3.3 Air Quality and Global Climate Change

3.3.1 Introduction

This section describes the regulatory and environmental setting associated with the air quality and global climate changes for the study area affected by the HST project, the potential impacts on air quality and global climate change that would result from the project, and mitigation measures that would eliminate or reduce these impacts. Emission reduction measures identified in the Statewide Program EIR/EIS (Authority and FRA 2005) are incorporated in the project design as described in Section 3.3.6, Mitigation Measures.

The Statewide Program EIR/EIS (Authority and FRA 2005) concluded that the HST project would have low potential to result in significant impacts on air quality. The HST would reduce vehicle miles otherwise traveled and result in an air quality benefit when viewed on a systemwide and regional basis. The HST alternatives incorporate, to the extent possible, design measures, such as state-of-the-art, energy-efficient equipment and renewable energy sources, to minimize potential air pollution impacts associated with power used by the HST System.

The *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a) provides more detailed air quality and global climate change information. Sections 3.18 and 3.19 of this Project EIR/EIS discuss growth-inducing impacts and cumulative impacts, respectively.

3.3.2 Laws, Regulations, and Orders

3.3.2.1 Federal

The U.S. Environmental Protection Agency (EPA) is responsible for establishing the National Ambient Air Quality Standards (NAAQS), enforcing the Clean Air Act (CAA), and regulating transportation-related emission sources, such as aircraft, ships, and certain types of locomotives, under the exclusive authority of the federal government. The EPA also establishes vehicular emission standards, including those for vehicles sold in states other than California. Automobiles sold in California must meet stricter emission standards established by the California Air Resources Board (CARB).

Clean Air Act and Conformity Rule

The CAA defines nonattainment areas as geographic regions designated as not meeting one or more of the NAAQS. It requires that a state implementation plan (SIP) be prepared for each nonattainment area, and a maintenance plan be prepared for each former nonattainment area that subsequently demonstrated compliance with the standards. A SIP is a compilation of a state's air quality control plans and rules, approved by EPA. 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. The state and U.S. EPAs' goals are to eliminate or reduce the severity and number of violations of the NAAQS and to achieve expeditious attainment of these standards.

Pursuant to CAA Section 176(c) requirements, EPA promulgated Title 40 of the Code of Federal Regulations Part 51 (40 CFR 51) Subpart W and 40 CFR Part 93, Subpart B, "Determining Conformity of General Federal Actions to State or Federal Implementation Plans" (see 58 Federal Register [FR] 63214, [November 30, 1993], as amended, 75 FR 17253 [April 5, 2010]). These regulations, commonly referred to as the General Conformity Rule, apply to all federal actions except for those federal actions which are excluded from review (e.g., stationary source emissions) or related to transportation plans, programs, and projects under Title 23 U.S. Code or the Federal Transit Act, which are subject to Transportation Conformity. The General Conformity Rule applies to all federal actions not addressed by the Transportation Conformity Rule.

40 CFR Part 51, Subpart W, applies in states where the state has an approved SIP revision adopting General Conformity regulations; 40 CFR Part 93, Subpart B, applies in states where the state does not have an approved SIP revision adopting General Conformity regulations.

The General Conformity Rule is used to determine if federal actions meet the requirements of the CAA and the applicable SIP by ensuring that air emissions related to the action do not:

- Cause or contribute to new violations of a NAAQS.
- Increase the frequency or severity of any existing violation of a NAAQS.
- Delay timely attainment of a NAAQS or interim emission reduction.

A conformity determination under the General Conformity Rule is required if the federal agency determines: the action will occur in a nonattainment or maintenance area; that one or more specific exemptions do not apply to the action; the action is not included in the federal agency's "presumed to conform" list; the emissions from the proposed action are not within the approved emissions budget for an applicable facility; and 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 regulations (75 FR 17255).

Conformity regulatory criteria are listed in 40 CFR 93.158. An action will be determined to conform to the applicable SIP if, for each pollutant that exceeds the *de minimis* emissions level in 40 CFR 93.153(b), or otherwise requires a conformity determination due to the total of direct and indirect emissions from the action, the action meets the requirements of 40 CFR 93.158(c).

In addition, federal activities may not cause or contribute to new violations of air quality standards, exacerbate existing violations, or interfere with timely attainment or required interim emissions reductions toward attainment. The proposed project is subject to review under the EPA General Conformity Rule. However, there may be some smaller highway elements of the project that will be dealt with through case-by-case modification of the RTP consistent with transportation conformity.

National and State Ambient Air Quality Standards

As required by the CAA, EPA has established NAAQS for six major air pollutants. These pollutants, known as criteria pollutants, are ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead. California has also established ambient air quality standards, known as the California Ambient Air Quality Standards (CAAQS), which are generally more stringent than the corresponding federal standards, and incorporate additional standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility reducing particles.

Table 3.3-1 summarizes state and federal standards. The primary standards have been established to protect public health. The secondary standards are intended to protect the nation's welfare and account for air pollutant impacts on soil, water, visibility, materials, vegetation, and other aspects of the general welfare.

Table 3.3-1
State and Federal Ambient Air Quality Standards

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		Federal Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)	1 Hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m^3)		0.075 ppm (147 µg/m^3)		
Respirable Particulate Matter (PM10)	24 Hour	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		—		
Fine Particulate Matter (PM2.5)	24 Hour	No Separate State Standard		35 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	15.0 µg/m^3		
Carbon Monoxide (CO)	8 Hour	9.0 ppm (10mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	9 ppm (10 mg/m^3)	None	Non-Dispersive Infrared Photometry (NDIR)
	1 Hour	20 ppm (23 mg/m^3)		35 ppm (40 mg/m^3)		
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	—
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.030 ppm (57 µg/m3)	Gas Phase Chemiluminescence	53 ppb (100 µg/m^3) (see footnote 8)	Same as Primary Standard	Gas Phase Chemiluminescence
	1 Hour	0.18 ppm (339 µg/m^3)		100 ppb (188 µg/m^3) (see footnote 8)	None	
Sulfur Dioxide (SO_2)	24 Hour	0.04 ppm (105 µg/m^3)	Ultraviolet Fluorescence	—	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)[9]
	3 Hour	—		—	0.5 ppm (1300 µg/m^3) (see footnote 9)	
	1 Hour	0.25 ppm (655 µg/m^3)		75 ppb (196 µg/m^3) (see footnote 9)	—	
Lead[10]	30 Day Average	1.5 µg/m^3	Atomic Absorption	—	—	—
	Calendar Quarter	—		1.5 µg/m^3	Same as Primary Standard	High Volume Sampler and Atomic Absorption
	Rolling 3-Month Average[11]	—		0.15 µg/m^3		
Visibility Reducing Particles	8 Hour	Extinction coefficient of 0.23 per kilometer — visibility of ten miles or more (0.07 — 30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent. Method: Beta Attenuation and Transmittance through Filter Tape.		No Federal Standards		
Sulfates	24 Hour	25 µg/m^3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[10]	24 Hour	0.01 ppm (26 µg/m^3)	Gas Chromatography			

See footnotes on next page …

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Table 3.3-1
State and Federal Ambient Air Quality Standards (Continued)

1. California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, suspended particulate matter—PM10, PM2.5, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2. National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact U.S. EPA for further clarification and current federal policies.

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

4. Any equivalent procedure which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

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

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

7. Reference method as described by the EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the EPA.

8. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010). Note that the EPA standards are in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national standards to the California standards the units can be converted from ppb to ppm. In this case, the national standards of 53 ppb and 100 ppb are identical to 0.053 ppm and 0.100 ppm, respectively.

9. On June 2, 2010, the U.S. EPA established a new 1-hour SO_2 standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. EPA also proposed a new automated Federal Reference Method (FRM) using ultraviolet technology, but will retain the older pararosaniline methods until the new FRM have adequately permeated State monitoring networks. The EPA also revoked both the existing 24-hour SO_2 standard of 0.14 ppm and the annual primary SO_2 standard of 0.030 ppm, effective August 23, 2010. The secondary SO_2 standard was not revised at that time; however, the secondary standard is undergoing a separate review by EPA. Note that the new standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the new primary national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

10. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

11. National lead standard, rolling 3-month average: final rule signed October 15, 2008.

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Source: CARB (2010a).

Mobile Source Air Toxics

In addition to the criteria pollutants for which there are NAAQS, EPA regulates mobile source air toxics (MSATs). In February 2007, EPA finalized a rule (Control of Hazardous Air Pollutants from Mobile Sources, February 9, 2007) to reduce hazardous air pollutants from mobile sources. The rule limits the benzene content of gasoline and reduces toxic emissions from passenger vehicles and gas cans. EPA estimates that in 2030 this rule would reduce total emissions of MSATs by 330,000 tons and volatile organic compound (VOC) emissions (precursors to O_3 and $PM_{2.5}$) by more than 1 million tons. The latest revision to this rule occurred in October 2008. This revision added specific benzene control technologies that the previous rule did not include. No federal or California ambient standards exist for MSATs. Specifically, EPA has not established NAAQS or provided standards for hazardous air pollutants.

Greenhouse Gas Regulations

Greenhouse gas (GHG) emissions are regulated at the federal and state level. Laws and regulations, as well as plans and policies, have been adopted to address global climate change issues. Key federal regulations relevant to the project are summarized below.

On September 22, 2009, EPA published the Final Rule that requires mandatory reporting of GHG emissions from large sources in the U.S. The gases covered by the Final Rule are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and other fluorinated gases including nitrogen trifluoride (NF_3) and hydrofluorinated ethers (HFE).This is not a transportation-related regulation. This rule will affect electric generation sources that contribute to the California electric grid and does not apply directly to the HST System (EPA 2010a).

