = less than

- = no threshold

µg/m³ = micrograms of pollutant per cubic meter of air

BAAQMD = Bay Area Air Quality Management District

CAAQS = California ambient air quality standards

CO = carbon monoxide

LMF = light maintenance facility

N/A = not applicable

NO₂ = nitrogen dioxide

PM_{2.5} = particulate matter 2.5 microns or less in diameter

PM₁₀ = particulate matter 10 microns or less in diameter

SIL = significant impact level

SO₂ = sulfur dioxide

USEPA = U.S. Environmental Protection Agency

Exceedances of thresholds are shown in **bolded underline with an asterisk (*)**.

¹ Only the highest modeled concentration in the form of the standard is presented for each pollutant.

² Represents the maximum incremental off-site concentration in the form of the standard from project construction.

³ A background 1-hour CO concentration of 2,864, 3,895, and 2,749 $\mu\text{g}/\text{m}^3$ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁴ A background 8-hour CO concentration of 1,604, 1,833, and 2,062 $\mu\text{g}/\text{m}^3$ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁵ A background 1-hour NO₂ concentration of 137.2, 89.9, and 127.8 $\mu\text{g}/\text{m}^3$ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁶ A background 24-hour SO₂ concentration in the form of the standard of 2.9, 2.9, 2.9 $\mu\text{g}/\text{m}^3$ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁷ Background PM₁₀ concentration alone exceeds the CAAQS. Therefore, the incremental project increase in PM₁₀ concentrations should be compared to the applicable SIL as recommended by the BAAQMD (Kirk 2016). SILs for pollutants other than PM₁₀ are shown for information only.

⁸ A background 24-hour PM₁₀ concentration of 69.0, 69.0, and 69.0 $\mu\text{g}/\text{m}^3$ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁹ A background 1-hour SO₂ concentration of 9.4, 9.4, and 9.4 $\mu\text{g}/\text{m}^3$ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

¹⁰ "Combined" conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.

¹¹ USEPA SIL guidance (USEPA 2018f).

Table 3.3-19 Criteria Pollutant Concentration Effects from Construction of Alternative A ($\mu\text{g}/\text{m}^3$)¹ Compared to 1- to 24-hour National Ambient Air Quality Standards

Construction Area	CO				NO ₂		PM _{2.5}		PM ₁₀		SO ₂	
	Project 1-hour ²	Total 1-hour ³	Project 8-hour ²	Total 8-hour ⁴	Project 1-hour ²	Total 1-hour ⁵	Project 24-hour ²	Total 24-hour ⁶	Project 24-hour ²	Total 24-hour ⁷	Project 1-hour ²	Total 1-hour ⁸
San Francisco to South San Francisco Subsection												
4th and King Street Station	186	2,172	74	1,411	21	123	2.2	28	9.6	57	0.32	6.4
4th and King Street Station to Chavez Street (at grade)	39	2,025	17	1,354	18	120	0.96	27	5.3	52	0.11	6.2
Chavez Street to Salinas Avenue (at grade)	74	2,060	25	1,362	29	131	1.6	28	9.4	56	0.17	6.3
Salinas Avenue to Linden Avenue (at grade)	47	2,033	37	1,374	21	123	1.4	28	9.0	56	0.12	6.2
Brisbane LMF	237	2,223	62	1,399	12	114	0.2	26	0.8	48	0.29	6.4
Combined ⁹	225	2,211	91	1,428	39	141	3.5	30	19.6*	67	0.43	6.5
San Bruno to San Mateo Subsection												
Millbrae Station	146	2,132	48	1,385	15	117	1.5	28	6.2	53	0.25	6.4
Linden Avenue to Peninsula Avenue (at grade)	49	2,035	15	1,352	22	124	1.5	28	8.4	55	0.16	6.3
Linden Avenue to Peninsula Avenue (embankment)	31	2,017	9.8	1,347	14	116	0.91	27	5.7	53	0.10	6.2
Peninsula Avenue to Ninth Avenue (at grade)	73	2,059	19	1,356	30	132	1.5	28	8.3	55	0.21	6.3
Peninsula Avenue to Ninth Avenue (embankment)	72	2,058	19	1,356	30	132	1.4	28	8.5	56	0.21	6.3
Combined ⁹	195	2,181	63	1,400	37	139	3.0	29	14.6*	62	0.41	6.5

Construction Area	CO				NO ₂		PM _{2.5}		PM ₁₀		SO ₂	
	Project 1-hour ²	Total 1-hour ³	Project 8-hour ²	Total 8-hour ⁴	Project 1-hour ²	Total 1-hour ⁵	Project 24-hour ²	Total 24-hour ⁶	Project 24-hour ²	Total 24-hour ⁷	Project 1-hour ²	Total 1-hour ⁸
San Mateo to Palo Alto Subsection												
At grade	78	3,973	19	1,852	26.3	105	1.6	25	8.5	58	0.16	6.3
Embankment	28	3,923	6.9	1,840	10.1	89.1	0.5	24	3.3	53	0.07	6.2
Mountain View to Santa Clara Subsection												
San Antonio Road to Lawrence Expressway (at grade)	68	2,397	18	1,775	33	118	1.5	28	8.2	58	0.25	6.4
Lawrence Expressway to Scott Boulevard (at grade)	18	2,347	11	1,768	9.1	94	0.92	28	5.1	55	0.07	6.2
San Jose Diridon Station Approach Subsection												
Embankment	138	2,467	66	1,822	51	137	19	50*	44*	93	<1	6
At grade	62	2,391	28	1,785	26	112	10	41*	14*	63	<1	6
Diridon Station	44	2,373	17	1,774	6	91	1	32	3	53	<1	6
Combined ⁹	181	2,511	83	1,840	57	143	20	51*	47*	97	<1	7
Threshold												
SIL (µg/m ³) ^{10,11}	2,000	-	500	-	N/A	-	1.2	-	10.4	-	7.8	-
NAAQS (µg/m ³)	-	40,000	-	10,000	-	188	-	35	-	150	-	196.0

Sources: AERMOD version 18081; USEPA 2018a, 2018f

< = less than

- = no threshold

µg/m³ = micrograms of pollutant per cubic meter of air

CO = carbon monoxide

LMF = light maintenance facility

N/A = not applicable

NAAQS = national ambient air quality standards

NO₂ = nitrogen dioxide

PM_{2.5} = particulate matter 2.5 microns or less in diameter

PM₁₀ = particulate matter 10 microns or less in diameter

SIL = significant impact level

SO₂ = sulfur dioxide

USEPA = U.S. Environmental Protection Agency

Exceedances of NAAQS or PM₁₀ SIL are shown in **bolded underline with an asterisk (*)**.

¹ Only the highest modeled concentration in the form of the standard is presented for each pollutant.

² Represents the maximum incremental off-site concentration in the form of the standard from project construction.

³ A background 1-hour CO concentration of 1,986, 2,979, and 2,329 $\mu\text{g}/\text{m}^3$ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁴ A background 8-hour CO concentration of 1,337, 1,489, and 1,757 $\mu\text{g}/\text{m}^3$ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁵ A background 1-hour NO₂ concentration of 101.8, 79.0, and 85.2 $\mu\text{g}/\text{m}^3$ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁶ A background 24-hour PM_{2.5} concentration in the form of the standard of 26.2, 23.3, and 26.8 $\mu\text{g}/\text{m}^3$ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁷ A background 24-hour PM₁₀ concentration of 47.0, 49.7, and 49.7 $\mu\text{g}/\text{m}^3$ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁸ A background 1-hour SO₂ concentration of 6.1 $\mu\text{g}/\text{m}^3$ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St.) was added to the maximum incremental off-site project contribution.

⁹ “Combined” conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.

¹⁰ USEPA SIL guidance (USEPA 2018f).

¹¹ Background concentrations do not exceed the NAAQS. Therefore, USEPA SILs are shown for information only.

Table 3.3-20 Criteria Pollutant Concentration Effects from Construction of Alternative B ($\mu\text{g}/\text{m}^3$)¹ Compared to 1- to 24-hour California Ambient Air Quality Standards

Construction Area	CO				NO ₂		PM _{2.5}		PM ₁₀		SO ₂	
	Project 1-hour ²	Total 1-hour ³	Project 8-hour ²	Total 8-hour ⁴	Project 1-hour ²	Total 1-hour ⁵	Project 24-hour ²	Total 24-hour ⁶	Project 24-hour ^{2,7}	Total 24-hour ^{7,8}	Project 1-hour ²	Total 1-hour ⁹
San Francisco to South San Francisco Subsection												
4th and King Street Station	207	3,071	76	1,680	37	174	0.07	2.97	9.7	<u>78.7*</u>	0.47	9.9
4th and King Street Station to Chavez Street (at grade)	39	2,903	17	1,621	21	158	0.02	2.92	5.3	<u>74.3*</u>	0.12	9.5
Chavez Street to Salinas Avenue (at grade)	74	2,938	25	1,629	40	177	0.03	2.93	9.4	<u>78.4*</u>	0.24	9.6
Salinas Avenue to Linden Avenue (at grade)	47	2,911	37	1,641	25	162	0.02	2.92	9.0	<u>78.0*</u>	0.15	9.6
Brisbane LMF	282	3,146	86	1,690	32	169	0.09	3.0	2.3	<u>71.3*</u>	0.45	9.9
Combined ¹⁰	246	3,110	93	2,079	58	195	0.09	2.99	<u>21.4*</u>	<u>90.4*</u>	0.59	10.0
San Bruno to San Mateo Subsection												
Millbrae Station	181	3,045	51	1,655	29	166	0.05	2.95	6.5	<u>75.5*</u>	0.37	9.8
Linden Avenue to Peninsula Avenue (at grade)	49	2,913	15	1,619	29	166	0.02	2.92	8.4	<u>78.4*</u>	0.21	9.6
Linden Avenue to Peninsula Avenue (embankment)	31	2,895	10	1,614	19	156	0.02	2.92	5.7	<u>74.7*</u>	0.14	9.5
Peninsula Avenue to Ninth Avenue (at grade)	73	2,937	19	1,623	47	184	0.03	2.93	8.3	<u>77.3*</u>	0.33	9.7
Peninsula Avenue to Ninth Avenue (embankment)	72	2,936	19	1,623	45	182	0.03	2.93	8.5	<u>77.5*</u>	0.32	9.7
Combined ¹⁰	230	3,094	66	1,670	58	195	0.07	2.97	<u>14.9*</u>	<u>83.9*</u>	0.58	10.0

Construction Area	CO				NO ₂		PM _{2.5}		PM ₁₀		SO ₂	
	Project 1-hour ²	Total 1-hour ³	Project 8-hour ²	Total 8-hour ⁴	Project 1-hour ²	Total 1-hour ⁵	Project 24-hour ²	Total 24-hour ⁶	Project 24-hour ^{2,7}	Total 24-hour ^{7,8}	Project 1-hour ²	Total 1-hour ⁹
San Mateo to Palo Alto Subsection												
Embankment	42	3,937	10	1,843	27	117	0.02	2.92	5.6	<u>74.6*</u>	0.21	9.6
At grade	29	3,924	7	1,840	16	106	0.01	2.91	5.8	<u>74.8*</u>	0.10	9.5
Mountain View to Santa Clara Subsection												
San Antonio Road to Lawrence Expressway (at grade)	68	2,817	18	2,080	44	172	0.21	3.11	8.2	<u>77.2*</u>	0.34	9.7
Lawrence Expressway to Scott Boulevard (at grade)	18	2,767	11	2,073	11	139	0.02	2.92	5.1	<u>74.1*</u>	0.09	9.5
San Jose Diridon Station Approach Subsection¹¹												
Viaduct	104/80	2,853/ 2,830	50/52	2,112/ 2,114	22/15	150/ 142	0.1/0.1	3/3	<u>15.5*/ 14.0*</u>	<u>84.5*/ 83.0*</u>	0.3/0.2	10/10
Embankment	267/272	3,016/ 3,031	128/ 127	2,190/ 2,189	106/ 106	233/ 234	0.3/0.3	3/3	<u>76.7*/ 76.7*</u>	<u>145.7*/ 145.7*</u>	1/1	11/11
At grade	78/99	2,828/ 2,849	41/52	2,103/ 2,114	38/47	166/ 175	0.1/0.1	3/3	<u>24.4*/ 32.1*</u>	<u>93.4*/ 101.1*</u>	0.3/0.3	10/10
Diridon Station	45/45	2,795/ 2,795	19/19	2,081/ 2,081	13/13	141/ 141	<0.1/ <0.1	3/3	3.7/3.7	<u>72.7*/ 72.7*</u>	0.1/0.1	10/10
Combined ¹⁰	267/317	3,016/ 3,066	147/ 147	2,209/ 2,209	119/ 119	246/ 247	0.3/0.3	3/3	<u>80.4*/ 80.4*</u>	<u>149.4*/ 149.4*</u>	1/1	11/11
Threshold												
SIL (µg/m ³) ^{7,12}	2,000	-	500	-	N/A	-	1.2	-	10.4	-	7.8	-
CAAQS (µg/m ³)	-	23,000	-	10,000	-	339	-	-	-	50	-	655

Sources: AERMOD version 18081; CARB 2018a; USEPA 2018f

< = less than

- = no threshold

µg/m³ = micrograms of pollutant per cubic meter of air

BAAQMD = Bay Area Air Quality Management District

CAAQS = California ambient air quality standards

CO = carbon monoxide

I- = Interstate

LMF = light maintenance facility

N/A = not applicable

NO₂ = nitrogen dioxide

PM₁₀ = particulate matter 10 microns or less in diameter

SIL = significant impact level

SO₂ = sulfur dioxide

USEPA = U.S. Environment Protection Agency

Exceedances of CAAQS or SIL (for PM₁₀ only) are shown in **bolded underline with an asterisk (*)**.

¹ Only the highest modeled concentration in the form of the standard is presented for each pollutant.

² Represents the maximum incremental off-site concentration in the form of the standard from project construction.

³ A background 1-hour CO concentration of 2,864, 3,895, and 2,749 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁴ A background 8-hour CO concentration of 1,604, 1,833, and 2,062 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁵ A background 1-hour NO₂ concentration of 137.2, 89.9, and 127.8 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁶ A background 24-hour SO₂ concentration in the form of the standard of 2.9 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St.) was added to the maximum incremental off-site project contribution.

⁷ Background PM₁₀ concentration alone exceeds the CAAQS. Therefore, the incremental project increase in PM₁₀ concentrations should be compared to the applicable USEPA SIL as recommended by the BAAQMD (Kirk 2016). SILs for pollutants other than PM₁₀ are shown for information only.

⁸ A background 24-hour PM₁₀ concentration of 69.0 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St.) was added to the maximum incremental off-site project contribution.

⁹ A background 1-hour SO₂ concentration of 9.4 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St.) was added to the maximum incremental off-site project contribution.

¹⁰ "Combined" conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.

¹¹ Concentrations are presented for Alternative B (Viaduct to I-880) first, followed by Alternative B (Viaduct to Scott Boulevard).

¹² USEPA SIL guidance (USEPA 2018f).

Table 3.3-21 Criteria Pollutant Concentration Effects from Construction of Alternative B ($\mu\text{g}/\text{m}^3$)¹ Compared to 1- to 24-hour National Ambient Air Quality Standards

Construction Area	CO				NO ₂		PM _{2.5}		PM ₁₀		SO ₂	
	Project 1-hour ²	Total 1-hour ³	Project 8-hour ²	Total 8-hour ⁴	Project 1-hour ²	Total 1-hour ⁵	Project 24-hour ²	Total 24-hour ⁶	Project 24-hour ²	Total 24-hour ⁷	Project 1-hour ²	Total 1-hour ⁸
San Francisco to South San Francisco Subsection												
4th and King Street Station	186	2,172	74	1,411	21	123	2.2	28.4	9.6	57	0.32	6.4
4th and King Street Station to Chavez Street (at grade)	39	2,025	17	1,354	18	120	0.96	27	5.3	52	0.11	6.2
Chavez Street to Salinas Avenue (at grade)	74	2,060	25	1,362	29	131	1.6	28	9.4	56	0.17	6.3
Salinas Avenue to Linden Avenue (at grade)	47	2,033	37	1,374	21	123	1.4	28	9.0	56	0.12	6.2
Brisbane LMF	282	2,268	86	1,423	32	133	0.4	27	2.3	49	0.45	6.6
Combined ⁹	225	2,211	91	1,428	39	141	3.4	30	18.6*	66	0.43	6.5
San Bruno to San Mateo Subsection												
Millbrae Station	146	2,132	48	1,385	15	117	1.5	28	6.2	53	0.25	6.4
Linden Avenue to Peninsula Avenue (at grade)	49	2,035	15	1,352	22	124	1.5	28	8.4	55	0.16	6.3
Linden Avenue to Peninsula Avenue (embankment)	31	2,017	9.8	1,347	14	116	0.91	27	5.7	53	0.10	6.2
Peninsula Avenue to Ninth Avenue (at grade)	73	2,059	19	1,356	30	132	1.5	28	8.3	55	0.21	6.3
Peninsula Avenue to Ninth Avenue (embankment)	72	2,058	19	1,356	30	132	1.4	28	8.5	56	0.21	6.3
Combined ⁹	195	2,181	63	1,400	37	139	3.0	29	14.6*	62	0.41	6.5
San Mateo to Palo Alto Subsection												
Embankment	42	3,937	10	1,843	16	95	1.1	24.4	5.6	55.3	0.12	6.2
At grade	29	3,924	7	1,840	9.8	88.8	1.2	24.5	5.8	55.5	0.06	6.2

Construction Area	CO				NO ₂		PM _{2.5}		PM ₁₀		SO ₂	
	Project 1-hour ²	Total 1-hour ³	Project 8-hour ²	Total 8-hour ⁴	Project 1-hour ²	Total 1-hour ⁵	Project 24-hour ²	Total 24-hour ⁶	Project 24-hour ²	Total 24-hour ⁷	Project 1-hour ²	Total 1-hour ⁸
Mountain View to Santa Clara Subsection												
San Antonio Road to Lawrence Expressway (at grade)	68	2,397	18	1,775	33	118	1.5	28	8.2	58	0.25	6.4
Lawrence Expressway to Scott Boulevard (at grade)	18	2,347	11	1,768	9.1	94	0.92	28	5.1	55	0.07	6.2
San Jose Diridon Station Approach Subsection¹⁰												
Viaduct	93/69	2,422/ 2,398	43/33	1,800/ 1,790	15/10	100/96	2/2	33/33	<u>14*/13*</u>	64/62	0.2/0.2	6/6
Embankment	241/242	2,571/ 2,572	117/118	1,774/ 1,875	75/73	160/158	12/13	<u>43*/44*</u>	<u>69*/69*</u>	118/118	1/1	7/7
At grade	76/98	2,406/ 2,427	37/47	1,793/ 1,803	33/42	119/127	3/4	<u>34*/35*</u>	<u>22*/29*</u>	71/78	0.2/0.3	6/6
Diridon Station	44/44	2,373/ 2,373	17/17	1,774/ 1,774	6/6	91/91	1/1	32/32	3/3	53/53	0.1/0.1	6/6
Combined ⁹	286/286	2,617/ 2,626	134/135	1,891/ 1,892	81/79	167/164	13/13	<u>44*/44*</u>	<u>72*/72*</u>	122/122	1/1	7/7
Threshold												
SIL (µg/m ³) ^{11,12}	2,000	-	500	-	N/A	-	1.2	-	10.4	-	7.8	-
NAAQS (µg/m ³)	-	40,000	-	10,000	-	188	-	35	-	150	-	196.0

Sources: AERMOD version 18081; USEPA 2018a, 2018f

- = no threshold

µg/m³ = micrograms of pollutant per cubic meter of air

CO = carbon monoxide

I = Interstate

LMF = light maintenance facility

N/A = not applicable

NAAQS = national ambient air quality standards

NO₂ = nitrogen dioxide

PM_{2.5} = particulate matter 2.5 microns or less in diameter

PM₁₀ = particulate matter 10 microns or less in diameter

SIL = significant impact level

SO₂ = sulfur dioxide

USEPA = U.S. Environmental Protection Agency

Exceedances of NAAQS or PM₁₀ SIL are shown in **bolded underline with an asterisk (*)**.

¹ Only the highest modeled concentration in the form of the standard is presented for each pollutant.

² Represents the maximum incremental off-site concentration in the form of the standard from project construction.

³ A background 1-hour CO concentration of 1,986, 2,979, and 2,329 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁴ A background 8-hour CO concentration of 1,337, 1,489, and 1,757 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁵ A background 1-hour NO₂ concentration of 101.8, 79.0, and 85.2 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁶ A background 24-hour PM_{2.5} concentration in the form of the standard of 26.2, 23.3, and 26.8 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁷ A background 24-hour PM₁₀ concentration of 47.0, 49.7, and 49.7 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁸ A background 1-hour SO₂ concentration of 6.1 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St.) was added to the maximum incremental off-site project contribution.

⁹ “Combined” conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.

¹⁰ Concentrations are presented for Alternative B (Viaduct to I-880) first, followed by Alternative B (Viaduct to Scott Boulevard).

¹¹ USEPA SIL guidance (USEPA 2018f).

¹² Background concentrations do not exceed the NAAQS. Therefore, USEPA SILs are shown for information only.

Table 3.3-22 Criteria Pollutant Concentration Effects from Construction of Alternative A ($\mu\text{g}/\text{m}^3$)¹ Compared to Annual National Ambient Air Quality Standards and California Ambient Air Quality Standards

Construction Area	NO ₂ (CAAQS)		NO ₂ (NAAQS)		PM _{2.5} (CAAQS)		PM _{2.5} (NAAQS)		PM ₁₀ (CAAQS)	
	Project Annual ²	Project Annual ³	Project Annual ²	Total Annual ⁴	Project Annual ²	Total Annual ⁵	Project Annual ²	Total Annual ⁶	Project Annual ^{2,7}	Total Annual ^{7,8}
San Francisco to South San Francisco Subsection										
4th and King Street Station	0.26	23	0.25	22	0.02	9.7	0.02	8.2	0.16	<u>22*</u>
At grade	3.9	26	3.7	25	0.59	10.	0.56	8.8	<u>3.2*</u>	<u>25*</u>
Brisbane LMF	0.16	23	0.16	21	0.04	9.7	0.04	8.2	0.1	<u>22*</u>
Combined ⁹	4.2	27	4.0	25	0.67	10.	0.63	8.8	<u>3.5*</u>	<u>26*</u>
San Bruno to San Mateo Subsection										
Millbrae Station	0.19	23	0.19	22	0.02	9.7	0.01	8.2	0.10	<u>22*</u>
Embankment	2.3	25	2.2	24	0.57	10	0.54	8.7	<u>2.7*</u>	<u>25*</u>
At grade	2.9	26	2.9	24	0.58	10	0.56	8.8	<u>3.1*</u>	<u>25*</u>
Combined ⁹	3.1	26	3.1	24	0.60	10	0.57	8.8	<u>3.2*</u>	<u>25*</u>
San Mateo to Palo Alto Subsection										
Embankment	2.3	21	2.2	20	0.57	9.6	0.54	8.2	<u>2.8*</u>	<u>25*</u>
At grade	2.9	22	2.8	21	0.41	9.4	0.40	8.1	<u>2.5*</u>	<u>24*</u>
Combined ⁹	2.9	22	2.8	21	0.57	9.6	0.54	8.2	<u>2.8*</u>	<u>25*</u>
Mountain View to Santa Clara Subsection										
At grade	4.3	28	3.9	27	0.95	11	0.85	10	<u>5.3*</u>	<u>27*</u>
Combined ⁹	4.3	28	3.9	27	0.95	11	0.85	10	<u>5.3*</u>	<u>27*</u>
San Jose Diridon Station Approach Subsection										
Embankment	3	27	3	26	1	11	1	10	<u>7*</u>	<u>29*</u>
At grade	0	24	0	23	0	11	0	10	<u>3*</u>	<u>25*</u>
Diridon Station	7	31	6	29	2	<u>12*</u>	2	11	0	<u>22*</u>
Combined ⁹	7	31	6	29	2	<u>12*</u>	2	11	<u>7*</u>	<u>29*</u>

Construction Area	NO ₂ (CAAQS)		NO ₂ (NAAQS)		PM _{2.5} (CAAQS)		PM _{2.5} (NAAQS)		PM ₁₀ (CAAQS)	
	Project Annual ²	Project Annual ³	Project Annual ²	Total Annual ⁴	Project Annual ²	Total Annual ⁵	Project Annual ²	Total Annual ⁶	Project Annual ^{2,7}	Total Annual ^{7,8}
Threshold										
SIL (µg/m ³) ^{7,10}	1		1		0.2		0.2		2.08	
CAAQS/NAAQS (µg/m ³)	-	57	-	100	-	12	-	12	-	20

Sources: AERMOD version 18081; CARB 2018a; USEPA 2018a, 2018f

- = no threshold

µg/m³ = micrograms of pollutant per cubic meter of air

BAAQMD = Bay Area Air Quality Management District

CAAQS = California ambient air quality standards

LMF = light maintenance facility

NAAQS = national ambient air quality standards

NO₂ = nitrogen dioxide

PM_{2.5} = particulate matter 2.5 microns or less in diameter

PM₁₀ = particulate matter 10 microns or less in diameter

SIL = significant impact level

USEPA = U.S. Environmental Protection Agency

Exceedances of CAAQS (for all pollutants) or SIL (for PM₁₀ only) are shown in **bolded underline with an asterisk (*)**.

¹ Only the highest modeled concentration in the form of the applicable standard is presented for each pollutant.

² Represents the maximum incremental off-site concentration in the form of the standard from project construction.

³ A background annual NO₂ concentration in the form of the (CAAQS) standard of 22.6, 18.8 and 24.1 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁴ A background annual NO₂ concentration in the form of the (NAAQS) standard of 21.3, 18.2, and 22.8 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁵ A background annual PM_{2.5} concentration in the form of the (CAAQS) standard of 9.7, 9.0, and 9.9 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁶ A background annual PM_{2.5} concentration in the form of the (NAAQS) standard of 8.2, 7.7, 9.2 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁷ Background PM₁₀ concentration alone exceeds the CAAQS. Therefore, the incremental project increase in PM₁₀ concentrations should be compared to the applicable USEPA SIL as recommended by the BAAQMD (Kirk 2016). SILs for pollutants other than PM₁₀ are shown for information only.

⁸ A background annual PM₁₀ concentration in the form of the (CAAQS) standard of 22.1, 21.9, and 21.9 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁹ "Combined" conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.

¹⁰ USEPA SIL guidance (USEPA 2018f).

Table 3.3-23 Criteria Pollutant Concentration Effects from Construction of Alternative B ($\mu\text{g}/\text{m}^3$)¹ Compared to Annual National Ambient Air Quality Standards and California Ambient Air Quality Standards

Construction Area	NO ₂ (CAAQS)		NO ₂ (NAAQS)		PM _{2.5} (CAAQS)		PM _{2.5} (NAAQS)		PM ₁₀ (CAAQS)	
	Project Annual ²	Project Annual ³	Project Annual ²	Total Annual ⁴	Project Annual ²	Total Annual ⁵	Project Annual ²	Total Annual ⁶	Project Annual ^{2,7}	Total Annual ^{7,8}
San Francisco to South San Francisco Subsection										
4th and King Street Station	0.26	23	0.25	22	0.02	9.7	0.02	8.2	0.16	<u>22*</u>
At grade	3.9	26	3.7	25	0.59	10.	0.56	8.8	<u>3.2*</u>	<u>25*</u>
Brisbane LMF	0.84	23	0.84	22	0.07	9.8	0.07	8.3	0.4	<u>22*</u>
Combined ⁹	4.2	27	4.0	25	0.67	10	0.63	8.8	<u>3.5*</u>	<u>26*</u>
San Bruno to San Mateo Subsection										
Millbrae Station	0.19	23	0.19	22	0.02	9.7	0.01	8.2	0.10	<u>22*</u>
Embankment	2.3	25	2.2	24	0.57	10	0.54	8.7	<u>2.7*</u>	<u>25*</u>
At grade	2.9	26	2.9	24	0.58	10	0.56	8.8	<u>3.1*</u>	<u>25*</u>
Combined ⁹	3.1	26	3.1	24	0.60	1.	0.57	8.8	<u>3.2*</u>	<u>25*</u>
San Mateo to Palo Alto Subsection										
Embankment	4.0	23	3.8	22	1.1	10	1.0	8.7	<u>6.5*</u>	<u>28*</u>
At grade	5.3	24	5.1	23	1.5	11	1.5	9.2	<u>10*</u>	<u>32*</u>
Combined ⁹	5.3	24	5.1	23	1.5	11	1.5	9.2	<u>10*</u>	<u>32*</u>
Mountain View to Santa Clara Subsection										
At grade	4.3	28	3.9	27	0.95	11	0.85	10	<u>5.3*</u>	<u>27*</u>
Combined ⁹	4.3	28	3.9	27	0.95	11	0.85	10	<u>5.3*</u>	<u>27*</u>
San Jose Diridon Station Approach Subsection¹⁰										
Viaduct	2/2	26/26	2/2	24/24	0.4/0.3	11/11	0.4/0.3	10/10	<u>3.3*/2.06*</u>	<u>25*/24*</u>
Embankment	2/2	26/26	2/2	25/25	1/1	11/11	1/1	10/10	<u>4.6*/4.8*</u>	<u>27*/27*</u>
At grade	5/5	29/29	5/5	28/28	1/1	11/11	1/1	10/11	<u>5.4*/5.4*</u>	<u>27*/27*</u>
Diridon Station	0.3/0.3	24/24	0.2/0.2	23/23	<0.1/<0.1	11/11	<0.1/<0.1	10/10	0.1/0.1	<u>22*/22*</u>
Combined ⁹	6/6	30/30	5/5	30/28	1/1	12/11	1/1	10/10	<u>5.5*/5.5*</u>	<u>27*/27*</u>