On October 5, 2009, Federal Executive Order (E.O.) 13514, *Federal Leadership in Environmental, Energy, and Economic Performance,* was signed by the White House Council on Environmental Quality (CEQ). The E.O. requires federal agencies to set a 2020 GHG emissions reduction target within 90 days, increase energy efficiency, reduce fleet petroleum consumption, conserve water, reduce waste, support sustainable communities, and leverage federal purchasing power to promote environmentally responsible products and technologies.

On December 7, 2009, the Final Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the CAA was signed. The endangerment finding states that current and projected concentrations of the six key well-mixed GHGs in the atmosphere—CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6—threaten the public health and welfare of current and future generations. Furthermore, it states that the combined emissions of these well-mixed GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution that threatens public health and welfare (EPA 2010b).

Under the endangerment finding, EPA is developing vehicle emission standards under the CAA. EPA and the Department of Transportation's National Highway Traffic Safety Administration have issued a joint proposal to establish a national program consisting of new emission standards for light-duty vehicles, model year 2012 through 2016, that will reduce GHG emissions and improve fuel economy. This marks the first GHG standards proposed by EPA under the CAA as a result of the endangerment and cause or contribute findings.

On February 18, 2010, CEQ released draft guidance on the consideration of GHG in NEPA documents for federal actions. The draft guidelines include a presumptive threshold of 25,000 metric tons of carbon dioxide equivalent (CO_2e) emissions from a proposed action to trigger a quantitative analysis. CEQ has not established when GHG emissions are "significant" for NEPA purposes but posed that question to the public (CEQ 2010).

3.3.2.2 State

California Air Resources Board

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

CARB administers the CCAA at the state level. Local air pollution control districts and air quality management districts administer CCAA at the regional level. CARB oversees the functions of local air pollution control districts and air quality management districts, which in turn administer air quality activities for controlling emission sources at the regional and county levels.

Asbestos Control Measures

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

Greenhouse Gas Regulations

California has taken proactive steps, briefly described below, to address the issues associated with GHG emissions and climate change.

Assembly Bill 1493

In 2002, with the passage of Assembly Bill 1493 (AB 1493), California launched an innovative and pro-active approach to dealing with GHG emissions and climate change at the state level. AB 1493 requires CARB to develop and implement regulations to reduce automobile and light truck GHG emissions. These stricter emissions standards were designed to apply to automobiles and light trucks beginning with the model year 2009. Although litigation challenged these regulations and EPA initially denied California's related request for a waiver, the waiver request was granted (EPA 2010c).

Executive Order S-3-05

On June 1, 2005, Governor Arnold Schwarzenegger signed Executive Order S-3-05. The goal of this executive order is to reduce California's GHG emissions to year 2000 levels by 2010; 1990 levels by 2020; and 80% below the 1990 levels by 2050. Executive Order S-3-05 also calls for Cal-EPA to prepare biennial science reports on the potential impact of continued global warming on certain sectors of the California economy. As a result of the scientific analysis presented in these biennial reports, a comprehensive Climate Adaptation Strategy (CAS) was released in December 2009 following extensive interagency coordination and stakeholder input. The latest of these reports, *Climate Action Team Biennial Report*, was published in December 2010 (Cal-EPA 2010).

Assembly Bill 32

In 2006, the goal of Executive Order S-3-05 was further reinforced with the passage of AB 32, the Global Warming Solutions Act of 2006. AB 32 sets overall GHG emissions reduction goals and mandates that CARB create a plan, which includes market mechanisms, and implement rules to achieve "real, quantifiable, cost-effective reductions of GHGs." Executive Order S-20-06 further directs state agencies to begin implementing AB 32, including the recommendations made by the state's Climate Action Team.

Among AB 32's specific requirements are the following:

- CARB will prepare and approve a scoping plan for achieving the maximum technologically feasible and cost-effective reductions in GHG emissions from sources or categories of sources of GHGs by 2020 (Health and Safety Code [HSC] Section 38561). The scoping plan, approved by CARB on December 12, 2008, provides the outline for future actions to reduce GHG emissions in California via regulations, market mechanisms, and other measures.
- The scoping plan includes the implementation of high-speed rail as a GHG reduction measure, estimating a 2020 reduction of 1 million metric tons of CO_2 equivalent (MMT CO_2e).
- Identify the statewide level of GHG emissions in 1990 to serve as the emissions limit to be achieved by 2020 (HSC Section 38550). In December 2007, CARB approved the 2020 emission limit of 427 MMT CO_2e of GHG.
- Adopt a regulation requiring the mandatory reporting of GHG emissions (HSC Section 38530). In December 2007, CARB adopted a regulation requiring the largest industrial sources to report and verify their GHG emissions. The reporting regulation serves as a solid foundation to determine GHG emissions and track future changes in emission levels.

Executive Order S-01-07

With Executive Order S-01-07, Governor Schwarzenegger set forth the low carbon fuel standard for California. Under this executive order, the carbon intensity of California's transportation fuels is to be reduced by at least 10% by 2020.Senate Bill 375

SB 375, signed into law by the governor on September 30, 2008, became effective January 1, 2009. This law requires CARB to develop regional reduction targets for GHG emissions, and prompts the creation of regional land use and transportation plans to reduce emissions from passenger vehicle use throughout the state. The targets apply to the regions in the state covered by California's 18 metropolitan planning organizations (MPOs). The 18 MPOs have been tasked with creating the regional land use and transportation plans called "Sustainable Community Strategies" (SCS). The MPOs are required to develop the SCS through integrated land use and transportation planning and demonstrate an ability to attain the proposed reduction targets by 2020 and 2035. This would be accomplished through either the financially constrained sustainable communities' strategy as part of their RTP or an unconstrained alternative planning strategy. If regions develop integrated land use, housing, and transportation plans that meet the SB 375 targets, new projects in these regions can be relieved of certain review requirements of CEQA.

Pursuant to SB 375, CARB appointed a Regional Targets Advisory Committee (RTAC) on January 23, 2009, to provide recommendations on factors to be considered and methodologies to be used in CARB's target setting process. The RTAC was required to provide its recommendations in a report to CARB by September 30, 2009. The report included relevant issues such as data needs, modeling techniques, growth forecasts, jobs-housing balance, interregional travel, various land use/transportation issues affecting GHG emissions, and overall issues relating to setting these targets. CARB adopted the final targets on September 23, 2010. CARB must update the regional targets every 8 years (or 4 years if it so chooses) consistent with each MPO update of its RTP.

3.3.2.3 Regional and Local

The San Joaquin Valley Air Pollution Control District (SJVAPCD) is responsible for 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; and enforcing air pollution statutes and regulations governing stationary sources. The following regulations that may be relevant to the project, as administered by the SJVAPCD with CARB oversight, were identified and considered for analysis:

- SJVAPCD Rule 2201 New and Modified Stationary Source Review.

- SJVAPCD Rule 2280 Portable Equipment Registration.
- SJVAPCD Rule 2303 Mobile Source Emission Reduction Credits.
- SJVAPCD Rule 4201 and Rule 4202 Particulate Matter Concentration and Emission Rates.
- SJVAPCD Rule 4301 Fuel Burning Equipment.
- SJVAPCD Rule 8011 General Requirements – Fugitive Dust Emission Sources.
- SJVAPCD Rule 9510 Indirect Source Review.
- SJVAPCD CEQA Guidelines

Fugitive Dust Control Measures

According to Rule 8011, the SJVAPCD requires the implementation of control measures for fugitive dust emission sources. The project would also implement the mandatory control measures listed in Table 6-2 in the *Guide for Assessing and Mitigating Air Quality Impacts* (GAMAQI) (SJVAPCD 2002) to reduce fugitive dust emissions. These measures are not considered mitigation measures because they are required by law.

Many of the control measures required by the SJVAPCD are the same or similar to the control measures listed in the Statewide Program EIR/EIS. The SJVAPCD Rule 8011 requirements are listed below:

- All disturbed areas, including storage piles, that are not being actively utilized for construction purposes, will be effectively stabilized of dust emissions using water or a chemical stabilizer/suppressant, or covered with a tarp or other suitable cover or vegetative ground cover.

- All onsite unpaved roads and offsite unpaved access roads will be effectively stabilized of dust emissions using water or a chemical stabilizer/suppressant.

- All land clearing, grubbing, scraping, excavation, land leveling, grading, cut and fill, and demolition activities will be effectively controlled of fugitive dust emissions by utilizing an application of water or by presoaking.

- With the demolition of buildings up to six stories in height, all exterior surfaces of the building will be wetted during demolition.

- When materials are transported offsite, all material will be covered or effectively wetted to limit visible dust emissions, and at least 6 inches of freeboard space from the top of the container will be maintained.

- All operations will limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at the end of each workday. The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions. Use of blower devices is expressly forbidden.

- Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, piles will be effectively stabilized of fugitive dust emissions utilizing sufficient water or a chemical stabilizer/suppressant.

- Within urban areas, trackout will be immediately removed when it extends 50 or more feet from the site and at the end of each workday.

- Any site with 150 or more vehicle trips per day will prevent carryout and trackout.

SJVAPCD Rule 2201: New and Modified Stationary Source Review

Stationary sources at the station (such as natural gas heaters) would also need to be permitted by the SJVAPCD and would have to comply with best available control technology (BACT) requirements if applicable. Many stationary sources would be associated with HMF activities, such as exterior washing, welding, material storage, cleaning solvents, abrasive blasting, painting, oil/water separation, and wastewater treatment and combustion. Permits would need to be obtained for equipment associated with these activities from the SJVAPCD and would need to comply with applicable new source review rules such as BACT requirements.