Construction Area	NO ₂ (CAAQS)		NO ₂ (NAAQS)		PM _{2.5} (CAAQS)		PM _{2.5} (NAAQS)		PM ₁₀ (CAAQS)	
	Project Annual ²	Project Annual ³	Project Annual ²	Total Annual ⁴	Project Annual ²	Total Annual ⁵	Project Annual ²	Total Annual ⁶	Project Annual ^{2,7}	Total Annual ^{7,8}
Threshold										
SIL (µg/m ³) ^{7,11}	N/A		N/A		N/A		0.2		2.08	
CAAQS/NAAQS (µg/m ³)	-	57	-	100	-	12	-	12	-	20

Sources: AERMOD version 18081; USEPA 2018a, 2018f; CARB 2018b

< = less than

- = no threshold

µg/m³ = micrograms of pollutant per cubic meter of air

BAAQMD = Bay Area Air Quality Management District

CAAQS = California ambient air quality standards

I = Interstate

LMF = light maintenance facility

N/A = not applicable

NAAQS = national ambient air quality standards

NO₂ = nitrogen dioxide

PM_{2.5} = particulate matter 2.5 microns or less in diameter

PM₁₀ = particulate matter 10 microns or less in diameter

SIL = significant impact level

USEPA = U.S. Environmental Protection Agency

Exceedances of CAAQS or SIL (for PM₁₀ only) are shown in **bolded underline with an asterisk (*)**.

¹ Only the highest modeled concentration in the form of the applicable standard is presented for each pollutant.

² Represents the maximum incremental off-site concentration in the form of the standard from project construction.

³ A background annual NO₂ concentration in the form of the (CAAQS) standard of 22.6, 18.8 and 24.1 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁴ A background annual NO₂ concentration in the form of the (NAAQS) standard of 21.3, 18.2, and 22.8 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁵ A background annual PM_{2.5} concentration in the form of the (CAAQS) standard of 9.7, 9.0, and 9.9 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁶ A background annual PM_{2.5} concentration in the form of the (NAAQS) standard of 8.2, 7.7, 9.2 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁷ Background PM₁₀ concentration alone exceeds the CAAQS. Therefore, the incremental project increase in PM₁₀ concentrations should be compared to the applicable USEPA SIL as recommended by the BAAQMD (Kirk 2016).

⁸ A background annual PM₁₀ concentration in the form of the (CAAQS) standard of 22.1, 21.9, and 21.9 µg/m³ (for the locations of San Francisco—Arkansas St., Redwood City—Barron Ave., and San Jose—Jackson St., respectively) was added to the maximum incremental off-site project contribution.

⁹ "Combined" conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.

¹⁰ Concentrations are presented for Alternative B (Viaduct to I-880) first, followed by Alternative B (Viaduct to Scott Boulevard).

¹¹ USEPA SIL guidance (USEPA 2018f).

As shown in Tables 3.3-18 and 3.3-20, construction of either Alternative A or Alternative B (with either viaduct option) would result in localized concentrations that would exceed the 24-hour PM₁₀ CAAQS and SIL, indicating that both project alternatives would contribute to existing exceedances of the CAAQS for PM₁₀ where background concentrations already exceed the CAAQS. Within the San Jose Diridon Station Approach Subsection, construction of either Alternative A or Alternative B (with either viaduct option) also would result in localized concentrations that would exceed the 24-hour PM_{2.5} NAAQS, the annual PM_{2.5} CAAQS, the 24-hour PM₁₀ CAAQS and SIL, and the annual PM₁₀ CAAQS and SIL (see Tables 3.3-21 through 3.3-23). The amount of construction effort with the DDV would be approximately the same as Alternative A without the DDV and thus the amount of construction-period criteria pollutant emissions and concentrations would be approximately the same. The CAAQS and NAAQS represent the maximum amount of pollution that can be present in outdoor air without any harmful impacts on people and the environment. The main health impacts 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.

CEQA Conclusion

The impact would be significant under CEQA for both project alternatives because construction could result in temporary exceedances of the annual CAAQS for PM_{2.5}, and the 24-hour and annual CAAQS for PM₁₀, and contribute to existing exceedances of the PM₁₀ standard. Project features (AQ-IAMF#1 through AQ-IAMF#6) will minimize construction emissions through the best available on-site controls. However, exceedances of the CAAQS still would occur and the project would contribute a significant level of localized PM pollution within the RSA. No feasible mitigation is available to reduce this impact.

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

Construction of either project alternative, 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 project construction. Construction would result in DPM emissions primarily from diesel-fueled off-road equipment and heavy-duty trucks.

Table 3.3-24 shows estimated construction-related health risks relative to BAAQMD thresholds for both project alternatives. The local topography and meteorology can greatly influence DPM air concentrations and the resulting exposure and health risk. Consequently, health risks for each subsection were estimated based on representative local meteorological conditions. The health risks shown in Table 3.3-24 represent the highest modeled off-site risk, which typically occurs at receptors adjacent to or within a few hundred yards of the project footprint.

As shown in Table 3.3-24, maximum health risks in the SFBAAB would be the same under both alternatives, except for slight differences in the San Jose Diridon Station Approach Subsection. In this subsection, Alternative A results in slightly greater potential cancer risk than Alternative B. The receptor locations at which the maximum modeled risks occur are different for each alternative. Although the total construction emissions of DPM in the San Jose Diridon Station Approach Subsection are greater for Alternative B than for Alternative A, site-specific conditions result in the slightly greater potential cancer risk for Alternative A. These conditions include the individual construction activities near each receptor and different orientation of the alignment relative to local wind directions. For the same reasons, the acute Hazard Index (which is derived not from DPM but from the summed concentrations of all modeled TACs) is slightly greater for Alternative B than for Alternative A.

Construction of Alternative A with the DDV would move the HSR tracks slightly nearer to sensitive receptors along North Montgomery Street (east of the construction area and north of the SAP Center; see Figure 3.3-6) than construction under Alternative A without the DDV. The receptors closest to the DDV construction would be located farther away from construction than would the

most affected receptors along the rest of Alternative A without the DDV. The most affected receptors without the DDV would not be exposed to TAC emissions above the BAAQMD thresholds. Because the most affected receptors during DDV construction would be farther from the construction than would the most affected receptors without the DDV, the nearest receptors during DDV construction also would not be exposed to TAC emissions above the BAAQMD thresholds.

Although the intensity of health risks would vary by location, neither project alternative would result in increases in cancer risk, health hazards, or PM_{2.5} concentrations in excess of BAAQMD thresholds.

Table 3.3-24 Excess Cancer, Noncancer, and PM_{2.5} Concentration Health Risks Associated with Project Construction in the San Francisco Bay Area Air Basin¹

Subsection	Alternative A				Alternative B			
	Cancer (per million) ²	Chronic HI ³	Acute HI ³	PM _{2.5} (µg/m ³)	Cancer (per million) ²	Chronic HI ³	Acute HI ³	PM _{2.5} (µg/m ³)
San Francisco to South San Francisco	1.1	<0.1	<0.1	<0.1	1.1	<0.1	<0.1	<0.1
San Bruno to San Mateo	2.3	<0.1	0.10	<0.1	2.3	<0.1	0.10	<0.1
San Mateo to Palo Alto	1.8	<0.1	0.10	<0.1	3.3	<0.1	0.10	<0.1
Mountain View to Santa Clara	3.6	<0.1	<0.1	<0.1	3.6	<0.1	<0.1	<0.1
San Jose Diridon Station Approach ⁴	5.5	<0.1	0.1	<0.1	3.8/3.9	<0.1/<0.1	0.2/0.2	<0.1/<0.1
BAAQMD Risk Threshold	10.0	1.0	1.0	0.3	10.0	1.0	1.0	0.3

Sources: AERMOD version 18081; OEHHA 2015; HARP 2 version 18159

< = less than

µg/m³ = micrograms of pollutant per cubic meter of air

BAAQMD = Bay Area Air Quality Management District

HI = hazard index

I- = Interstate

LMF = light maintenance facility

PM_{2.5} = particulate matter 2.5 microns or less in diameter

¹ Only the highest modeled off-site risk is presented for each subsection. The reported risk includes effects from combined construction of all features (e.g., at grade, embankment, station, LMF) in each subsection.

² Cancer risk represents the incremental increase in the number of cancers in a population of 1 million. Risks are cumulative of inhalation, dermal, soil, mother's milk, and crop pathways.

³ The hazard index (HI) is shown by pollutant contributions to the most affected organ system (respiratory).

⁴ Risks and concentrations are presented for Alternative B (Viaduct to I-880) first, followed by Alternative B (Viaduct to Scott Boulevard).

The California Public Resources Code, Section 21151.4, sets requirements for construction of any facility within 0.25 mile (1,320 feet) of a school that emits TACs in quantities that pose a health or safety hazard to humans at the school. Table 3.3-24 shows that predicted health risks at the maximally exposed receptor location (within 1,000 feet of the project footprint) would be less than the BAAQMD thresholds. Because DPM and PM_{2.5} concentrations decrease as a function of distance from the emissions source, health risks at schools located beyond 1,000 feet would be lower than reported in Table 3.3-24. Consequently, health risks at schools within 0.25 mile due to project construction activities also would be less than the BAAQMD thresholds, and therefore would not pose a health or safety hazard to humans.

CEQA Conclusion

The impact would be less than significant under CEQA for both project alternatives because the incremental increases in maximum cancer risk and noncancer health hazards would not exceed BAAQMD thresholds. Therefore, CEQA does not require any 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 ultramafic and metavolcanic bedrock. NOA may be present in Potrero Point because this hill is mapped as serpentinite, a metamorphosed ultramafic rock. Construction activities near the Potrero Point serpentinite would consist of minor track modifications in the existing Caltrain corridor. No major excavation of serpentinite rock is anticipated; therefore, the risk of exposure of construction workers and the public to airborne NOA would be limited. If NOA is disturbed, the design-build contractor will prepare a construction management plan that outlines practices for avoiding and minimizing 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* (BAAQMD 2002), which requires dust control measures to limit the potential for airborne asbestos.

The demolition of asbestos-containing materials is subject to the *National Emission Standards for Hazardous Air Pollutants* (40 C.F.R. Parts 61 and 63) and would require an asbestos inspection. The Authority would consult with the BAAQMD, as applicable, before demolition activities begin. The project will 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 demolitions and relocations, LBP and asbestos would be handled and disposed of in accordance with applicable standards.

The Authority will 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). These plans will minimize the potential exposure of the public and construction workers to these hazardous materials. A hazardous materials and waste plan, including procedures for hazardous waste transport, containment, and storage (HMW-IAMF#10), will further minimize potential health impacts on workers and community members during project demolition activities (Section 3.10).

Alternative B (Viaduct to Scott Boulevard) would require about 1,866,000 square feet of demolition, and therefore has greater potential to encounter and expose receptors to impacts from asbestos and LBP, compared to Alternative B (Viaduct to I-880), which would require about 1,678,000 square feet of demolition, or Alternative A, which would require about 817,000 square feet of demolition. The amount of construction effort for the DDV would be approximately the same as Alternative A without the DDV and thus the amount of demolition would be approximately the same. Under Alternative A with the DDV, the DDV would be constructed closer to a few sensitive receptors east of the construction area north of the SAP Center. The receptors closest to the DDV construction would be located farther away from construction than the most affected receptors along the rest of Alternative A without the DDV. Because the most affected receptors during DDV construction would be farther from the construction than would the most affected receptors without the DDV, potential exposure to asbestos and LBP at the nearest receptors during DDV construction would be less than at the most affected receptors without the DDV. Both project alternatives would use the same construction techniques and comply with the same regulations and standards to minimize exposure to these substances.

Valley fever is rare within the SFBAAB and NCCAB; it is more common in the SJVAB. AQ-IAMF#1 will minimize potential exposure to *C. immitis* during construction in the SFBAAB due to temporary ground-disturbing activities and operation of vehicles and equipment on unpaved roads by reducing emissions of fugitive dust. The project would not involve any earth disturbance in the NCCAB or SJVAB. The only activity associated with the project in the NCCAB or SJVAB

would be truck travel on SR 152 and I-5. These activities would not be expected to expose humans to *C. immitis*.

CEQA Conclusion

The impact would be less than significant under CEQA for both project alternatives 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 would not expose receptors to substantial public health risks related to asbestos and LBP.

Concerning Valley fever, temporary ground-disturbing activities and operation of vehicles and equipment on unpaved roads during construction in the SFBAAB would be conducted under a fugitive dust control plan (AQ-IAMF#1) and a safety and security management plan (SS-IAMF#1: Construction Safety Transportation Management Plan), which will minimize potential exposure to the fungus that leads to Valley fever. Because the only activity associated with the project in the NCCAB and SJVAB would be truck travel on SR 152 and I-5, the project would not expose receptors to substantial public health risks related to the *C. immitis* fungus. Impacts would thus be less than significant under CEQA. Therefore, CEQA does not require any mitigation.

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

Sources of odor during project 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. The equipment odors would be temporary and localized, and they would cease once construction activities have been completed. The BAAQMD has 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 similar for both project alternatives (with or without the DDV) because both project alternatives would use 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 for both project alternatives 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 any mitigation.

Operations Impacts

Operations of the project would include HSR train operations, maintenance activities and operation of stations and LMF. Operations and maintenance activities are more fully described in Chapter 2. All impacts of project operations and maintenance activities would occur within the SFBAAB; no operations impacts would occur in the NCCAB or the SJVAB.

Impact AQ#9: Continuous Permanent Direct Impacts on Air Quality in the SFBAAB

Operation of the project has the potential to reduce long-term air pollutant emissions in the Northern California region. The project would improve passenger rail opportunities, 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 operations of the project were quantified for 2015, 2029, and 2040 to capture changes in ridership and regional emission factors.

Table 3.3-25 through Table 3.3-27 summarize the estimated changes in regional emissions changes due to HSR operations under the medium and high ridership scenarios relative to 2015 existing conditions 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 between the project alternatives. These emissions changes would occur throughout the Northern California region. Emissions from operation of the stations and Brisbane LMF would be the same for both

project alternatives. Emissions from the stations and Brisbane LMF would occur locally at and near the building locations. Fugitive dust emissions from train movement would be similar for both project alternatives based on the length of the at-grade and embankment track. Refer to the Air Quality and Greenhouse Gases Technical Report (Authority 2021a, 2021b) for detailed emissions results by individual source (e.g., on-road vehicles, stations).

As shown in Tables 3.3-25 through 3.3-27, operations of the project 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 Brisbane LMF, relative to the 2015 existing conditions and 2029 and 2040 No Project conditions. Fugitive dust emissions would also increase because of train movement over the track. Electricity demands and the associated emissions from power plants would be the same for both project alternatives. Station and Brisbane LMF emissions would be the same for both project alternatives.

Although project operations would increase criteria pollutant emissions associated with power plants, train movement, stations, and the Brisbane LMF, it would result in emissions reductions from on-road vehicles and aircraft, relative to the 2015 existing conditions and 2029 and 2040 No Project conditions. These emissions benefits would be achieved by reductions in personal vehicle trips and aircraft activity; with a greater number of people traveling on the HSR system, fewer vehicle and aircraft trips would occur. Increases in gate-down time at grade crossings would increase vehicle idling emissions, but this increase would be more than compensated for by the reduction in regional emissions from on-road vehicles. Because the reductions in on-road vehicles and aircraft activity are directly tied to ridership, there would be no difference in emissions benefits between the project alternatives.

The emission savings due to reduced VMT are conservative because they do not consider the recently enacted SAFE Vehicles Rule. The SAFE Vehicles Rule relaxes the requirement for the reduction of GHG emissions from light-duty gasoline-powered vehicles, and thus causes an increase in estimated vehicle emissions for future model years over the emissions that were previously projected. As such, applying the SAFE Vehicles Rule would increase the benefits of the HSR VMT reductions by as much as 4 percent for certain criteria pollutants in 2040 (CARB 2020d). Nonetheless, the criteria pollutant emissions reductions achieved by changes in on-road vehicle and aircraft activity would more than offset the emissions increase from operations of the project (electricity, train movement, stations, and Brisbane LMF). Long-term operations of the Project Section and the larger HSR system would therefore result in a net reduction in operations emissions from the 2015 existing conditions and 2029 and 2040 No Project conditions.

CEQA Conclusion

The impact would be less than significant under CEQA for both alternatives because project operations are anticipated to result in a net reduction of criteria pollutant emissions. This reduction would be relative to existing conditions if emissions are compared for 2015, and would be relative to the No Project conditions if emissions are compared for 2029 and 2040. Project operations would not create a new violation of any air quality standard or contribute substantially to an existing or projected air quality violation. Reductions in regional O₃ precursors (VOC and NO_x) and PM emissions may contribute to reductions in O₃ and secondary PM formation, which may result in public health benefits, such as reductions in lost work days, hospital admissions, and certain respiratory and cardiovascular symptoms. Therefore, CEQA does not require any mitigation.

Table 3.3-25 Changes in Regional Criteria Pollutant Emissions from Project Operations (under the Medium and High Ridership Scenarios) Relative to the 2015 Existing Conditions

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)	
	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High
Indirect Emissions Change												
On-road vehicles	-11	-14	-413	-553	-41	-55	-1	-1	-28	-37	-8	-10
Aircraft	-40	-38	-341	-326	-328	-314	-35	-34	-10	-9	-10	-9
Power plants	1	1	13	14	6	7	1	1	2	2	1	2
Direct Emissions Change ¹												
Stations ^{2,3}	5	5	55	55	5	5	0	0	11	11	3	3
Brisbane LMF ³	2	2	3	3	1	1	0	0	1	1	0	0
Train movement ⁴									15	15	2	2
Total Emissions Change ⁵												
Project	-43	-44	-682	-806	-356	-355	-35	-34	-9	-18	-11	-13

Sources: Volume 2, Appendix 3.3-A; Authority 2019g; SJVAPCD 1996; USEPA 2006a; CAPCOA 2017

CO = carbon monoxide

I = Interstate

LMF = light maintenance facility

NO_x = nitrogen dioxide

PM_{2.5} = particulate matter 2.5 microns or less in diameter

PM₁₀ = particulate matter 10 microns or less in diameter

SO₂ = sulfur dioxide

VOC = volatile organic compound

yr = year

Values less than 0.5 have been rounded to zero.

Sum of individual values may not equal total due to rounding.

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 Existing and Existing Plus Project conditions).

³ Values for Alternative A and Alternative B (both viaduct options) are the same after rounding.

⁴ Train movement would only generate fugitive dust emissions. Emissions for Alternative A would be 15.5 tons/year PM₁₀ and 2.3 tons/year PM_{2.5}, for Alternative B (Viaduct to I-880) 14.6 tons/year PM₁₀ and 2.2 tons/year PM_{2.5}, and for Alternative B (Viaduct to Scott Boulevard) 13.9 tons/year PM₁₀ and 2.1 tons/year PM_{2.5}. Because of the similarity of these values, this table only reports the results for the highest alternative (Alternative A).

⁵ Total includes indirect and direct emissions.

Table 3.3-26 Changes in Regional Criteria Pollutant Emissions from Operation of the Project (under the Medium and High Ridership Scenarios) Relative to 2029 No Project Conditions

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)	
	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High
Indirect Emissions Change												
On-road vehicles	-2	-2	-103	-138	-8	-10	0	-1	-20	-27	-5	-7
Aircraft	-26	-28	-216	-237	-213	-233	-23	-25	-6	-7	-6	-7
Power plants	1	1	11	12	6	6	1	1	1	1	1	1
Direct Emissions Change¹												
Stations ^{2,3}	1	1	12	12	1	1	0	0	6	6	2	2
LMF ³	2	2	2	2	1	1	0	0	1	1	0	0
Train movement ⁴									15	15	2	2
Total Emissions Change⁵												
Project	-24	-27	-294	-349	-213	-236	-23	-25	-3	-10	-6	-8

Sources: Volume 2, Appendix 3.3-A; Authority 2019g; SJVAPCD 1996; USEPA 2006a; CAPCOA 2017

CO = carbon monoxide

I- = Interstate

LMF = light maintenance facility

NO_x = nitrogen dioxide

PM_{2.5} = particulate matter 2.5 microns or less in diameter

PM₁₀ = particulate matter 10 microns or less in diameter

SO₂ = sulfur dioxide

VOC = volatile organic compound

yr = year

Values less than 0.5 have been rounded to zero.

Sum of individual values may not equal total due to rounding.

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 No Project and Project conditions).

³ Values for Alternative A and Alternative B (both viaduct options) are the same after rounding.

⁴ Train movement would only generate fugitive dust emissions. Emissions for Alternative A would be 15.5 tons/year PM₁₀ and 2.3 tons/year PM_{2.5}, for Alternative B (Viaduct to I-880) 14.6 tons/year PM₁₀ and 2.2 tons/year PM_{2.5}, and for Alternative B (Viaduct to Scott Boulevard) 13.9 tons/year PM₁₀ and 2.1 tons/year PM_{2.5}. Because of the similarity of these values, this table only reports the results for the highest alternative (Alternative A).

⁵ Total includes indirect and direct emissions.

Table 3.3-27 Changes in Regional Criteria Pollutant Emissions from Operation of the Project (under the Medium and High Ridership Scenarios) Relative to the 2040 No Project Conditions

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)	
	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High
Indirect Emissions Change												
On-road vehicles	-2	-2	-135	-154	-9	-11	-1	-1	-38	-51	-10	-13
Aircraft	-55	-53	-459	-440	-452	-433	-49	-47	-14	-13	-14	-13
Power plants	1	1	12	14	6	7	1	1	1	2	1	2
Direct Emissions Change¹												
Stations ^{2,3}	2	2	17	17	2	2	0	0.0	12	12	3	3
LMF ³	2	2	2	2	1	1	0	0.0	1	1	0	0
Train movement ⁴									15	15	2	2
Total Emissions Change⁵												
Project	-52	-49	-563	-561	-452	-435	-49	-47	-21	-33	-16	-19

Sources: Volume 2, Appendix 3.3-A; Authority 2019g; SJVAPCD 1996; USEPA 2006a; CAPCOA 2017

CO = carbon monoxide

I- = Interstate

LMF = light maintenance facility

NO_x = nitrogen dioxide

PM_{2.5} = particulate matter 2.5 microns or less in diameter

PM₁₀ = particulate matter 10 microns or less in diameter

SO₂ = sulfur dioxide

VOC = volatile organic compound

yr = year

Values less than 0.5 have been rounded to zero.

Sum of individual values may not equal total due to rounding.

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 No Project and Project conditions)

³ Values for Alternative A and Alternative B (both viaduct options) are the same after rounding.

⁴ Train movement would only generate fugitive dust emissions. Emissions for Alternative A would be 15.5 tons/year PM₁₀ and 2.3 tons/year PM_{2.5}, for Alternative B (Viaduct to I-880) 14.6 tons/year PM₁₀ and 2.2 tons/year PM_{2.5}, and for Alternative B (Viaduct to Scott Boulevard) 13.9 tons/year PM₁₀ and 2.1 tons/year PM_{2.5}. Because of the similarity of these values, this table only reports the results for the highest alternative (Alternative A).

⁵ Total includes indirect and direct emissions.

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

During operations, either project alternative would result in net decreases in all criteria pollutant emissions (VOC, CO, NO_x, SO₂, PM₁₀ and PM_{2.5}) when compared to 2015 existing conditions and 2029 and 2040 No Project conditions, as shown in Tables 3.3-24 through 3.3-27. This would be consistent with the BAAQMD's air quality plans, as well as the local RTP. 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, operations of the project would not conflict with or obstruct implementation of applicable air quality plans. Therefore, CEQA does not require any mitigation.

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

The Authority performed a CO hot-spot analysis for intersections that could cause a localized CO hot spot. Intersections were screened, selected, and modeled as described in Section 3.3.4.3. Traffic data provided by Fehr & Peers (see Volume 2, Appendix 3.3-A) indicate that no intersections in the local RSA would have volumes of more than the BAAQMD criterion of 24,000 vehicles per hour (the lower of BAAQMD's two screening criteria; see Section 3.3.4.5), but some intersections do not meet the BAAQMD criterion that the project be consistent with an applicable congestion management program. Intersections with an LOS that is better than the established LOS standard in the applicable congestion management program under 2040 Plus Project conditions were considered to be consistent with the congestion management program. Intersections that would have LOS that is equal to or worse than the established LOS standard in the applicable congestion management program under 2040 Plus Project conditions were considered to be potentially not consistent with the congestion management program, and therefore were considered for further analysis.

Thirty-nine intersections along the Caltrain corridor between 4th and King Street Station in San Francisco and West Alma Avenue in San Jose would have existing or predicted LOS in 2040 equal to or worse than the established LOS standards in the congestion management program. The following eight intersections with the highest traffic volumes and worst congestion in 2040 were selected for CO modeling:

- Bayshore Boulevard/Geneva Avenue (Brisbane)
- El Camino Real (SR 82)/Millbrae Avenue (Millbrae)
- El Camino Real (SR 82)/Palo Alto Avenue—Sand Hill Road (Palo Alto)
- Central Expressway/Rengstorff Avenue (Mountain View)
- Central Expressway/Moffett Boulevard—Castro Street (Mountain View)
- Coleman Avenue/Interstate (I-) 880 Northbound Ramps (San Jose)
- The Alameda (former SR 82)/Taylor Street—Naglee Avenue (San Jose)
- Autumn Street (former SR 82)/West Santa Clara Street (former SR 82) (San Jose)

A microscale CO hot-spot analysis at five intersections near the 4th and King Street Station was performed separately for 2029 because this station would no longer be in use by 2040. The following five intersections with the highest traffic volumes and worst congestion near the 4th and King Street Station in 2029 were selected for CO modeling:

- Fourth Street/King Street
- Fifth Street/King Street/I-280 Ramps
- Owens Street/16th Street
- Fifth Street/Bryant Street
- Third Street/16th Street

The modeled CO concentrations were adjusted to reflect the impact of the SAFE Vehicles Rule (CARB 2020d) and were combined with CO background concentrations. The total ambient CO concentrations were then compared to the air quality standards. Results would be the same for either project alternative because projected traffic volumes would be the same for both. Table 3.3-28 shows the CO hot-spot analysis results and shows that CO concentrations are not anticipated to exceed the 1- or 8-hour NAAQS and CAAQS for either project alternative.