SJVAPCD Rule 9510: Indirect Source Review

In December 2005, the SJVAPCD adopted the Indirect Source Rule (Rule 9510) to meet the SJVAPCD's emission reduction commitments in the PM_{10} and Ozone attainment plans. Indirect Source Review (ISR) regulation applies to any transportation project in which construction emissions equal or exceed 2 tons of NO_x or PM_{10} per year. The HST alignment would be subject to ISR and would have to submit an Air Impact Assessment (AIA) application to the SJVAPCD with commitments to reduce construction exhaust NO_x and PM_{10} emissions by 20% and 45%, respectively. If the project is unable to achieve the reductions as required by ISR, the project would pay the required offsite mitigation fees.

3.3.3 Methods for Evaluating Impacts

The methods for evaluating impacts are intended to satisfy the federal and state requirements including NEPA, CEQA and general conformity. In accordance with CEQA requirements, an EIR must include a description of the existing physical environmental conditions in the vicinity of the project. Those conditions, in turn, "will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant" (CEQA Guidelines §15125[a]).

For a project such as the HST project that would not commence operation for almost 10 years and would not reach full operation for almost 25 years, use of only existing conditions as a baseline for air quality impacts would be misleading. It is more likely that existing background traffic volumes (and background roadway changes from other programmed traffic improvement projects) and vehicle emission factors would change between today and 2020/2035 than it is that existing conditions would remain unchanged over the next 10 to 25 years. For example, RTPs include funded transportation projects programmed to be constructed by 2035. To ignore that these projects would be in place before the HST project reaches maturity (i.e., the point/year at which HST-related traffic emissions reaches its maximum), and to evaluate the HST project's air quality impacts ignoring that these RTP improvements would change the underlying background conditions to which HST project traffic/emissions would be added, would be misleading because it would represent a hypothetical comparison.

Therefore, the air quality analysis uses a dual baseline approach. That is, the HST project's air quality impacts are evaluated both against existing background conditions and against future background (i.e., No Project) conditions as they are expected to be in 2035. This approach complies with CEQA. (See *Woodwark Park Homeowners Assn v. City of Fresno* [2007], 150 Cal. App.4th 683, 707 and *Sunnyvale West Neighborhood Assn. v. City of Sunnyvale* [2010], 190 Cal. App. 4th 1351.) Results for both baselines are presented. Additional details of the analysis are presented in the *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a).

3.3.3.1 Statewide and Regional Emission Calculations

The emission burden analysis of a project determines a project's overall potential impact on air quality. The proposed project would affect long-distance, city-to-city vehicular travel along freeways and highways throughout the state, as well as long-distance, city-to-city aircraft take-offs and landings. The project would also affect electrical demand throughout the state.

On-Road Vehicles

An on-road vehicle emission analysis was conducted using average daily vehicle miles traveled (VMT) estimates and associated average daily speed estimates, for each affected county. Emission factors were estimated by using the CARB emission factor program, EMFAC2007 (see Emissions Model in Section 3.3.3.2, Microscale CO Analysis). Parameters were set in the program for each individual county to reflect conditions within each county, and statewide parameters were used to reflect statewide conditions. The analysis was conducted for the future No Project Alternative and the HST alternatives for the project's design year, both of which are 2035; the existing condition (2009); and the existing condition plus project (2009).

To determine the overall pollutant burdens generated by on-road vehicles, the estimated VMT were multiplied by the specific pollutant's emission factors, which were based on speed, vehicle mix, and analysis year. According to the current version of EMFAC2007, future fuel economy factors are forecast to improve only slightly between the years 2008 and 2035. However, this forecast is an artifact of the current version of EMFAC2007, which does not consider recent regulatory actions for improvements in vehicle fuel economy. Although the estimated 2035 on-road emissions would be lower if the recent regulatory actions were incorporated into the emission factors, the overall conclusions of this report would not change.

Airport Emissions

The Federal Aviation Administration's (FAA's) Emission and Dispersion Modeling System (EDMS) Version 5.1.2 was used to estimate airplane emissions. EDMS estimates emissions generated from a specified number of landing and take-off cycles. Along with the emissions from the planes themselves, emissions generated from associated ground maintenance requirements are included. Average plane emissions were calculated based on the profile of aircraft currently servicing the San Francisco to Los Angeles Corridor. The number of air trips removed because of the HST was estimated through the travel demand modeling analyses conducted for the project.

Power Plant Emissions

The HST System, including the propulsion of the trains and the operations of the stations and maintenance facilities, would be powered by the state's electricity grid. Because no dedicated generating facilities are proposed for this project, no source facilities can be identified. Therefore, emission changes from power generation were predicted on a statewide level. In addition, because of the state requirement that an increasing fraction (33% by 2020) of electricity generated for the state's power portfolio must come from renewable energy sources, the emissions generated for the HST System are expected to be lower in the future as compared to emissions estimated for this analysis, which are based on the state's current power portfolio. In addition, the Authority has adopted a goal to purchase the HST System's power from renewable energy sources.

3.3.3.2 Microscale CO Analysis

Analyses were conducted to estimate the potential localized air quality impacts of HST-related changes in traffic conditions near heavily traveled roadways, congested intersections, and areas near train station parking structures. Microscale CO modeling was performed by using EMFAC2007 and the CALINE4 air quality dispersion model to estimate existing (2009), future (2035) No Project Alternative, and future (2035) CO levels with the HST alternatives at selected locations.

Site Selection and Receptor Locations

Traffic conditions at affected intersections were evaluated to identify which intersections in the study area would have the potential to cause CO hot spots. Intersections within the study area were screened based on changes in intersection volume, delay, and level of service (LOS) between the existing condition, No Project Alternative, and HST alternatives. Intersections were considered to have the potential to cause CO hot spots if the LOS decreased from D or better to D or worse under any of the HST alternatives. Intersections that were already below LOS D were considered to have the potential to cause CO hot spots if their LOS, delays, and/or volume would increase from the existing condition and No Project Alternative with any of the HST alternatives. Using these criteria, intersections were ranked according to LOS, increased delay, and total traffic volume of the HST alternative compared to the existing condition and No Project

What Is a Microscale CO Analysis?

A microscale CO analysis is an estimation of potential future localized CO concentrations and a comparison of those concentrations to the NAAQS.

Alternative. The three intersections with the worst LOS, delay, and/or traffic volume were included in the CO hot-spot modeling.

Changes in emissions from vehicular activities near the Merced and Fresno parking structure locations were also modeled because of the emission increases near these locations.

Receptors for both the intersection and parking structure analyses were located in accordance with University of California, Davis, CO Protocol (Caltrans 1997). All receptors used were located at a height of 1.8 meters. Receptors for the intersection analysis were located 3 meters from the roadway spaced at 25 and 50 meters from the intersection for both the 1-hour and 8-hour analyses. For the parking structure, 1-hour analysis receptors were located 3 meters from the parking structure at each corner and the entrance of the structure.

Emission Model

Vehicular emissions were estimated by using EMFAC2007, which is a mobile source emission estimate program that provides current and future estimates of emissions from highway motor vehicles. EMFAC2007 (the latest in the EMFAC series) was designed by CARB to address a wide variety of air pollution modeling needs and incorporates updated information on basic emission rates, more realistic driving patterns, separation of start and running emissions, improved correction factors, and changing fleet composition.

Dispersion Model

Mobile source dispersion models are the basic analytical tools used to estimate CO concentrations expected under given traffic, roadway geometry, and meteorological conditions. The mathematical expressions and formulations that compose the models attempt to describe a complex physical phenomenon as closely as possible. The dispersion modeling program used in this study for estimating pollutant concentrations near roadway intersections is the CALINE4 dispersion model developed by Caltrans.

The analysis of roadway CO impacts followed the protocol recommended by Caltrans (Caltrans 1997). It is also consistent with CO modeling procedures identified in the SJVAPCD CEQA guidance (SJVAPCD 2002).

Meteorological Conditions

The transport and concentration of pollutants emitted from motor vehicles are influenced by three principal meteorological factors: wind direction, wind speed, and the temperature profile of the atmosphere. The values for these parameters were chosen to maximize pollutant concentrations at each prediction site (i.e., to establish a conservative worst-case situation). The *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a), which was prepared for the project, provides these values. Their selection was based on recommendations from the CEQA Air Quality Handbook, Caltrans' CO Protocol, and EPA guidelines.

Persistence Factor

Peak 8-hour concentrations of CO were obtained by multiplying the highest peak-hour CO estimates by a persistence factor. The persistence factor accounts for the fact that over 8-hours (as distinct from a single hour) vehicle volumes will fluctuate downward from the peak hour, vehicle speeds may vary, and meteorological conditions including wind speed and wind direction will vary compared to the conservative assumptions used for the single hour. A persistence factor of 0.7, as in the CO protocol (Caltrans 1997), was used in this analysis.

Background Concentrations

Microscale modeling is used to predict CO concentrations resulting from emissions from motor vehicles, using roadways immediately adjacent to the locations at which predictions are being made. A CO background level must be added to these values to account for CO entering the area from other sources upwind of the receptors. CO background levels were from data collected at a monitoring station located away from the influence of local traffic congestion. For this study area, background data collected at the Fresno-Drummond monitoring station were used.

The use of these monitors is conservative because while they are the closest monitors to the general study area stations and have a neighborhood spatial scale, they are influenced by traffic-related emissions. In addition, future CO background levels are anticipated to be lower than existing levels because of mandated emission source reductions.

The second-highest monitored values were used as background concentrations. The second-highest monitored 1-hour CO concentration, based on the latest 3 years of available data, was 3.5 parts per million (ppm), and the second-highest 8-hour average was 2.14 ppm for the Fresno-Drummond monitoring station.

Traffic Information

Traffic data for the air quality analysis were derived from traffic counts and other information developed as part of an overall traffic analysis for the project. Output from the Traffix 8.0 and Synchro6 signal-timing traffic models was used to obtain signal-timing parameters. The microscale CO analysis was performed based on data from this analysis for the AM and PM peak traffic periods. These are the periods when maximum traffic volumes occur on local streets and when the greatest traffic and air quality impacts of the proposed project are expected.

Analysis Years

CO concentrations were predicted for existing conditions (2009) and the project's design year (2035).

3.3.3.3 Particulate Matter Hot-Spot Analysis

While the HST portion of the project is subject to the general and not transportation conformity guidelines, because the region is classified as a federal nonattainment area for $PM_{2.5}$ and a federal maintenance area for PM_{10}, a PM_{10} and $PM_{2.5}$ hot-spot analysis following EPA's 2010 *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (EPA 2010f) was conducted, as recommended in the EPA Final Rule regarding the localized or "hot-spot" analysis of $PM_{2.5}$ and PM_{10} (40 CFR Part 93, issued March 10, 2006).

> What Is a PM Hot-Spot Analysis?
>
> A hot-spot analysis is an estimation of likely future localized PM_{10} and $PM_{2.5}$ pollutant concentrations and a comparison of those concentrations to the NAAQS (40 CFR 93.101).

EPA specifies in 40 CFR 93.123(b)(1) that only "projects of air quality concern" are required to undergo a $PM_{2.5}$ and PM_{10} hot-spot analysis. EPA defines projects of air quality concern as certain highway and transit projects that involve significant levels of diesel traffic or any other project that is identified by the $PM_{2.5}$ SIP as a localized air quality concern:

- New or expanded highway projects that have a significant number of or significant increase in diesel vehicles.
- Projects affecting intersections that are at LOS D, E, or F with a significant number of diesel vehicles or those that will degrade to LOS D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project.

- New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location.
- Projects in, or affecting, locations, areas, or categories of sites that are identified in the PM2.5- or PM10-applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation.

A discussion of the proposed project compared to projects of air quality concern, as defined by 40 CFR 93.123(b)(1), is provided below.

3.3.3.4 Mobile Source Air Toxics Analysis

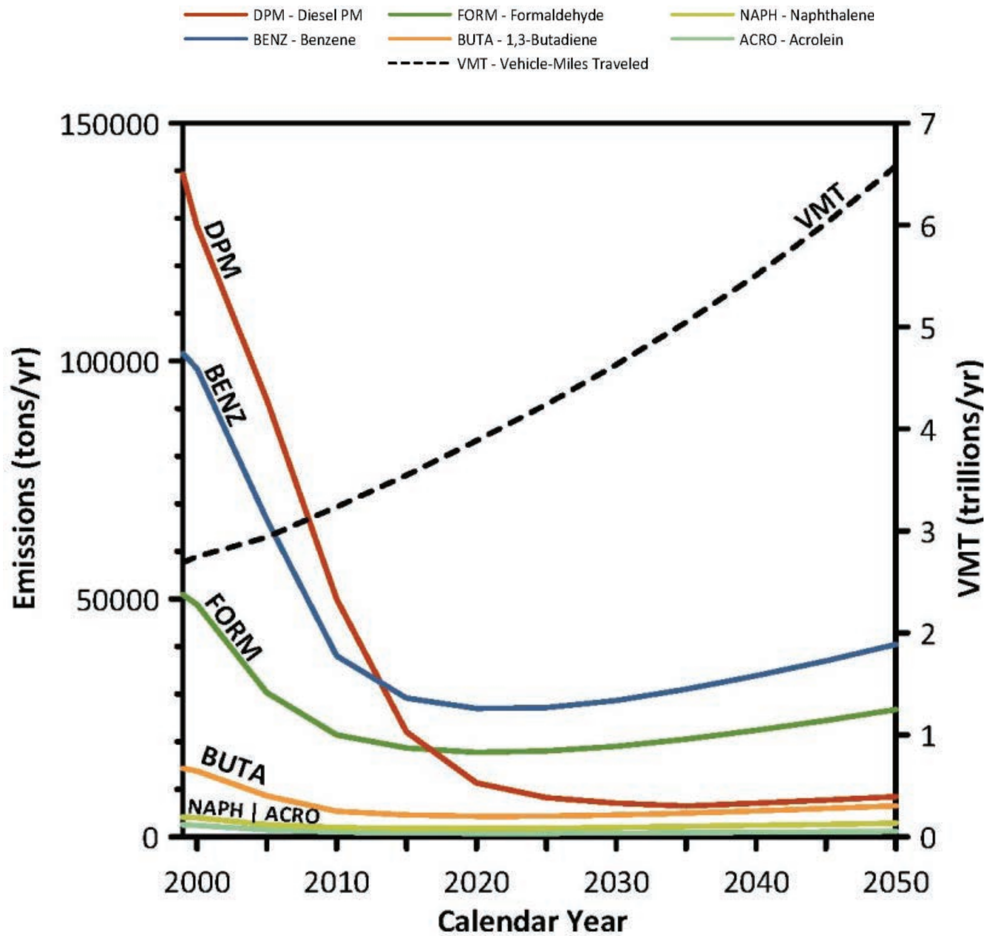
Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that EPA regulate 188 air toxics, also known as hazardous air pollutants. EPA assessed this expansive list in its latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007) and identified 93 compounds emitted from mobile sources that are listed in its Integrated Risk Information System (EPA 2011). In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national- and regional-scale cancer risk drivers from its 1999 National Air Toxics Assessment (EPA 1999). These seven compounds are acrolein, benzene, 1.3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter.

Under the 2007 rule, EPA sets standards on fuel composition, vehicle exhaust emissions, and evaporative losses from portable containers. The new standards are estimated to reduce total emissions of MSATs by 330,000 tons in 2030, including 61,000 tons of benzene. Concurrently, total emissions of VOC will be reduced by over 1.1 million tons in 2030 as a result of adopting these standards. Future emissions likely would be lower than present levels as a result of EPA's national control programs, which are projected to reduce MSAT emissions by 72% from 1999 to 2050, even if VMT increases by 145%, as shown in Figure 3.3-1.

On February 3, 2006, the FHWA released Memorandum: *Interim Guidance on Air Toxic Analysis in NEPA Documents* (FHWA 2006). This guidance was superseded on September 30, 2009, by FHWA's Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents (FHWA 2009). The purpose of FHWA's guidance is to advise on when and how to analyze MSATs in the NEPA process for highways. This guidance is interim because MSAT science is still evolving. As the science progresses, the FHWA will update the guidance. The FHWA's Interim Guidance groups projects into the following tier categories:

- No analysis for projects that have no potential for meaningful MSAT impacts.
- Qualitative analysis for projects with a low potential for MSAT impacts.
- Quantitative analysis to differentiate alternatives for projects with a higher potential for MSAT impacts.

The project has a low potential for MSAT impacts. Accordingly, a qualitative analysis was used to provide a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the HST alternatives. The qualitative assessment is derived in part from the FHWA study *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives* (FHWA 2010).



[a] Annual emissions of polycyclic organic matter are projected to be 561 tons/yr for 1999, decreasing to 373 tons/yr for 2050.
[b] Trends for specific locations may be different, depending on locally derived information representing vehicle miles traveled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.

Source: FHWA (2009).

Figure 3.3-1
National MSAT Emission Trends (1999–2050)
for Vehicles Operating on Roadways Using EPA's Mobile6.2 Model

3.3.3.5 Asbestos

Asbestos minerals occur in rock and soil as the result of natural geologic processes, often in veins near earthquake faults in the coastal ranges and the foothills of the Sierra Nevada Mountains and other areas of California. Naturally occurring asbestos (NOA) takes the form of long, thin, flexible, separable fibers. Natural weathering or human disturbance can break NOA down to microscopic fibers that are easily suspended in air. When inhaled, these thin fibers irritate tissues and resist the body's natural defenses. In addition, asbestos-containing materials may have been used in constructing buildings that would be demolished.

Asbestos is a known human carcinogen. It causes cancers of the lung and the lining of internal organs, as well as asbestosis and pleural disease that inhibit lung function. EPA is working to address concerns about the potential impacts of NOA in several areas in California.

The California Geological Survey identifies ultramafic rocks in California to be the source of NOA. The California Geological Survey published *A General Location Guide for Ultramafic Rocks in California – Areas More Likely to Contain Naturally Occurring Asbestos* (CDMG 2000). This study was used to determine if NOA would be located within the project area.

3.3.3.6 Greenhouse Gas Analysis

The proposed project would reduce long-distance, city-to-city travel along freeways and highways throughout the state, as well as long-distance, city-to-city aircraft take-offs and landings. The project would also affect electrical demand throughout the state. These elements would affect GHG emissions on both a statewide and regional study area level. The following sections discuss the methodology for estimating GHG emissions associated with the operation of the project.

The methodology for estimating GHG emissions associated with construction is included in Section 3.3.3.8, Construction Phase.