Table 3.3-28 Carbon Monoxide Modeling Concentration Results at Roadway Intersections

Intersection and Year	Receptor ID ¹	1-Hour Concentration ² (ppm)		8-Hour Concentration ³ (ppm)	
		No Project	Plus Project	No Project	Plus Project
2029					
4th Street/King Street	21	2.9	2.9	1.9	1.9
	22	2.9	2.9	1.9	1.9
	23	2.9	2.9	1.9	1.9
	24	2.9	2.9	1.9	1.9
5th Street/King Street/ I-280 Ramps	25	2.9	2.9	1.9	1.9
	26	2.9	2.9	1.9	1.9
	27	3.0	3.0	2.0	2.0
	28	3.0	3.0	2.0	2.0
Owens Street/16th Street	29	2.7	2.7	1.8	1.8
	30	2.6	2.6	1.7	1.7
	31	2.6	2.6	1.7	1.7
	32	2.6	2.6	1.7	1.7
5th Street/Bryant Street	33	2.6	2.7	1.7	1.8
	34	2.7	2.8	1.8	1.9
	35	2.7	2.7	1.8	1.8
	36	2.7	2.7	1.8	1.8
3rd Street/16th Street	37	2.7	2.7	1.8	1.8
	38	2.8	2.8	1.9	1.9
	39	2.8	2.8	1.9	1.9
	40	2.6	2.6	1.7	1.7
2040					
El Camino Real (SR 82)/ Millbrae Avenue	1	3.9	3.9	2.1	2.1
	2	3.8	3.8	2.1	2.1
	3	3.8	3.8	2.1	2.1
	4	3.8	3.8	2.1	2.1
El Camino Real (SR 82)/Palo Alto Avenue-Sand Hill Road	5	3.7	3.7	2.0	2.0
	6	3.8	3.8	2.1	2.1
	7	4.0	4.0	2.2	2.2
	8	3.9	3.9	2.1	2.1

Intersection and Year	Receptor ID ¹	1-Hour Concentration ² (ppm)		8-Hour Concentration ³ (ppm)	
		No Project	Plus Project	No Project	Plus Project
Central Expressway/ Rengstorff Avenue	9	3.8	3.8	2.1	2.1
	10	3.9	3.9	2.1	2.1
	11	3.8	3.8	2.1	2.1
	12	3.8	3.8	2.1	2.1
Central Expressway/Moffett Boulevard-Castro Street	13	3.8	3.8	2.1	2.1
	14	3.9	3.9	2.1	2.1
	15	3.9	3.9	2.1	2.1
	16	3.8	3.8	2.1	2.1
Bayshore Boulevard/Geneva Avenue	17	3.6	3.6	1.9	1.9
	18	3.7	3.7	2.0	2.0
	19	3.6	3.6	1.9	1.9
	20	3.9	3.9	2.1	2.1
Coleman Avenue/I-880 Northbound Ramps	21	2.9	2.9	2.3	2.3
	22	3.0	3.1	2.3	2.4
	23	3.0	3.0	2.3	2.3
	24	3.1	3.1	2.4	2.4
The Alameda (former SR 82)/ Taylor Street-Naglee Avenue	25	3.0	3.0	2.3	2.3
	26	2.9	3.0	2.3	2.3
	27	3.0	3.0	2.3	2.3
	28	3.0	3.0	2.3	2.3
Autumn Street (former SR 82)/ West Santa Clara Street (former SR 82)	29	2.9	2.9	2.3	2.3
	30	2.8	2.9	2.2	2.3
	31	2.9	3.0	2.3	2.3
	32	2.9	3.0	2.3	2.3
State standard (ppm)		20	20	9	9
Federal standard (ppm)		35	35	9	9

Sources: Volume 2, Appendix 3.3-A; Garza et al. 1997

Caltrans = California Department of Transportation

I = Interstate

ID = identifier

ppm = parts per million

SR = State Route

¹ Consistent with Caltrans methods (Garza et al. 1997), receptors are located 3 meters from the intersection at each of the four corners to represent the nearest location in which a receptor could potentially be adjacent to a traveled roadway. The modeled receptors indicated do not necessarily represent actual sensitive receptors. Receptor locations are theoretical and may not reflect actual locations.

² An average 1-hour background concentration of 2.00 ppm was assumed for 2029, based on 2015–2017 measured data at the Redwood City—Barron Avenue monitoring site (USEPA 2018a). An average 1-hour background concentration of 2.80 ppm was assumed for 2040, based on 2015–2017 measured data at the San Francisco—Arkansas Street monitoring site (USEPA 2018a).

³ An average 8-hour background concentration of 1.27 ppm was assumed for 2029, based on 2015–2017 measured data at the Redwood City—Barron Avenue monitoring site (USEPA 2018a). An average 1-hour background concentration of 1.37 ppm was assumed for 2040, based on 2015–2017 measured data at the San Francisco—Arkansas Street monitoring site (USEPA 2018a).

CEQA Conclusion

The impact would be less than significant under CEQA for both 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 impacts. Therefore, CEQA does not require any mitigation.

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 the 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 the 2015 existing and 2029 and 2040 No Project conditions; 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.

Although reductions in regional MSATs are expected because of decreased VMT, localized increases in MSAT emissions could occur near the stations and the LMF because of additional passenger and employee commute trips. These increases would not be considered to have “higher potential MSAT effects” per FHWA guidance because the anticipated change in local average daily traffic would not exceed the FHWA’s (2016) MSAT threshold 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 FHWA’s MSAT 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. Although there may be differences among the project alternatives with respect to localized MSAT emissions, 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 both 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 any mitigation.

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

The BAAQMD is designated nonattainment for PM_{2.5}. To identify locations where a quantitative PM₁₀/PM_{2.5} analysis may be warranted, analysts used criteria for a “project of air quality concern” as defined in USEPA (2015) guidance. Analysts considered that if a location or facility meets one

of these criteria, then a quantitative $PM_{10}/PM_{2.5}$ analysis would be warranted.³⁰ 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.
- **Projects affecting intersections that are at LOS D, E, or F with a significant number of diesel vehicles or those that would degrade to LOS D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project**—The traffic volume increases at the affected intersections would be from mostly gasoline-powered passenger cars and transit buses operated by the San Mateo County Transit District (SamTrans) and San Francisco Municipal Railway (MUNI) that are a mix of diesel, diesel-electric, and electric trolleys. MUNI has plans for an all-electric bus fleet by 2035 (San Francisco Municipal Transit Authority 2018). SamTrans has committed to an all-electric bus fleet by 2033 (SamTrans 2018).
- **New or expanded bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location**—The project would not have new or expanded bus or rail terminals or transfer points that significantly increase the number of diesel vehicles congregating at a single location. Increased bus service to the passenger rail terminals 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. SamTrans and MUNI have plans to transition to all-electric bus fleets that will also reduce diesel bus emissions over time. The Brisbane LMF may be accessed by diesel vehicles, but the projected volume is only 20 or fewer trucks per day.
- **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 a site of violation or possible violation in the USEPA-approved SIP.

Based on this evaluation, neither project alternative meets the above criteria. Therefore, a quantitative analysis is not warranted and neither alternative would violate the $PM_{10}/PM_{2.5}$ health-protective NAAQS or have an adverse localized impact with respect to PM on sensitive receptors during project operations.

CEQA Conclusion

The impact would be less than significant under CEQA for both alternatives because the project would not violate the $PM_{10}/PM_{2.5}$ health-protective NAAQS or have an adverse localized impact with respect to PM on sensitive receptors during project operations. Changes in on-road vehicle operation associated with the project 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 any mitigation.

³⁰ Although the project is not subject to transportation conformity, the USEPA's 2015 *Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (USEPA 2015) was used in the analysis of localized $PM_{2.5}$ impacts because it is the most appropriate technical guidance available for this purpose. This use of the guidance to assess localized $PM_{2.5}$ impacts for the project does not imply that the project is subject to transportation conformity or that any part of the project is a Project of Air Quality Concern as defined in 40 C.F.R. Section 93.123(b)(1).

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

Shifting of tracks carrying freight trains to accommodate higher speeds for existing and new passenger rail 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 shifted track. Health risks to the closest receptors along shifted track sections were estimated using the BAAQMD's rail inventory tool and the methods described in Section 3.3.4.3. The analysis assumes conservatively that the track shift would be complete in 2022. Accordingly, emissions exposure under the shifted track scenario and the No Project conditions were assumed to begin in 2022. Existing conditions reflect the risks that would occur if the freight tracks were not shifted and exposure to emissions began in 2015.

Table 3.3-29 shows the incremental change in health risks between the existing, project, and No Project conditions. In Table 3.3-29, the receptor at which the project would have the greatest impact is listed for each subsection. As shown in this table, track shifts would result in both increases and decreases in cancer and noncancer health risks, relative to 2015 existing conditions. The decreases occur primarily because of advancements in locomotive emissions control technology and the retirement of older, higher-emitting engines, which would reduce future DPM emission rates. At locations where risks would decrease compared to 2015 existing conditions, the reduction in future locomotive emission rates is enough to offset the increased risk associated with shifting freight trains closer to existing receptors. At locations where risks would increase, the decrease in distance to receptors due to the track shift is relatively large, leading to a relatively large increase in risk. As a result, the reduction in locomotive emission rates would not be enough to offset the increased risk associated with shifting freight trains closer to existing receptors.

The comparison of project to No Project conditions accounts for changes in locomotive emission rates because both conditions assume exposure begins in 2022. Accordingly, the comparison of risks to the No Project conditions reflects the incremental project impact, exclusive of background trends. As shown in Table 3.3-29, compared to the No Project conditions, the track shifts would result in minor increases in cancer and noncancer health risks at modeled receptor locations. However, these increases, including increases under Alternative A with the DDV, would not exceed BAAQMD thresholds. The analysis only evaluates locations where tracks would be moved closer to receptors. In many of these locations, receptors on the other side of the track would experience a corresponding health benefit because freight trains would be moved farther away from these receptors.

Table 3.3-29 Summary of Changes in Cancer and Noncancer Health Risks from Freight Trains on Shifted Track Relative to Existing Conditions and No Project Conditions

Subsection and Location	Change in Risk in 2022 with the Track Shifts Relative to Risk under Existing (2015) Conditions ^{1,2}			Change in Risk in 2022 with the Track Shifts Relative to Risk under No Project (2022) Conditions ^{3,4}		
	Cancer	Chronic HI	PM _{2.5} (µg/m ³)	Cancer	Chronic HI	PM _{2.5} (µg/m ³)
San Francisco to South San Francisco						
Near San Francisco Avenue and Santa Clara Street	-5.6	<0.01	<0.01	0.8	<0.01	<0.01
San Bruno to San Mateo						
Near Hillcrest Boulevard and Hemlock Avenue	1.4	<0.01	<0.01	8.0	<0.01	<0.01
San Mateo to Palo Alto						
Near El Camino Real and Morse Boulevard	-3.7	<0.01	<0.01	4.3	<0.01	<0.01
Mountain View to Santa Clara						
N/A ⁵	N/A	N/A	N/A	N/A	N/A	N/A
San Jose Diridon Station Approach						
Near Chestnut Street and Asbury Street ⁶	-17.2	<0.01	-0.03	5.2	<0.01	<0.01
Near Harrison Street and Fuller Ave ⁶	-3.9	<0.01	<0.01	5.6	<0.01	0.01
Near West Julian Street and North Montgomery Street ⁷	-12.8	<0.0	<0.0	8.4	<0.1	<0.1
BAAQMD Threshold	10.0	1.0	0.3	10.0	1.0	0.3

Sources: Winkel 2018; Peninsula Corridor Joint Powers Board 2015; OEHHA 2015

< = less than

µg/m³ = micrograms of pollutant per cubic meter of air

BAAQMD = Bay Area Air Quality Management District

HI = hazard index

HSR = high-speed rail

N/A = not applicable: no locations with both substantial track shifts and nearby receptors were identified in this subsection.

PM_{2.5} = particulate matter 2.5 microns or less in diameter

Risks apply to both alternatives unless noted otherwise.

¹ Existing conditions reflect the risks that would occur if the tracks were not shifted and exposure to emissions began in 2015.

² The change in risk represents the effects of decreased distance from the freight trains to the receptors due to the track shift, decreased emissions from freight trains due to locomotive fleet turnover from 2015 to 2022, and projected increases in freight train volumes from 2015 to 2022.

³ No Project conditions reflect the risks that would occur if the tracks were not shifted and exposure to emissions began in 2022.

⁴ The change in risk represents the effect of decreased distance from the freight trains to the receptors, due to the track shift, in 2022. Though the track shift is associated with the project, there is no change in risk due to the HSR service because the HSR trains are electric and do not produce emissions along the alignment.

⁵ No locations with both substantial track shifts and nearby receptors were identified in this subsection.

⁶ Risks apply to Alternative A only. No track would be shifted in the San Jose Diridon Station Approach Subsection under Alternative B.

⁷ The track shift near West Julian Street and North Montgomery Street would only occur under Alternative A with the DDV and would shift freight operations approximately 37 feet closer to receptors along West Julian Street and North Montgomery Street.

The 4th and King Street, Millbrae, and San Jose Diridon Stations currently have emergency generators (one at each station) for use in the event of a power outage. The project includes installation of a second fully permitted generator at Millbrae Station and an additional two fully permitted generators at San Jose Diridon Station. The LMF would also have a generator. The generators would comply with the permitting requirements specified in BAAQMD Regulation 2, Rule 5 as discussed in Section 3.3.4.3, which prohibits their operation if cancer or acute hazards exceed air district thresholds. Accordingly, cancer risk and acute hazards from generator testing at the stations and LMF would not exceed BAAQMD thresholds. Regulation 2, Rule 5 does not establish any permit restrictions on PM_{2.5} concentrations in the BAAQMD. PM_{2.5} exhaust concentrations from emergency generator testing were estimated using emissions data from CalEEMod and USEPA's AERMOD dispersion model and compared to BAAQMD's PM_{2.5} threshold. Table 3.3-30 shows the results of the health risk analysis for PM_{2.5} at the stations and LMF. Maximum PM_{2.5} concentrations from testing of the emergency generators would be less than BAAQMD's health risk thresholds of significance for both project alternatives.

Table 3.3-30 Maximum PM_{2.5} Concentrations from Operation of Emergency Generators at Project Stations and the Light Maintenance Facility

Generator Location/Condition	Maximum PM _{2.5} Concentration (µg/m ³)
2015 Existing/2029 and 2040 No Project	
4th and King Street Station	<0.1
Millbrae Station	<0.1
San Jose Diridon Station	<0.1
2029/2040 Plus Project	
4th and King Street Station	<0.1
Millbrae Station	<0.1
East Brisbane LMF (Alternative A)	<0.1 ¹
West Brisbane LMF (Alternative B)	<0.1 ¹
San Jose Diridon Station	<0.1
Project vs. Existing and No Project Conditions²	
4th and King Street Station	<0.1
Millbrae Station	<0.1
East Brisbane LMF (Alternative A)	<0.1 ¹
West Brisbane LMF (Alternative B)	<0.1 ¹
San Jose Diridon Station	<0.1
BAAQMD Threshold	0.3

Source: AERMOD version 18081

< = less than

µg/m³ = micrograms of pollutant per cubic meter of air

BAAQMD = Bay Area Air Quality Management District

LMF = light maintenance facility

PM_{2.5} = particulate matter 2.5 microns or less in diameter

Risks apply to both alternatives unless noted otherwise.

¹ No sensitive receptors would be within 1,000 feet of the emergency generators at the Brisbane LMF under either alternative. Accordingly, a health risk assessment is not required, consistent with BAAQMD (2017a) guidance.

² Represents the net concentration effect of the project (i.e., the difference in between the existing/No Project and the project condition)

CEQA Conclusion

The impact would be less than significant under CEQA for both alternatives, including Alternative A with the DDV, because operations-related DPM and PM_{2.5} concentrations would not exceed BAAQMD's cancer and noncancer risk thresholds. Therefore, CEQA does not require any 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. Some area source emissions would be associated with station and LMF 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 both alternatives. The solvent and paint use would have the potential to cause odors at nearby sensitive receptors. However, any potential odor emissions would be similar to those from solvent and paint use at existing land uses in the area and would not represent new or unique odors, relative to those under the No Project conditions.

CEQA Conclusion

The impact would be less than significant under CEQA for both alternatives 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 any mitigation.

3.3.6.3 Greenhouse Gases

Long-term operations of the project would result in a net reduction of regional and statewide GHG emissions when compared to 2015 existing conditions and the 2029 and 2040 No Project conditions. Construction of the project would result in the temporary 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 in approximately 2 to 7 months. Accordingly, the project would result in a net decrease in GHG emissions that 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 3.3.6.2, reasonably foreseeable projects throughout Northern California would result in emissions from on-road vehicles, aircraft, and power plant sources. The emissions intensity of on-road vehicles and aircraft would improve in the future, and these improvements would reduce total GHG emissions under the No Project conditions. Additionally, because of the state requirement that an increasing fraction (100 percent by 2045) of electricity generated for the state's power portfolio come from renewable energy sources, emissions from power plant sources in the future likely 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**

Construction of the project would generate GHG emissions impacts from heavy-duty construction equipment, construction worker vehicles, truck hauling, and concrete/cement manufacture and hauling during the construction period. Table 3.3-31 summarizes total estimated GHG emissions associated with project construction. In Table 3.3-31 the payback period indicates the amount of time of project operation that would be required for the project-associated GHG reductions to equal (or "pay back") the total construction GHG emissions.

Table 3.3-31 reflects the impact of the SAFE Vehicles Rule (CARB 2020d). The emissions results assume 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 Reports (Authority 2021a, 2021b) for annual emission results. The total GHG construction emissions of the project would be 0.051 to 0.062 percent of the total annual statewide GHG emissions, depending on the alternative.³¹

Table 3.3-31 Comparison of Carbon Dioxide–Equivalent Construction Emissions for the Project Alternatives

Year	CO ₂ e Emissions (MT/year)			
	Alternative A ¹		Alternative B ²	
2021	20,085		22,615/22,615	
2022	55,561		65,035/65,035	
2023	51,179		64,909/65,972	
2024	45,251		61,685/62,102	
2025	46,087		50,494/47,636	
2026	14		18/0	
Construction total	218,177		264,756/263,359	
Amortized GHG Emissions (averaged over 25 years³)				
CO ₂ e per year for total construction	8,727		10,590/10,534	
Payback of GHG Emissions (months)⁴				
Ridership scenario	Medium	High	Medium	High
Payback period (project vs. 2015 existing conditions)	1.9	1.5	2.3/2.3	1.8/1.8
Payback period (project vs. 2029 No Project conditions)	4.5	6.1	5.4/5.4	7.4/7.3
Payback period (project vs. 2040 No Project conditions)	2.5	1.6	3.0/3.0	1.9/1.9

Sources: CAPCOA 2017; CARB 2018a; The Climate Registry 2017; Scholz 2018, 2020, 2021

CO₂e = carbon dioxide equivalent

GHG = greenhouse gas

MT = metric tons

Emission factors for CO₂e do not account for improvements in technology over time that would reduce emissions.

¹ The construction effort and materials with the DDV would be approximately the same as Alternative A without the DDV; therefore, associated GHG emissions would be approximately the same with and without the DDV.

² Emissions are presented for Alternative B (Viaduct to I-880) first, followed by Alternative B (Viaduct to Scott Boulevard).

³ Project life is assumed to be 25 years.

⁴ Payback periods were estimated by dividing the total GHG emissions during construction years by the annual GHG emission reduction during operations. See Table 3.3-32 for operations GHG emission-reduction data. The range in payback time represents the range of emissions changes based on the medium and high ridership scenarios and the project alternatives. For example, the annual GHG reduction with the project compared to 2015 existing conditions under the medium ridership scenario is 1.37 million MT (1,370,000 MT) (Table 3.3-32). The total construction emissions for Alternative A are 218,177 MT (Table 3.3-31). The payback period is 218,177 ÷ 1,370,000 = 0.16 years or 1.9 months as shown in Table 3.3-31.

Long-term operations of the project would result in a net GHG reduction, relative to the 2015 existing conditions and the 2029 and 2040 No Project conditions. To provide a comparison to long-term project operations, construction emissions were amortized over a 25-year project life (although the actual project life would be much longer). Total amortized GHG construction emissions for the project were estimated to be 8,727 metric tons of carbon dioxide equivalent

³¹ 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 the most recent CARB emissions inventory (2020a), which estimated that the annual CO₂e emissions in California are about 429 million metric tons (CARB 2020a).

(CO₂e) per year under Alternative A, 10,590 metric tons of CO₂e per year under Alternative B (Viaduct to I-880), and 10,534 metric tons of CO₂e per year under Alternative B (Viaduct to Scott Boulevard). The increase in GHG emissions generated by construction would be offset in about 2 to 7 months of operations (because car and aircraft trips removed in the RSA by the project would reduce emissions relative to the No Project conditions), depending on the ridership scenario and alternative.

CEQA Conclusion

The impact would be less than significant under CEQA for both alternatives because emission reductions during operations from reduced auto and aircraft trips would offset the temporary construction-related contribution to increased GHG emissions. Construction of the project would generate GHG emissions between 2021 and 2026. However, these emissions would be fully offset in about 2 to 7 months of operations (depending on the ridership scenario and alternative). Within a few months of operation, the project would result in annual emissions reductions and a GHG benefit. Additionally, the project is identified in the CARB's AB 32 Scoping Plan and 2017 Scoping Plan as a component of a sustainable transportation system, and would be consistent with the state's plan to achieve GHG emissions reductions in the long term. GHG reductions would occur for each year that the HSR system is operational, resulting in long-term GHG reductions during the post-2020 period. Such reductions in the post-2020 period would be consistent with the statewide goal specified in SB 32. Consequently, the project would not impede the state from meeting the statewide GHG emissions targets. Therefore, CEQA does not require any mitigation.

Operations Impacts

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

Operations of the project have the potential to create permanent GHG impacts through operation of the stations and Brisbane LMF. The project would improve passenger rail opportunities, 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 3.3-32 summarizes the estimated net operations emissions under the medium and high ridership scenarios relative to 2015 existing conditions and the 2029 and 2040 No Project conditions (expressed in terms of CO₂e). 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 the same for both project alternatives. Emissions from operation of the stations and LMF would be the same for both alternatives. Refer to the Air Quality and Greenhouse Gases Technical Report (Authority 2021a, 2021b) for detailed emissions results by individual source (e.g., on-road vehicles, stations).

As shown in Table 3.3-32, operations of the project under both 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 and Brisbane LMF, relative to the 2015 existing conditions and the 2029 and 2040 No Project conditions. Electricity demands and the associated emissions from power plants would be the same for both project alternatives. Direct emissions from the stations and Brisbane LMF would also be the same for both project alternatives.

Table 3.3-32 Changes in Statewide Greenhouse Gas Emissions from Project Operations under the Medium and High Ridership Scenarios Compared to Existing, 2029, and 2040 No Project Conditions

Emission Source	Change in CO ₂ e Emissions from HSR (Million MT/year)	
	Medium	High
Existing Plus Project Emissions Relative to 2015 Existing Conditions		
<i>Indirect Emissions Change</i>		
On-road vehicles	-1.07	-1.47
Aircraft	-0.70	-0.67
Power plants	0.35	0.39
<i>Direct Emissions Change¹</i>		
Stations and Brisbane LMF	0.02	0.02
Total Emissions Change²	-1.40	-1.73
2029 Plus Project Emissions Relative to 2029 No Project Conditions		
<i>Indirect Emissions Change</i>		
On-road vehicles	-0.45	-0.27
Aircraft	-0.46	-0.50
Power plants	0.30	0.33
<i>Direct Emissions Change¹</i>		
Stations and Brisbane LMF	0.01	0.01
Total Emissions Change²	-0.60	-0.43
2040 Plus Project Emissions Relative to 2040 No Project Conditions		
<i>Indirect Emissions Change</i>		
On-road vehicles	-0.49	-1.11
Aircraft	-0.97	-0.94
Power plants	0.35	0.39
<i>Direct Emissions¹</i>		
Stations and Brisbane LMF	0.02	0.02
Total Emissions Change²	-1.09	-1.64

Sources: Volume 2, Appendix 3.3-A; Authority 2019g; CAPCOA 2017

CO₂e = carbon dioxide equivalent

HSR = high-speed rail

LMF = light maintenance facility

MT = metric tons

Sum of individual values may not equal total due to rounding.

¹ Sum of station and LMF emissions. Represents the net emissions effect of the project (i.e., the difference in operating emissions between existing or No Project condition and the project condition).

² The total includes the indirect and direct emissions.

Although operations of the project would increase GHG emissions associated with power plants, stations, and the Brisbane LMF, it would result in emissions reductions from on-road vehicles and aircraft, relative to the 2015 existing conditions and the 2029 and 2040 No Project conditions. Reductions in vehicle trips and aircraft activity would achieve these emissions benefits; with more people traveling on the HSR system, fewer vehicle and aircraft miles would occur. Because the reductions in on-road vehicle and aircraft activity are directly tied to ridership, there would be no difference in emissions benefits between the alternatives. Increases in gate-down time at at-grade crossings would increase vehicle idling emissions, but this increase would be more than compensated for by the reduction in regional emissions from on-road vehicles.

The emission savings due to reduced VMT are conservative because they do not consider the recently enacted SAFE Vehicles Rule. The SAFE Vehicles Rule relaxes the requirement for the reduction of GHG emissions from light-duty gasoline-powered vehicles, and thus causes an increase in estimated vehicle emissions for future model years over the emissions that were previously projected. As such, applying the SAFE Vehicles Rule would increase the benefits of the HSR project's VMT reductions by as much as 10 percent for CO₂ emissions in 2040 (CARB 2020d). The GHG reductions achieved by changes in on-road vehicles and aircraft activity would more than offset the emissions increase from operations of the project (electricity, stations, and Brisbane LMF). Long-term operations of the project and the larger HSR system therefore would result in a net reduction in operations emissions from the 2015 existing conditions and the 2029 and 2040 No Project conditions. These emissions benefits would begin accumulating after construction emissions are offset, which as noted above, would occur within 2 to 7 months of project operation.

As described in Section 3.3.4.5, 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 GHG emissions targets. The project is discussed in CARB's AB 32 Scoping Plan and update as a key strategy to meet California's long-term air quality and climate objectives (CARB 2017a). As indicated in Table 3.3-32, either project alternative 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 construction emissions. Therefore, the project would have a beneficial contribution towards meeting California's GHG reduction goals. Because the project is committed to using 100 percent renewable energy for electricity and the system runs on electricity (thus displacing vehicle fossil fuel emissions), the project would also help the state meet the 2045 goal of carbon neutrality in EO B-55-18.

CEQA Conclusion

The impact would be less than significant under CEQA for both alternatives because operations of the project would result in net statewide reductions of GHG emissions as travel modes shift away from on-road vehicles and aircraft trips to the HSR system, which would avoid significant impacts from GHGs on the environment. Additionally, the HSR project is discussed in the CARB's AB 32 Scoping Plan and 2017 Scoping Plan and would help the state attain its 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 any mitigation.

3.3.7 Mitigation Measures

Construction emissions of NO_x would exceed the BAAQMD threshold under both project alternatives, and would exceed the BAAQMD ROG threshold under Alternative B. 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.

Construction activities under both alternatives would not result in exceedances of applicable local air district health risk thresholds or criteria; however, they would increase existing exceedances of the CAAQS for PM₁₀ and result in new exceedances of the annual CAAQS for PM_{2.5}.

AQ-MM#1 and AQ-MM#2 will address impacts on air quality from project construction. There would be no significant impacts under CEQA associated with project operations and therefore no mitigation measures are required for project operations.

AQ-MM#1: Construction Emissions Reductions—Requirements for Use of Zero Emission and/or Near Zero Emission Vehicles and Off-Road Equipment

This mitigation measure will reduce the impact of construction emissions from project-related on-road vehicles and off-road equipment.

The Authority and all project construction contractors will require that a minimum of 25 percent, with a goal of 100 percent, of all light-duty on-road vehicles (e.g., passenger cars, light-duty trucks) associated with the project (e.g., on-site vehicles, contractor vehicles) use zero emission (ZE) or near-zero emission (NZE) technology.

The Authority and all project construction contractors will have the goal that a minimum of 25 percent of all heavy-duty on-road vehicles (e.g., for hauling, material delivery and soil import/export) associated with the project use ZE or NZE technology.

The Authority and all project construction contractors will have the goal that a minimum of 10 percent of off-road construction equipment use ZE or NZE vehicles.

If local or state regulations mandate a faster transition to using ZE and/or NZE vehicles at the time of construction, the more stringent regulations will be applied. For example, EO N-79-20, issued by California Governor Newsom September 23, 2020, currently states the following:

- Light-duty and passenger car sales be 100 percent ZE vehicles by 2035
- Full transition to ZE short haul/drayage trucks by 2035
- Full transition to ZE heavy-duty long-haul trucks, where feasible, by 2045
- Full transition to ZE off-road equipment by 2035, where feasible

The project will have a goal of surpassing the requirements of these or other future regulations as a mitigation measure.

Because the commercial availability of future electric equipment and vehicles is unknown, emissions reductions achieved by AQ-MM#1 cannot currently be quantified or included in the analysis.

AQ-MM#2: Offset Project Construction Emissions in the SFBAAB

Prior to issuance of construction contracts, the Authority will be required to enter into an agreement with BAAQMD to reduce ROG/VOC and NO_x emissions to the required levels. The required levels in the SFBAAB are as follows:

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

The mitigation offset fee amount will be determined at the time of mitigation to fund one or more emissions reduction projects within the SFBAAB. The offset fee will be determined by the Authority and BAAQMD based on the type of projects that present appropriate emission reduction opportunities. These funds may be spent to reduce either VOC or NO_x emissions (O₃ precursors). Documentation of payment will be provided to the Authority or its designated representative.

The agreement will 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 BAAQMD will serve as an acknowledgment and commitment by BAAQMD to undertake the following steps: (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 emissions 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 emissions 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 will 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 equate roughly to 1 year prior to the required mitigation; additional lead time may be necessary depending on the level of off-site emissions reductions required for a specific year.

This mitigation measure will be effective in offsetting emissions generated during construction of the project through the funding of emissions reduction projects. It is BAAQMD's experience that implementation of an agreement is feasible mitigation that effectively achieves actual emissions reductions.