On-Road Vehicles

The on-road vehicle GHG emission analysis was conducted by using average daily VMT estimates and associated average daily speed estimates, which were calculated for each affected county. GHG emission factors were estimated from EMFAC2007, using parameters set within the program for each individual county to reflect travel within each county and statewide parameters appropriate for each county. The analysis was conducted for the future No Project and HST alternatives for the project's design year (2035).

To determine overall GHG burdens generated by on-road vehicles, estimated VMTs were multiplied by appropriate GHG emission factors, which were based on speed, vehicle mix, and analysis year. According to EMFAC2007, fuel economy factors are forecast to improve only slightly between 2008 and 2035. However, this conclusion does not consider recent regulatory actions that will likely result in substantial future improvements in fuel economy and CO_2 emission factors. These actions are as follows:

- EPA and National Highway Traffic Safety Administration (NHTSA) updated the Corporate Average Fuel Economy (CAFE) fuel standards on May 7, 2010 (75 FR 25324), which requires substantial improvements in fuel economy for all vehicles sold in the United States starting with model year 2012 through 2016.
- The State of California has enacted legislation requiring dramatic improvements in vehicle fuel economy for all vehicles sold in California.

Airport Emissions

Airport GHG emissions were estimated using the same methodology as described in Section 3.3.3.1.

Power Plant Emissions

Power plant GHG emissions were estimated using the same methodology as described in Section 3.3.3.1.

3.3.3.7 HMF Impact Analysis

The HST project would include a heavy maintenance facility (HMF) that would service and repair the rail cars and locomotives. The facility would include locomotives, heavy-duty equipment (e.g., cranes, backhoes, loaders, and emergency generators), heavy-duty delivery trucks, and a spray booth for painting the trains. Although measures would be incorporated to minimize atmospheric emissions from these sources, such as the use of electric yard trains to move rail cars and electric locomotives around the site and the use of diesel-retrofits on heavy-duty diesel engines, the activities at the HMF site would generate emissions that conceivably could affect sensitive land uses. Dispersion modeling analysis was conducted for the HMF emissions to evaluate the impacts on air quality. In addition, a health risk analysis was conducted to evaluate the cancer risk impacts on sensitive receptors near the HMF. The major sources of HMF emissions include:

- Switch diesel locomotive activities associated with maintenance of way operations
- Spray booth painting operations
- Diesel equipment[1]
- Diesel trucks

HMF Locations

Several locations are being considered for the HMF site including Harris-DeJager, Fagundes, Gordon-Shaw, Kojima Development, and Castle Commerce Center sites. The final location of the HMF has not been selected. Therefore, an air quality analysis was conducted for a prototypical facility (using the current facility design and anticipated activities) to determine whether HMF operations have the potential to significantly affect nearby sensitive land uses.

Pollutants of Concern

Both criteria and non-criteria toxic air contaminants (TACs) were considered in this analysis. The criteria pollutants considered are:

- NO_2 from diesel locomotives, diesel equipment, and trucks
- PM_{10} and $PM_{2.5}$ from both diesel engines and spray booth operations

The TACs considered are contaminants identified according to the California's Office of Environmental Health Hazard Assessment (OEHHA)'s *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (Cal-EPA 2003) that may be emitted from HMF operations, including diesel engines and spray booth activities. Of these, diesel PM has the likelihood of contributing the most to the potential health effects of the HMF operations because of the type of activities that would occur at these facilities. Diesel PM has been identified by OEHHA as a TAC based on its potential to cause cancer and other adverse health problems, including respiratory illnesses and increased risk of heart disease. There are also a number of other toxic pollutants of different toxicities that are either carcinogenic or non-carcinogenic that can be potentially released from spray booth operations and diesel vehicular exhaust. Analyses were therefore conducted for diesel PM and applicable TACs that considered both chronic (long-term) carcinogenic and non-carcinogenic and acute (short-term) health risks.

In addition to the above pollutants, CO, VOC, and GHG emissions from HMF operations were estimated. CO and GHG are not expected to cause localized air quality impacts, due to the relatively low CO background concentrations and the global nature of GHG impacts. VOC emissions would be evaluated in terms of speciated toxics in the analysis. Therefore, CO, VOC, and GHG emissions from HMF operations are only included in the regional air quality impact discussion.

HMF Emission Factors and Rates

Emissions factors from the diesel-powered engines and spray booth operations were estimated as follows:

- PM_{10} emission factors were conservatively used to represent diesel PM emission factors. Most diesel PM emissions, however, are made up of particles smaller than 2.5 microns ($PM_{2.5}$), which are estimated to be 92% of PM_{10} values.

- Diesel PM (PM_{10}), $PM_{2.5}$, NO_2, VOC, and CO emissions from switch locomotives were estimated using EPA Tier 4 emission standards (which are also adopted by CARB) applicable for newly manufactured (after 2015) locomotives (40 CFR Title 40, Part 89) that use stringent control technologies and use

[1] The diesel equipment includes nonroad diesel engines such as internal combustion engines (not including motor vehicle engines).

ultra-low sulfur diesel fuel. This is a reasonable assumption because the HMF would be operational by 2021.

- All new locomotives after 2015 must meet these standards. To enable catalytic after treatment methods at the Tier 4 stage, EPA requires the use of low-sulfur diesel fuel for all on-road and off-road engines after 2015. A sulfur limit of 500 parts per million (ppm) has been in effect since June 2007, and after June 2012, this limit becomes 15 ppm. California in 2006 also adopted regulations lowering the sulfur content of diesel fuel to less than 15 ppm. Refineries in California are already making low-sulfur diesel so it is available where needed, and transit agencies in California have been required to use ultra-low sulfur diesel since July 2002.
- Locomotive emission rates were also estimated based on locomotive type and assumptions regarding notch settings, activity times, and durations.
- The assumption that all switch locomotives would be diesel-powered might be conservative because some or all of these vehicles may be electrically powered (or duel-fueled) and therefore have no (or less) onsite generated emissions.
- CO_2 emissions from moving locomotives were estimated based on diesel fuel density, carbon content, and consumption rate per brake-horsepower-hour (EPA-420-F-09-025). CO_2 emissions from idling locomotives were estimating using the same fuel density and carbon content as well as an assumed consumption per idling-hour, based on the seasonal conditions.
- It was conservatively assumed that all of the NO_x released from the diesel engines (which is generally composed of only a small percentage of NO_2) would be converted in the atmosphere to NO_2 by the time it reached the site boundary, even though a lower conversion rate would likely occur.
- CO_2 emissions from moving and idling locomotives were estimated using a standard diesel fuel density, carbon content, and consumption rate per brake-horsepower (hp)-hour (EPA-420-F-09-025).
- SO_2 emissions from moving and idling locomotives were estimated using a standard diesel-fuel density, a sulfur content of ULSD (which was assumed to be 15 ppm), and a consumption rate per brake-hp-hour (EPA-420-F-09-025).
- For other diesel equipment, EPA's Tier 4 emission standards for non-road diesel engines were used (69 FR 38957-39273, 29 June 2004) to estimate diesel PM (PM_{10}), $PM_{2.5}$, NO_2, VOC, and CO emissions. In the absence of a VOC-specific emission factor, VOC emissions were represented using the non-methane hydrocarbon Tier 4 emission standard.
- CO_2 emissions from other diesel equipment were estimated using the CARB's OFFROAD 2007, for a 200 horsepower (hp), model year 2017 equipment belonging to the Other General Industrial Equipment category.
- SO_2 emissions from diesel equipment were estimated using Santa Barbara County Air Pollution Control District's *Technical Information and References*, Table 2, "Construction Equipment Controlled Emission Factors" (Santa Barbara County Air Pollution Control District 1997).
- On-road diesel truck PM (PM_{10}), $PM_{2.5}$, NO_2, VOC, CO, SO_2, and CO_2 emissions were estimated using EMFAC2007 emissions factors for heavy-heavy duty trucks running at 10 mph for the year 2017, which is a conservative assumption because the HMF would be operational only by 2021.
- VOCs from paint booth emissions were estimated using conservative volatility rates (i.e., 620 pounds of VOC per gallon of paint even though values as low as 360 pounds per gallon are available) and paint usage projections
- VOCs from paint booth emissions were also estimated based on the assumption that the paint booths would be equipped with conventional filters with a 90% control efficiency.

- Speciated TAC emissions from paint booth operations were estimated using CARB's "Organic Speciation Profile for Surface Coating Operations," found in *Organic Chemical Profiles for Source Categories* (CARB 2011a).

- Emissions of metal compounds, which are bonded to diesel particulate matter (DPM) from diesel combustion, were calculated by using CARB's "PM Speciation Profile for Diesel Vehicle Exhaust," found in *PM Speciation Profile for Source Categories* (CARB 2011b).

- Emissions of organic compounds from diesel combustion were estimated using CARB's "Organic Speciation Profile for Diesel Light and Heavy Equipment," found in *Organic Chemical Profiles for Source Categories* (CARB 2011a).

Emission rates for diesel equipment and trucks were estimated based on the following HMF operating scenario which was supplied by the project design engineers:

- Two switch locomotives (for maintenance-of-way operations) and six pieces of diesel-fueled equipment would operate at the HMF.
- Two maintenance-of-way locomotives, which are assumed to be 2,000 hp each, would idle for 2 hours and move around the HMF site for 2 hours over a 24-hour period, and the locomotives would go through all notches (gears) when moving.
- The diesel equipment, which is assumed to be 200 hp each, would operate for 8 hours over a 24-hour period.
- Twenty diesel trucks would operate on the site for 8 hours over each 24-hour time period.

The *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a) provides estimated emission factors and emission rates for the pollutants evaluated.

Dispersion Analysis

A detailed dispersion modeling analysis was conducted to estimate the potential impacts of HMF emissions on nearby sensitive land uses. Using the same emission rates as those used in the screening analysis, the EPA AERMOD model was used to simulate physical conditions and predict pollutant concentrations at specific distances from the boundaries of a HMF site. AERMOD is generally applied to estimate impacts from simple point-source emissions from stacks, as well as emissions from volume and area sources. The model accepts actual hourly meteorological observations and directly estimates hourly and average concentrations for various time periods.

A prototypical site was analyzed to evaluate the HMF operation impacts. Pollutant concentrations were estimated at site boundary and in increments of 100 feet around the site. Regulatory default options and the rural dispersion algorithm of AERMOD were used in the analysis. The maximum concentrations at these distances were compared with NAAQS, CAAQS, and health-related guidelines to determine the level of impacts.

Emissions from expected operations were simulated as one area source spread out over the 140-acre HMF site. Five years of meteorological data (2004 through 2009) from Merced County Airport, as compiled by the San Joaquin Valley Air Pollution Control District, were used. An emissions release height was assumed to be 14.8 feet to approximate the stack heights of the locomotive engines, diesel trucks, and spray booth stack(s).

Maximum diesel PM and applicable TAC concentrations were used to estimate cumulative cancer risks and the overall non-cancer chronic and acute hazard index associated with HMF operations using procedures developed by OEHHA (OEHHA 2008). The cancer risk calculation procedure developed by the California's Office of Environmental Health Hazard Assessment (OEHHA) was used to estimate increased cancer risks resulting from the HMF's diesel PM and TAC emissions. Details of the risk analysis are in the *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a).

CO Hot-Spot Analysis

CO hot-spot analysis was conducted to evaluate the potential impacts of traffic volume change near the HMF stations. The Castle Commerce Center HMF site is near the largest population and the most sensitive receptors land uses; this site was evaluated in the CO hot-spot analysis because of its proximity to signalized intersections. CO hot-spot analysis was not conducted for the other potential HMF locations because they are located in remote rural areas and thus are not expected to cause traffic congestion at nearby intersections.

3.3.3.8 Construction Phase

Construction-phase emissions were quantitatively estimated for the earthwork and major civil construction activities of the following components of the project:

- At-grade guideway segments
- Elevated guideway segments
- Retained fill guideway segments
- Substations
- HMF
- HST stations
- Roadways and roadway overpasses

These major construction activities would account for the majority of earthwork, the largest number of diesel-powered off-road construction equipment, and the majority of material to be hauled along public streets compared to other minor construction activities of the project. Therefore, the regional emissions and localized emissions from these major activities would account for the majority of construction emissions that would be generated by the construction of the proposed project. The estimated construction emissions from these major activities were then used to estimate the regional air quality and localized air quality impacts that would occur during the construction phase. Default emission rates for activities, such as architectural coating, were used if -information specific to the project was not available.

Methodologies and Assumptions

Construction Activities: Criteria pollutant and GHG emissions from regional building demolition and construction of the at-grade rail segments, elevated rail segments, retained fill rail segments, transaction power substations, industrial buildings at the HMF, and HST stations including parking garages and platform facilities were calculated using URBEMIS 2007. URBEMIS 2007 uses emission factor data for off-road equipment using the OFFROAD 2007 and EMFAC2007 models. The URBEMIS model was chosen over the Sacramento Roadway Construction Model (RCM) because the URBEMIS model uses statewide off-road emission factors or county or air basin specific on-road emission factors, allows for overlapping construction phases, and provides emission rates on an annual basis. In addition, it is appropriate to use URBEMIS for linear construction projects such as the construction of the HST when project-specific construction phasing and equipment is known. Detailed analysis of the RCM and URBEMIS model features can be found in the *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a)

Mobile source emission burdens from worker trips and truck trips were calculated using VMT estimates and appropriate emission factors from EMFAC2007.

URBEMIS 2007 allows the user to specify the square footages of each category of building to be constructed at the facility, and allows the user to specify what types of fugitive dust control and tailpipe emission control measures will be used. Control measures that construction contractors will be required to implement as outlined in the Statewide Program EIR/EIS were incorporated in the analysis, such as watering unpaved access roads three times daily, watering disturbed areas two times daily, and promptly replacing ground cover over disturbed areas.

Project-specific data, including construction equipment lists and the construction schedule, were used for construction associated with the alignment/guideway. Project-specific data were not available for the nonlinear construction associated with the station and HMF buildings and therefore the URBEMIS 2007 default settings were used in these instances only. Calculations were performed for each year of construction.

Project-specific data, including construction equipment lists and the construction schedule, were used when available. Where project-specific data were not available, URBEMIS 2007 default settings were used. Calculations were performed for each year of construction.

The project's construction schedule is provided in Chapter 2, Alternatives; however, the assumptions used for the air quality construction calculations are based on the following:

- Structures and utilities would be prioritized as early action construction items.
- Local roads/highways would be the main access points to the construction sites.
- Rail construction would be performed in a linear fashion between structures.
- Plant-welded rail would be delivered to the alignment in 1,000-foot-long strings.
- The HMF guideway would be built independently from the line construction.
- The HMF buildings and guideway/systems would be built concurrently.
- Components of the HST System would be built to support testing and commissioning and would be built just before opening year.

The equipment list used in the analysis is based on the default settings in URBEMIS 2007 and is considered to represent the equipment that would be used for construction of the HST stations, the HMF, overnight layover/servicing facilities (which is colocated with the HMF), and the power substations (i.e., traction power supply, switching, and paralleling). The information required for URBEMIS 2007 to calculate emissions from the construction of stations and facilities includes areas (in square feet) and land use types (e.g., light industrial for HST stations and power substations and heavy industrial for maintenance facilities). Project mobilization and demobilization emissions were calculated using URBEMIS 2007, assuming two staging areas and negligible dust disturbance from off-road travel. Alignment construction emissions were calculated using URBEMIS 2007 and included the following phases: land grubbing, mass site grading, trenching, cutting and filling, constructing structures for the elevated rail, laying elevated rail, laying at-grade rail, constructing the retaining wall for the retained fill rail, and laying retained fill rail.

Material Hauling: Emissions from the exhaust of trucks used to haul material to the construction site were calculated using the heavy-duty truck emission factors from EMFAC2007 and anticipated travel distances of haul trucks within the San Joaquin Valley Air Basin (SJVAB). Ballast and sub-ballast materials could potentially be hauled by rail within the air basin. Rail emission factors from EPA document *Emission Factors for Locomotives* (EPA 2009) and the travel distance by rail within the SJVAB were used to estimate rail emissions.

Ballast and sub-ballast materials would be potentially transported from locations outside of SJVAB. For the regional emission analysis, emissions from ballast material-hauling were calculated using the distance traveled within the SJVAB. Emissions from ballast material-hauling by trucks and locomotives outside the SJVAB were also estimated based on the travel distances and transportation method (by rail or by truck) from the locations where ballast materials would be available. Rail emission factors using EPA guidance (EPA 2009) were used to estimate the locomotive emissions. Other construction materials would likely be delivered from supply facilities within the SJVAB.

Five potential quarries that provide ballast material were identified. Of these, three quarries, including Napa Quarry, Lake Herman Quarry, San Rafael Rock Quarry, were included in the evaluation because of their proximity to the project construction site. These three quarries are all located within 70 miles of the SJVAB border and would have material available for the project construction. The Bangor Rock Quarry Site A was included in the evaluation because it is located within 100 miles of the SJVAB border. In addition, this quarry would have material available for the project needs in quantities that exceed the material quantities available at the closest quarries. The other quarry, Kaiser Eagle Mountain Quarry, which is located 350 miles by rail (250 miles by road) from the border of the SJVAB, was analyzed because the annual production rate at this quarry was sufficient to meet construction material requirements.

The analysis was based on the largest amount of ballast needed for the project for a worst-case year. It was assumed that the material would be transferred either by diesel truck from the quarry to rail (if there was no rail head onsite) and then by rail to the border of SJVAB, entirely by rail to the border of the SJVAB (if there was a rail head onsite), or by diesel truck from the quarry to the border of the SJVAB. Emissions could potentially occur in several air basins and air districts outside SJVAB.

Five scenarios were analyzed:

1. All ballast and sub-ballast were transported by rail from Kaiser Eagle Mountain Quarry.
2. Ballast and sub-ballast were transported by truck and rail from the three closest quarries (Napa Quarry, Lake Herman Quarry, San Rafael Quarry) until production limits were reached, and the rest from Kaiser Eagle Mountain Quarry.
3. Ballast and sub-ballast were transported by truck and rail from the four closest quarries (Napa Quarry, Lake Herman Quarry, San Rafael Quarry and Bangor Rock Quarry – Site A) until production limits were reached and the rest from Kaiser Eagle Mountain Quarry.
4. Ballast and sub-ballast were transported by truck only from the four closest quarries (Napa Quarry, Lake Herman Quarry, San Rafael Quarry and Bangor Rock Quarry – Site A) until production limits were reached and the rest from Kaiser Eagle Mountain Quarry.
5. Ballast and sub-ballast were transported by truck only from the three closest quarries (Napa Quarry, Lake Herman Quarry, San Rafael Quarry) until production limits were reached, and the rest from Kaiser Eagle Mountain Quarry.

Concrete Batch Plants: Concrete would also be required for construction of bridges used to support the elevated sections of the alignment and for construction of the retaining wall used to support the retained fill sections of the alignment. To provide enough onsite concrete, an estimated three batch plants would operate in the project area during construction of the alignment sections. Because the locations of the concrete batch plants are unknown, emissions were estimated based on the total amount of concrete required (independent of the number of concrete batch plants) and emission factors from AP-42 Chapter 11.12 – Concrete Batching (EPA 2006a). Emissions from on-road truck trips associated with transporting material to and from the concrete batch plants were also included.