This mitigation measure would not be expected to adversely affect air quality in the SFBAAB 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, emissions reduction projects could reduce other criteria pollutants and GHGs. However, this would be a beneficial secondary impact 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 3.3-33 compares the impacts of the project alternatives and is followed by a summary of the impacts.

Table 3.3-33 NEPA Comparison of Project Alternative Impacts for Air Quality and Greenhouse Gases

Effect	Alternative A	Alternative B
Air Quality		
Impact AQ#1: Temporary Direct and Indirect Impacts on Air Quality in the SFBAAB	Temporary construction activity would generate emissions of criteria pollutants. Construction-related NO _x emissions would exceed BAAQMD significance threshold. Emissions of all pollutants would be less than the respective General Conformity <i>de minimis</i> thresholds. ³²	Emissions would be greater than Alternative A primarily because of construction of the passing tracks and the larger number of truck trips required for construction of the LMF under Alternative B. Construction-related VOC and NO _x emissions would exceed BAAQMD significance thresholds and NO _x emissions would exceed the General Conformity <i>de minimis</i> threshold. Alternative B (Viaduct to Scott Boulevard) would have slightly greater emissions (except for NO _x and fugitive PM) than Alternative B (Viaduct to I-880) because of additional construction activity required for the longer viaduct.
Impact AQ#2: Temporary Direct and Indirect Impacts on Air Quality within the NCCAB	Temporary construction activity (truck travel on SR 152) would generate criteria pollutants, but those emissions would not degrade air quality resources in the NCCAB because the RSA is considered in attainment for all criteria pollutants and there are no General Conformity <i>de minimis</i> thresholds.	Similar to Alternative A. Emissions would be greater than under Alternative A because more truck trips would be required for construction of the LMF under Alternative B.
Impact AQ#3: Temporary Direct and Indirect Impacts on Air Quality within the SJVAB	Temporary construction activity (truck travel on SR 152 and I-5) would generate criteria pollutants, but those emissions would not degrade air quality resources in the SJVAB because emissions of all criteria pollutants would be less than the respective General Conformity <i>de minimis</i> thresholds.	Similar to Alternative A. Emissions would be greater than under Alternative A because more truck trips would be required for construction of the LMF under Alternative B.

³² Although Table 3.3-12 shows that Alternative A in 2025 would have NO_x emissions of 104 tons, which is greater than the General Conformity threshold of 100 tons, Table 3.3-12 includes emissions associated with construction of the San Jose Diridon Station Approach Subsection. The General Conformity Determination presented in Appendix 3.3-B does not include the San Jose Diridon Station Approach Subsection, which is analyzed as part of the general conformity determination for the San Jose to Merced Project Section. When the emissions in the San Jose Diridon Station Approach Subsection are excluded for purposes of conformity evaluation (see Table 6 of Appendix 3.3-B), all emissions under Alternative A are less than the applicable General Conformity thresholds. Under Alternative B, NO_x emissions exceed the General Conformity threshold both with and without the San Jose Diridon Station Approach Subsection.

Effect	Alternative A	Alternative B
<p>Impact AQ#4: Temporary Direct Impacts on Implementation of an Applicable Air Quality Plan</p>	<p>Emissions of criteria pollutants from temporary construction activity in the SFBAAB would not exceed the General Conformity <i>de minimis</i> thresholds.³³</p> <p>Emissions of criteria pollutants from temporary construction activity in the NCCAB would not be subject to the General Conformity <i>de minimis</i> thresholds.</p> <p>Emissions of criteria pollutants from temporary construction activity in the SJVAB would not exceed the General Conformity <i>de minimis</i> thresholds.</p> <p>Therefore, construction emissions would not impede implementation of air quality plans in the SFBAAB, once mitigation offsets are applied, NCCAB, and SJVAB.</p>	<p>Emissions of NO_x from temporary construction activity in the SFBAAB would exceed the General Conformity <i>de minimis</i> thresholds and so could impede implementation of air quality plans in the SFBAAB. Emissions of criteria pollutants other than NO_x from temporary construction activity in the SFBAAB would not exceed the <i>de minimis</i> thresholds.</p> <p>Emissions of criteria pollutants from temporary construction activity in the NCCAB would be greater than under Alternative A but would not be subject to the General Conformity <i>de minimis</i> thresholds.</p> <p>Emissions of criteria pollutants from temporary construction activity in the SJVAB would be greater than under Alternative A but would not exceed the General Conformity <i>de minimis</i> thresholds.</p> <p>Therefore, construction emissions would not impede implementation of air quality plans in the NCCAB and SJVAB.</p>
<p>Impact AQ#5: Temporary Direct Impacts on Localized Air Quality in the SFBAAB—Criteria Pollutants</p>	<p>Construction-related PM₁₀ concentrations would contribute to existing exceedances of the PM₁₀ CAAQS.</p> <p>Construction-related criteria pollutant concentrations would lead to new exceedances of the PM_{2.5} CAAQS and NAAQS.</p>	<p>Similar to Alternative A. Emissions would be greater than Alternative A primarily because of construction of the passing tracks and the viaduct. Alternative B (Viaduct to Scott Boulevard) would have slightly greater emissions than Alternative B (Viaduct to I-880) because of additional construction activity required for the longer viaduct.</p>

³³ Although Table 3.3-12 shows that Alternative A in 2025 would have NO_x emissions of 104 tons, which is greater than the General Conformity threshold of 100 tons, Table 3.3-12 includes emissions associated with construction of the San Jose Diridon Station Approach Subsection. The General Conformity Determination presented in Appendix 3.3-B does not include the San Jose Diridon Station Approach Subsection, which is analyzed as part of the general conformity determination for the San Jose to Merced Project Section. When the San Jose Diridon Station Approach Subsection is excluded from Table 3.3-12 for purposes of conformity evaluation (see Table 6 of Appendix 3.3-B), all emissions under Alternative A are less than the applicable General Conformity thresholds. Under Alternative B, NO_x emissions exceed the General Conformity threshold both with and without the San Jose Diridon Station Approach Subsection.

Effect	Alternative A	Alternative B
Impact AQ#6: Temporary Direct Impacts on Localized Air Quality in the SFBAAB—Exposure to Diesel Particulate Matter and PM _{2.5} (Health Risk)	Temporary construction activity would not generate DPM or PM _{2.5} concentrations greater than applicable health risk thresholds, with or without the DDV. The maximum increase in potential cancer risk (5.5 per million without the DDV) and an acute Hazard Index of 0.1 would occur in the San Jose Diridon Station Approach Subsection. For Alternative A with the DDV, the incremental cancer risk would be 8.4 per million.	Similar to Alternative A. The maximum increase in potential cancer risk (3.8 per million under Alternative B (Viaduct to I-880) and 3.9 per million under Alternative B (Viaduct to Scott Boulevard)) would occur in the San Jose Diridon Station Approach Subsection and would be less than that under Alternative A. The acute Hazard Index of 0.2 under Alternative B (with either viaduct option) would be slightly greater than Alternative A.
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 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 approximately 817,000 square feet. Because Valley fever is rare within the SFBAAB, there would be limited potential for exposure of sensitive receptors to <i>C. immitis</i> . There would be no potential for exposure of sensitive receptors to <i>C. immitis</i> associated with truck travel in the NCCAB or SJVAB because there would be no earth disturbance in the NCCAB or SJVAB.	Similar to Alternative A. Greater potential for exposure than Alternative A because of additional demolition associated with construction of passing tracks and aerial viaducts in San Jose. There would be limited potential for exposure of sensitive receptors to asbestos or LBP associated with demolition of approximately 1,678,000 square feet for Alternative B (Viaduct to I-880) and 1,866,000 square feet for Alternative B (Viaduct to Scott Boulevard). Because Valley fever is rare within the SFBAAB, there would be limited potential for exposure of sensitive receptors to <i>C. immitis</i> . There would be no potential for exposure of sensitive receptors to <i>C. immitis</i> associated with truck travel in the NCCAB or SJVAB because there would be no earth disturbance in the NCCAB or SJVAB.
Impact AQ#8: Temporary Direct Impacts on Localized Air Quality in the SFBAAB—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 A
Impact AQ#9: Continuous Permanent Direct Impacts on Air Quality in the SFBAAB	Long-term operation of the HSR system would reduce criteria pollutant emissions, relative to the No Project conditions, resulting in a regional and local air quality benefit. Annual reductions in regional emissions would range from 24 to 52 tons of VOC, 294 to 561 tons of CO, 213 to 452 tons of NO _x , 23 to 49 tons of SO ₂ , 3 to 33 tons of PM ₁₀ , and 6 to 19 tons of PM _{2.5} , depending on the year and ridership scenario.	Same as Alternative A

Effect	Alternative A	Alternative B
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 A
Impact AQ#11: Continuous Permanent Direct Impacts on Localized Air Quality—Carbon Monoxide Hot Spots (NAAQS Compliance)	Increased station traffic would not result in localized CO hot spots or exceedances of the CO NAAQS or CAAQS.	Same as Alternative A
Impact AQ#12: Continuous Permanent Direct Impacts on Localized Air Quality—Exposure to Mobile Source Air Toxics	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 effects.	Same as Alternative A
Impact AQ#13: Continuous Permanent Direct Impacts on Localized Air Quality—Particulate Matter Hot Spots (NAAQS Compliance)	The project does not meet the criteria for 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 A
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 freight trains on shifted tracks, and station and LMF operation, would not expose sensitive receptors to excessive pollutant concentrations because health risks would not exceed BAAQMD's thresholds.	Same as Alternative A
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 A
Greenhouse Gases		
Impact AQ#16: Temporary Direct and Indirect Impacts on Global Climate Change—Greenhouse Gas Emissions	GHG emissions generated during temporary construction of 8,727 MT CO _{2e} per amortized year would be offset by reductions achieved through project operations within 2 to 6 months (relative to No Project conditions).	GHG emissions generated during temporary construction of 10,590 MT CO _{2e} per amortized year for Alternative B (Viaduct to I-880) and 10,534 MT CO _{2e} per amortized year for Alternative B (Viaduct to Scott Boulevard) would be offset by reductions achieved through project operations within 2 to 7 months (relative to No Project conditions).

Effect	Alternative A	Alternative B
Impact AQ#17: Continuous Permanent Direct and Indirect Impacts on Global Climate Change—Greenhouse Gas Emissions	Long-term operations of the HSR system would reduce GHG emissions, relative to the No Project conditions, resulting in a statewide and regional GHG benefit. Statewide annual reductions would range from 0.4 million MT CO _{2e} to 1.7 million MT CO _{2e} , depending on the year and ridership scenario.	Same as Alternative A

BAAQMD = Bay Area Air Quality Management District
 CAAQS = California ambient air quality standards
 C.F.R. = Code of Federal Regulations
 CO = carbon monoxide
 CO_{2e} = carbon dioxide equivalent
 DPM = diesel particulate matter
 GHG = greenhouse gas
 HSR = high-speed rail
 I = Interstate
 LBP = lead-based paint
 LMF = light maintenance facility

MSAT = mobile source air toxics
 MT = metric tons
 NAAQS = national ambient air quality standards
 NO_x = nitrogen oxides
 O₃ = ozone
 PM_{2.5} = particulate matter less than 2.5 microns in diameter
 PM₁₀ = particulate matter less than 10 microns in diameter
 SFBAAB = San Francisco Bay Area Air Basin
 SO₂ = sulfur dioxide
 SR = State Route
 VOC = volatile organic compound

Temporary construction activity for Alternative B would generate NO_x emissions in excess of the General Conformity *de minimis* thresholds in the SFBAAB. 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 types of facilities constructed. Construction emissions under Alternative B would be somewhat higher than under Alternative A, primarily because Alternative B includes construction of the passing tracks and aerial viaducts in San Jose, and a larger number of truck trips for LMF construction.

On-site project features (AQ-IAMF#1 through AQ-IAMF#6) will minimize emissions in the SFBAAB by requiring additional BMPs for reducing on-site emissions, including fugitive dust emissions, requiring the cleanest reasonably available diesel equipment and control measures to limit criteria pollutant emissions from construction equipment and vehicles, and concrete batch plants. AQ-MM#1 requires that a minimum of 25 percent of all light-duty on-road vehicles use ZE or NZE technology. The measure also includes ZE and NZE goals for heavy-duty on-road trucks and off-road equipment.

An agreement between the Authority and BAAQMD (AQ-MM#2) will offset remaining NO_x emissions in excess of the General Conformity *de minimis* thresholds generated in the SFBAAB to net zero. The Authority and FRA have agreed to collaborate on the development of a General Conformity Determination. The Draft General Conformity Determination provides a discussion of the federal General Conformity requirements and demonstrates how the project complies with the General Conformity requirements (refer to Volume 2, Appendix 3.3-B).

The Draft General Conformity Determination encompasses the portion of the Project Section from 4th and King Street Station in San Francisco to Scott Boulevard in Santa Clara. Emissions and concentration results for the San Jose Diridon Station Approach Subsection are not included in the Draft General Conformity Determination because this subsection was included in the General Conformity Determination for the San Jose to Merced Project Section. The General Conformity Determination includes project features AQ-IAMF#1 through AQ-IAMF#6 and AQ-MM#1 and AQ-MM#2.

Health risks from temporary construction activity for either project alternative would be less than the BAAQMD’s cancer risk significance threshold of 10 in 1 million. The hazard index threshold of one would not be exceeded. Under Alternative A, the maximum increase would be a cancer risk of 5.5 per million and hazard index of 0.1. Alternative B (Viaduct to Scott Boulevard) would have a slightly greater maximum increase (cancer risk of 3.9 per million and hazard index of 0.2) than the

Alternative B (Viaduct to I-880) (cancer risk of 3.8 per million and hazard index of 0.2) because of additional construction activity required for the longer viaduct. On-site project features (AQ-IAMF#1 through AQ-IAMF#6) that require the cleanest reasonably available equipment and control measures will reduce concentrations below uncontrolled levels.

Demolition activities during construction of the project could encounter asbestos and LBP. Alternative B (Viaduct to Scott Boulevard) would require about 1,866,000 square feet of demolition, and therefore has greater potential to encounter and expose receptors to impacts from asbestos and LBP compared to Alternative B (Viaduct to I-880), which would require about 1,678,000 square feet of demolition, or Alternative A, which would require about 817,000 square feet of demolition. 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 under both project alternatives. Odors generated during construction are not expected to affect a substantial number of people or to result in nuisance complaints.