The HST alternatives would also include the relocation and expansion of freeway segments, local roads, and overpasses and reconstruction of several intersections. Fugitive dust and exhaust emissions from these activities were estimated using the default equipment list and construction schedules from the Sacramento Roadway Construction Emissions Model (SMAQMD 2009) and URBEMIS 2007.

Schedule

Chapter 2, Alternatives, provides more information regarding construction methods and schedules for the project. The equipment and workforce schedule was used with URBEMIS 2007 to calculate construction emissions. The *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a) provides the detailed equipment and workforce schedule.

Project mobilization would occur from March 2013 to October 2013. Regional building demolition and land grubbing for the at-grade, elevated, and retained fill rail segments are expected to begin April 2013, concluding in August 2013. The major construction activities are expected to occur between 2013 and 2019, with construction of the HMF completed by 2021. Project demobilization would occur from August 2017 to December 2019.

Statewide EIR/EIS Programmatic Control Measures

The project design incorporates the following design elements from the Statewide Program EIR/EIS mitigation strategies to reduce air quality impacts associated with construction and operation of the HST System. Because the Statewide Program EIR/EIS includes these measures, they are not considered mitigation but are calculated as part of the project construction emissions prior to mitigation. The effectiveness of these measures was not included in the mitigated emissions calculations but was included in the unmitigated emission estimates. The programmatic measures and their corresponding emissions reductions include:

- Replacing ground cover in disturbed areas (PM, 5%).
- Watering exposed surfaces twice daily (PM, 55%).
- Watering unpaved access roads three times daily (PM, 61%).
- Reducing speed on unpaved roads to 15 miles per hour (PM, 45%).
- Ensuring that trucks hauling loose materials would be covered (PM, 69%).

Regulatory Control Measures

Many of the control measures required by the SJVAPCD Regulation VII are the same or similar to the control measures listed in the Statewide Program EIR/EIS. The emission reductions associated with SJVAPCD Regulation VII are the same as the emission reductions associated with the Statewide Program EIR/EIS (Authority and FRA 2008) listed above.

3.3.3.9 Significance Thresholds

The following values were used to determine whether estimated project impacts are considered to be significant.

Federal

Pursuant to NEPA regulations (40 CFR 1500-1508), project effects are evaluated based on the criteria of context and intensity. Context means the affected environment in which a proposed project occurs. Intensity refers to the severity of the effect, which is examined in terms of the type, quality, and sensitivity of the resource involved, location and extent of the effect, duration of the effect (short- or long-term), and other consideration of context. Beneficial effects are identified and described. When there is no measurable effect, impact is found not to occur. Intensity of adverse effects is summarized as the degree or magnitude of a potential adverse effect where the adverse effect is thus determined to be negligible, moderate, or substantial. It is possible that a significant adverse effect may still exist when on balance the impact is negligible or even beneficial.

Project emissions of criteria pollutants are compared to the general conformity *de minimis* applicability thresholds (GC thresholds) on a calendar-year basis for both construction and operational emissions. If annual project-related emissions generated in a nonattainment or maintenance area exceed the GC thresholds, a GC determination is required. In addition, the project emissions may not cause new violations or exacerbate an existing violation of NAAQS. Table 3.3-2 presents the GC thresholds for the project.

If the project pollutant emissions are below the corresponding general conformity thresholds, and are expected to cause pollutant emissions that do not exceed other applicable emissions, air quality, or health risk thresholds, then the impact is considered negligible. Moderate air quality impacts are defined as pollutant emissions below corresponding general conformity thresholds, but having the potential to exceed other applicable emissions, air quality, or health risk thresholds. Substantial impacts are defined as pollutant emissions that are greater than the corresponding general conformity threshold, or having the potential to exceed other applicable emissions, air quality, or health risk thresholds it is a substantial impact.

Table 3.3-2
General Conformity Thresholds

Pollutant	Federal Attainment Status	Threshold Values (tons/year)[a]
NO_2	Attainment	NA
Ozone precursor (nitrogen oxides [NO_x])[b]	Nonattainment: Extreme	10
Ozone precursor (VOC)[b]	Nonattainment: Extreme	10
CO[c]	Maintenance	100
Sulfur oxides (SO_x)	Attainment	NA
$PM_{2.5}$	Nonattainment	100
$PM_{2.5}$ precursor (SO_2) [d]	Nonattainment	100
PM_{10}	Maintenance	100
Lead	No Designation	NA

NA = not applicable

[a] Thresholds from 40 CFR Parts 51 and 93.

[b] Ozone reclassifications were made by EPA on May 5, 2010.

[c] Only the urban portion of Fresno County is a maintenance area for CO.

[d] SO_2 has a GC threshold of 100 tons per year. Due to the stringent requirement of using ultra-low sulfur content diesel in California, emissions of SO_2 anticipated from the project are expected to be negligible compared to the threshold. Regardless, further analysis and evaluation of SO_2 impacts are included in this report.

Sources: SJVAPCD (2010a); EPA (2010d).

State

Pursuant to CEQA Guidelines, impacts on air quality are considered to be significant if the project would:

- Conflict with or obstruct implementation of the applicable air quality plan.
- Exceed or contribute to an exceedance of any air quality standard or contribute substantially to an existing or projected air quality violation (refer to Table 3.3-3).
- 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 (including releasing emissions that exceed quantitative thresholds for ozone precursors).
- Expose sensitive receptors to substantial pollutant concentrations.
- Create objectionable odors 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 GHG.
- The SJVAPCD GAMAQI (SJVAPCD 2002) contains emissions thresholds used to evaluate the significance of a project's emissions (see Table 3.3-3). If a project's emissions are below the significance thresholds, impacts would be considered less than significant; if either the construction- or operational-phase emissions are greater than these values, impacts for that phase would be considered potentially significant.

Table 3.3-3
SJVAPCD CEQA Construction and Operational Thresholds of Significance

Pollutant	Thresholds (tons/year)
NO_x	10
Reactive organic gases (ROG)	10
PM_{10}	15
$PM_{2.5}$	15
Sources: SJVAPCD (2002); Willis (2010); Barber (2011).	

SJVAPCD does not have a quantitative SO_2 emission threshold, and SO_2 is not expected to be a pollutant of concern given the low background concentrations of the area and the type of project proposed. Therefore, impacts from SO_2 emissions would be negligible and less than significant because emissions would not cause or contribute to an exceedance of an air quality standard or contribute substantially to an existing or projected air quality violation. However, SO_2 emissions are presented in this analysis.

SJVAPCD does not have construction or operation emission thresholds for CO for CEQA. CO impacts during operation will be considered significant if the projected CO concentrations at potential hot-spot locations exceed NAAQS or CAAQS.

3.3.3.10 Study Areas for Analysis

Statewide

A statewide study area was identified to evaluate potential changes in air quality from large-scale non-localized impacts such as HST power requirements, changes in air traffic, and project conformance with the SIP.

Regional

This section of the HST System would potentially affect regional air pollutant concentrations within the SJVAB, in which the entire Merced to Fresno Section is located. Figure 3.3-2 shows the alignment as it is situated in the SJVAB, which includes Madera, Merced, and Fresno counties. The SJVAB, which is approximately 250 miles long and 35 miles wide, is the second-largest air basin in the state. The SJVAB is defined by the Sierra Nevada Mountains in the east (8,000 to 14,000 feet in elevation), the Coast Range in the west (averaging 3,000 feet in elevation), and the Tehachapi Mountains in the south (6,000 to 8,000 feet in elevation). To the north, the valley opens to the sea at the Carquinez Strait, where the Sacramento–San Joaquin River Delta empties into San Francisco Bay.