During operations, neither project alternative would generate emissions greater than the general conformity *de minimis* thresholds because both project 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 Alternative A (with and without the DDV) and Alternative B (both viaduct options), as would the emissions benefits from reduced on-road vehicle and aircraft activity. Station and LMF operation would generate criteria pollutant emissions from mobile (e.g., employee commuting vehicles) and area (e.g., architectural coatings) sources. Station and LMF emissions would be the same for both project alternatives. Direct emissions of fugitive dust induced by train movement would be similar for both project alternatives. 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 for both project alternatives and would not worsen traffic conditions to an extent that would result in localized CO or PM hot spots. Consistent with FHWA guidance, changes in local traffic conditions would have a low potential for meaningful MSAT impacts. Freight trains on shifted tracks, and station and LMF operations, would not generate DPM or PM_{2.5} concentrations greater than BAAQMD's cancer and noncancer risk thresholds. Odors generated during operations would be limited and would not be expected to affect a substantial number of people or to result in nuisance complaints.

As with criteria pollutants, construction of either project alternatives would generate GHG emissions. Amortized total GHG construction emissions would be 8,727 metric tons CO_{2e} per year under Alternative A, 10,590 metric tons CO_{2e} per year under Alternative B (Viaduct to I-880), and 10,534 metric tons CO_{2e} per year under Alternative B (Viaduct to Scott Boulevard). Emissions reductions during long-term project operations would offset construction-related GHGs within 2 to 7 months. The overall change in GHG emissions would be approximately the same under both alternatives. As a result, neither project alternative would result in global climate change impacts from GHG emissions.

3.3.9 CEQA Significance Conclusions

As described in Section 3.1.6.4, 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 3.3-34 identifies the CEQA significance conclusions for each impact described in Section 3.3.6. A summary of the significant impacts, mitigation measures, and factors supporting the significance conclusions after mitigation follows the table.

Table 3.3-34 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 in the SFBAAB	Significant for both alternatives: Construction-related VOC (under Alternative B only) and NO _x emissions would exceed BAAQMD thresholds.	AQ-MM#1: Construction Emissions Reductions—Requirements for use of Zero Emission and/or Near-Zero Emission Vehicles and Off-Road Equipment AQ-MM#2: Offset Project Construction Emissions in the SFBAAB	Less than Significant
Impact AQ#2: Temporary Direct and Indirect Impacts on Air Quality within the NCCAB	Less than significant for both alternatives. Construction-related PM ₁₀ emissions (truck travel) 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	Less than significant for both alternatives. Construction-related emissions (truck travel) would not exceed SJVAPCD's thresholds.	No mitigation measures are required	N/A
Impact AQ#4: Temporary Direct Impacts on Implementation of an Applicable Air Quality Plan	Significant for both alternatives: Construction-related VOC (under Alternative B only) and NO _x emissions would exceed BAAQMD thresholds.	AQ-MM#1: Construction Emissions Reductions—Requirements for use of Zero Emission and/or Near Zero Emission Vehicles and Off-Road Equipment AQ-MM#2: Offset Project Construction Emissions in the SFBAAB	Less than Significant
Impact AQ#5: Temporary Direct Impacts on Localized Air Quality in the SFAAB — Criteria Pollutants	Significant for both alternatives: Construction-related criteria pollutant concentrations would contribute to existing exceedances of the CAAQS for PM ₁₀ and lead to new exceedances of the CAAQS for PM _{2.5} .	AQ-MM#1: Construction Emissions Reductions—Requirements for use of Zero Emission and/or Near Zero Emission Vehicles and Off-Road Equipment	Significant and Unavoidable ¹
Impact AQ#6: Temporary Direct Impacts on Localized Air Quality in the SFBAAB — Exposure to Diesel Particulate Matter and PM _{2.5} (Health Risk)	Less than significant for both alternatives: construction-related DPM and PM _{2.5} concentrations would not exceed BAAQMD health risk thresholds.	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#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 both alternatives: Project design and compliance with existing asbestos and LBP handling and disposal standards would prevent exposure of sensitive receptors to substantial pollutant concentrations. Because Valley fever is rare within the SFBAAB, there would be limited potential for exposure of sensitive receptors to <i>C. immitis</i> . There would be no potential for exposure of sensitive receptors to <i>C. immitis</i> associated with truck travel in the SJVAB because there would be no earth disturbance in the SJVAB.	No mitigation measures are required	N/A
Impact AQ#8: Temporary Direct Impacts on Localized Air Quality in the SFBAAB—Exposure to Odors	Less than significant for both 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 in the SFBAAB	Less than significant for both alternatives: Long-term operation of the HSR system would reduce criteria pollutant emissions, relative to the 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 both 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 both alternatives: Increased station traffic would not result in localized CO hot spots or exceedances of the CO CAAQS or NAAQS.	No mitigation measures are required	N/A
Impact AQ#12: Continuous Permanent Direct Impacts on Localized Air Quality—Exposure to Mobile Source Air Toxics	Less than significant for both alternatives: Operation of the HSR system would result in a regional MSAT reduction benefit. Increased station traffic would have a low potential for meaningful localized MSAT impacts.	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#13: Continuous Permanent Direct Impacts on Localized Air Quality—Particulate Matter Hot Spots (NAAQS Compliance)	Less than significant for both alternatives: Changes in on-road vehicle operation would not expose sensitive receptors to substantial 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 both alternatives: Emissions of DPM and PM _{2.5} from freight trains on shifted tracks, and station and LMF operations, would not expose sensitive receptors to substantial pollutant concentrations because health risks would not exceed BAAQMD 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 both alternatives: Odors generated by 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 both alternatives: GHG emissions generated during construction would be offset by reductions achieved through project operation within 2 to 7 months.	No mitigation measures are required	N/A
Impact AQ#17: Continuous Permanent Direct and Indirect Impacts on Global Climate Change—Greenhouse Gas Emissions	Less than significant for both alternatives: Long-term operation of the HSR system would reduce GHG emissions relative to the No Project conditions, resulting in a statewide and regional GHG benefit.	No mitigation measures are required	N/A

BAAQMD = Bay Area Air Quality Management District
 CAAQS = California ambient air quality standards
 CEQA = California Environmental Quality Act
 CO = carbon monoxide
 DPM = diesel particulate matter
 GHG = greenhouse gases
 HSR = high-speed rail
 LBP = lead-based paint
 LMF = light maintenance facility
 MBARD = Monterey Bay Air Resources District
 MSAT = mobile source air toxics
 N/A = not applicable

NAAQS = national ambient air quality standards
 NCCAB = North Central Coast Air Basin
 NO_x = nitrogen oxides
 PM = particulate matter
 PM₁₀ = particulate matter smaller than or equal to 10 microns in diameter
 PM_{2.5} = particulate matter smaller than or equal to 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 compounds

¹ Although AQ-MM#1 will reduce PM emissions, as required, these reductions could occur regionally. Accordingly, the emission reductions achieved by these measures may not contribute to enough localized reductions to avoid a project-level violation of the CAAQS or SIL.

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

Both project alternatives would have a significant impact under CEQA because construction would result in regional VOC (under Alternative B only) and NO_x emissions that would exceed the BAAQMD's CEQA thresholds. Impacts associated with fugitive dust emissions will be minimized through a dust control plan (AQ-IAMF#1). The contractor will use low-VOC paints to limit the emissions of VOCs, which contribute to O₃ formation (AQ-IAMF#2). Exhaust-related pollutants will be reduced through use of renewable diesel fuel, Tier 4 off-road engines, and model year 2010 or newer on-road engines, as required by AQ-IAMF#3 through AQ-IAMF#5, respectively. AQ-IAMF#6 will reduce emissions from concrete batch plants. These project features minimize air quality impacts and associated public health consequences through the best available on-site controls to reduce construction emissions; however, even with these measures, construction of the project would result in exceedances of the BAAQMD's regional VOC (under Alternative B only) and NO_x thresholds.

The Authority would implement mitigation measures to reduce and offset the impacts on air quality resources. AQ-MM#1 requires that a minimum of 25 percent of all light-duty on-road vehicles use ZE or NZE technology. The measure also includes ZE and NZE goals for heavy-duty on-road trucks and off-road equipment.

The Authority would implement AQ-MM#2 to offset remaining VOC (under Alternative B only) and NO_x emissions to below BAAQMD's CEQA thresholds. BAAQMD thresholds are based on emissions levels identified under the NSR program (BAAQMD 2017a). The NSR program is a permitting program that was established by Congress as part of the CAA amendments to prevent new sources of emissions degrading air quality. The NSR program requires stationary sources to obtain permits before starting construction or use of the equipment to be permitted. By permitting large stationary sources, the NSR program assures that new emissions would not slow regional progress toward attaining 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 prevent construction of the project contributing a significant level of air pollution such that regional air quality within the SFBAAB would be degraded. Accordingly, with AQ-MM#2, the impact would be less than significant under both project alternatives.

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

Both project alternatives would have a significant impact under CEQA because construction would result in VOC (under Alternative B only) and NO_x emissions that would exceed the BAAQMD's threshold, which could conflict with applicable air quality plans. Project features (AQ IAMF#1 through AQ-IAMF#6) minimize air quality impacts, although VOC (under Alternative B only) and NO_x emissions still would exceed the BAAQMD's threshold. AQ-MM#1 and AQ-MM#2 will reduce the impacts on air quality resources. Construction VOC (under Alternative B only) and NO_x emissions in BAAQMD will be offset to below air district thresholds through AQ-MM#2. Therefore, the impact would be less than significant.

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

Both project alternatives would have a significant impact under CEQA because construction would contribute to existing PM₁₀ concentrations that exceed the CAAQS. Project features minimize air quality impacts (AQ-IAMF#1 through AQ-IAMF#6), although PM₁₀ concentrations still would exceed the CAAQS. These project features represent the best available on-site controls to reduce construction emissions. AQ-MM#1 requires that a minimum of 25 percent of all light-duty on-road vehicles use ZE or NZE technology. The measure also includes ZE and NZE goals for heavy-duty on-road trucks and off-road equipment. No additional mitigation is available. Therefore, this impact would be significant and unavoidable.

The NAAQS and CAAQS are set to protect public health and the environment with an adequate margin of safety. Some individuals exposed to pollutant concentrations that exceed the CAAQS

or NAAQS may experience certain acute or chronic health conditions, or both. Studies have linked particle 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 2018e). Studies have linked NO₂ pollution to the aggravation or development of certain respiratory diseases (e.g., asthma), leading to respiratory symptoms (e.g., coughing), hospital admissions, and visits to emergency rooms (USEPA 2016b).

There are no models capable of performing a meaningful project-specific correlation of project-generated NO₂ or PM emissions to specific health consequences (e.g., increased cases of asthma). Models that quantify changes in ambient air pollution and resultant health impacts 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 NO₂ or PM emissions to increases in specific health effects, the locations where specific health impacts could occur, or the number of additional days of nonattainment cannot be estimated with a high degree of accuracy.

Although there is no available tool to model project-level NO₂ or PM health effects individually, 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 (NO_x and SO₂).³⁴ These “benefit per ton” (BPT) or “incidence-per-ton” factors express the expected number of cases of specific health impacts per ton of emissions. USEPA developed BPT factors for 17 emission sectors (e.g., mobile sources) using nationwide photochemical modeling and demographic input parameters. All estimates are based on a national-scale study and do not account for location-specific meteorology, topography, geographical distribution of receptors, or photochemistry, all of which can affect pollutant dispersion and exposure. The resultant health impacts are therefore reflective of national averages and may not be exact when applied at the project level. Nevertheless, the BPT-based 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 PM formation).

Table 3.3-35 presents the estimated incidence (i.e., number of cases) of health impacts based on the construction emissions inventory for Alternative B (Viaduct to I-880). This alternative and design option would generate the most NO_x and PM_{2.5} (including fugitive) emissions of all project alternatives, and therefore represents the alternative combination with the greatest potential health burden. The estimates were developed by multiplying total project-generated PM_{2.5} and PM_{2.5} precursor (NO_x and SO₂) emissions (in average tons per year) by the relevant incidence per-ton metric from USEPA (2018c).³⁵ This estimate of regional health risk is different from the estimate of localized health risk, which is based on DPM emissions (see Section 3.3.4.3).

³⁴ Conversion of NO_x to NO₂ occurs in the atmosphere through various chemical reactions. Due to the complex chemistry governing NO₂ and other pollution formation (e.g., O₃), USEPA was not able to derive BPT values for secondary pollutants. USEPA’s BPT estimates are therefore only applicable to direct PM_{2.5} and PM_{2.5} precursors (NO_x and SO₂) (with no secondary formation).

³⁵ Analysis does not include PM emissions from demolition and earthmoving activities because there are no applicable incidence-per-ton metrics from USEPA for these sources. Demolition and earthmoving activities represent approximately 13 percent of total construction-generated PM_{2.5} emissions.

Table 3.3-35 Estimated Incidence of Health Outcomes Based on Total Directly Emitted NO_x, SO_x, and PM_{2.5} Emissions during Construction of Alternative B (Viaduct to I-880)

Health Endpoint	Incidence (cases per year) ¹
Premature mortality	1.1
Respiratory emergency room visits	<1
Acute bronchitis	<1
Lower respiratory symptoms	9
Upper respiratory symptoms	13
Minor restricted activity days	392
Work loss days	66
Asthma exacerbation	16
Cardiovascular hospital admissions	<1
Respiratory hospital admissions	<1
Nonfatal heart attacks (Peters et al. 2001)	<1
Nonfatal heart attacks (all studies other than Peters et al. 2001)	<1

Source: USEPA 2018c

< = less than

NO_x = nitrogen oxides

SO₂ = sulfur dioxide

SO_x = sulfur oxides

PM_{2.5} = particulate matter smaller than or equal to 2.5 microns in diameter

PM₁₀ = particulate matter smaller than or equal to 10 microns in diameter

USEPA = U.S. Environmental Protection Agency

¹ Calculated by multiplying total project-generated PM_{2.5} and PM_{2.5} precursor (NO_x and SO₂) emissions (in average tons per year) by the relevant incidence-per-ton metric from 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 because of intervening effects of location of emissions, meteorology, topography, and photochemistry.

Caution should be exercised when reviewing these results because 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 pollutant 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 represent less than one-tenth of one percent of the SFBAAB's PM_{2.5} emissions inventories (CARB 2017b; BAAQMD 2017b). The SFBAAB does 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 particle pollution, could be exposed to PM concentrations that cause or aggravate acute or chronic health outcomes (e.g., asthma, lost work days, premature mortality), regardless of project construction.