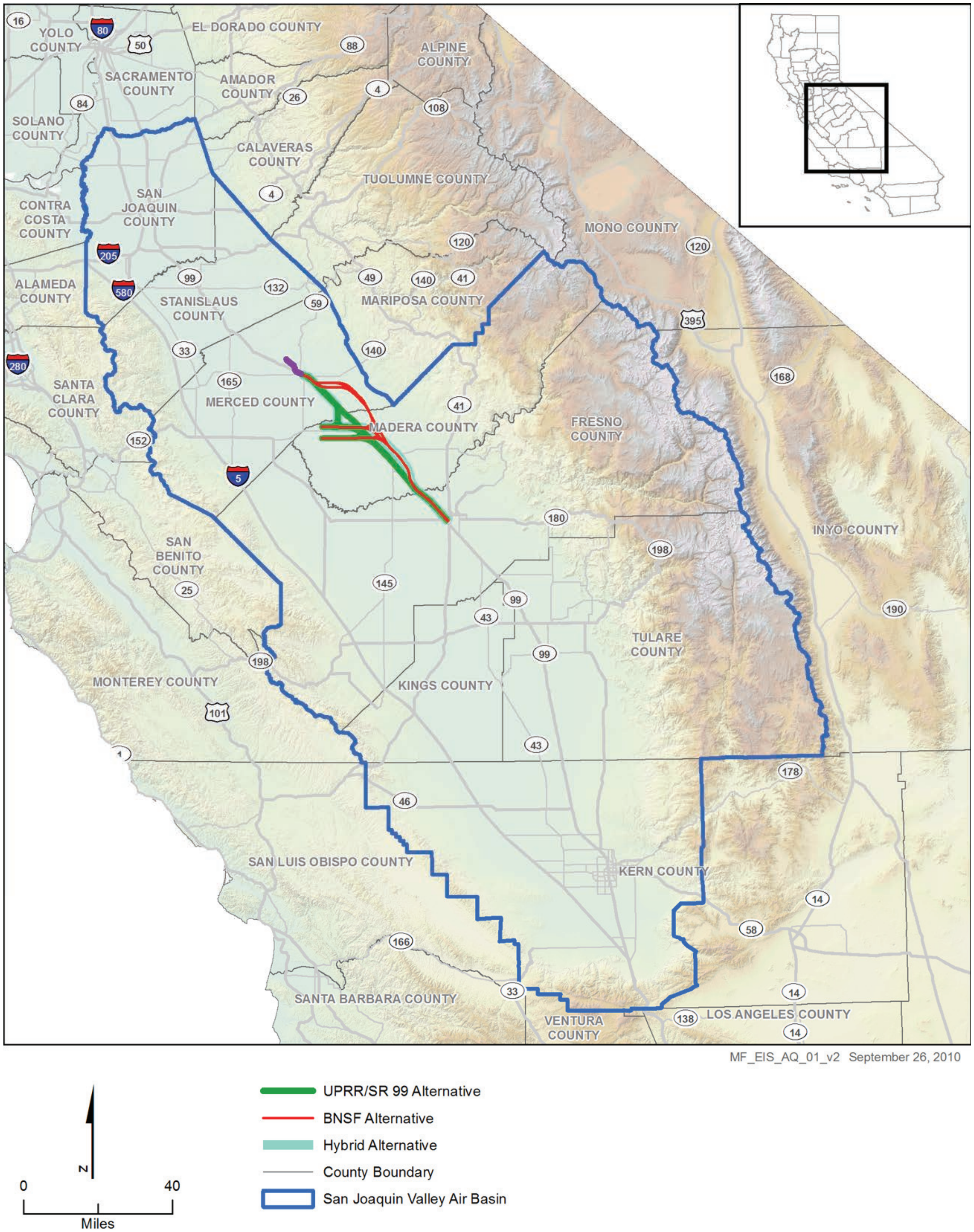


Figure 3.3-2
San Joaquin Valley Air Basin

Local

Local study areas are areas of potential major air emission activities along the project alignment, including areas near large construction activities and major traffic pattern changes. Local study areas are generally defined as areas within 1,000 feet of the proposed stations, major intersections, and HMFs. Analyses performed by CARB indicate that providing a separation of 1,000 feet from diesel sources and high traffic areas would substantially reduce diesel PM concentrations, public exposure, and asthma symptoms in children (CARB 2005). Potential impacts from changes in CO, $PM_{2.5}$, and PM_{10} concentrations caused by changes in local traffic conditions were evaluated at sensitive land uses within 1,000 feet of intersections operating at LOS D or worse.

3.3.4 Affected Environment

This section discusses the affected environment related to air quality and global climate change in the study area.

3.3.4.1 Local Meteorological Conditions

The rate and location of pollutant emissions and the meteorological conditions that influence movement and dispersal of pollutants in the atmosphere affect air quality. Atmospheric conditions, such as wind speed, wind direction, and air temperature gradients, along with local topography, provide the link between air pollutant emissions and local air quality levels.

Elevation and topography can affect localized air quality. The hills and mountains surrounding the San Joaquin Valley restrict air movement through and out of the majority of the basin. The SJVAB encompasses the southern two-thirds of California's Central Valley. Mountain ranges border the sides and southern boundary of the bowl. The valley's weather conditions include frequent temperature inversions; long, hot summers; and stagnant, foggy winters, all of which are conducive to forming and retaining air pollutants (SJVAPCD 2009a).

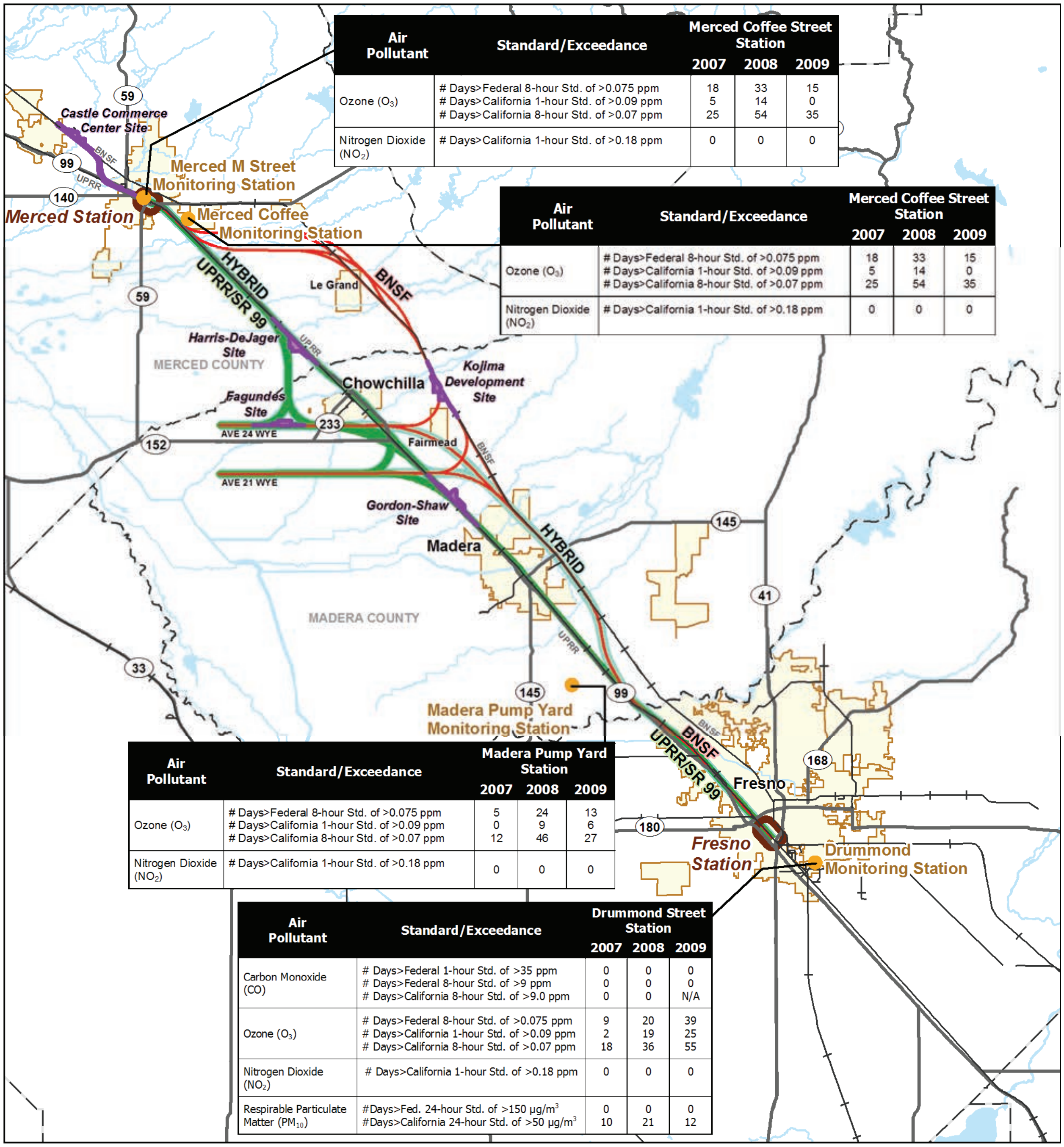
The SJVAB is typically arid in the summer, with cool temperatures and prevalent tule fog (i.e., a dense ground fog) in the winter and fall. The average high temperature in the summer is in the mid-90s, and the average low temperature in the winter is in the high 40s. January is typically the wettest month of the year, with an average of about 2 inches of rain. Wind direction is typically from the northwest, with speeds around 30 mph (Western Regional Climate Center 2009).

3.3.4.2 Local Monitored Air Quality

CARB maintains ambient air monitoring stations for criteria pollutants throughout California. The stations closest to the HST alternatives are the Merced Coffee, Madera Pump Yard, Fresno-Drummond, and Merced M Street monitoring stations. These stations, as shown in Figure 3.3-3, monitor NO_2, O_3, PM_{10}, CO, and $PM_{2.5}$, but do not monitor SO_2. Table 3.3-4 summarizes the results of ambient monitoring at the four stations from the latest 3 years of available data. The land uses in the region range from urban and residential to rural and agricultural. As shown, exceedances of the NAAQS and CAAQS, primarily for O_3 and particulate matter, have been recorded.

3.3.4.3 Relevant Pollutants

Three general classes of air pollutants are of concern for this project: criteria pollutants, TACs, and GHGs. Criteria pollutants are those for which EPA 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. TACs of concern for the proposed project are seven MSATs identified by EPA as having significant contributions from mobile sources: acrolein, benzene, 1,3-butadiene, diesel particulate matter and diesel exhaust organic gases, formaldehyde, naphthalene, and polycyclic organic matter. GHGs are gaseous compounds that limit the transmission of radiated heat from the earth's surface to the atmosphere.



Air Pollutant	Standard/Exceedance	Merced Coffee Street Station 2007	2008	2009
Ozone (O_3)	# Days>Federal 8-hour Std. of >0.075 ppm # Days>California 1-hour Std. of >0.09 ppm # Days>California 8-hour Std. of >0.07 ppm	18 5 25	33 14 54	15 0 35
Nitrogen Dioxide (NO_2)	# Days>California 1-hour Std. of >0.18 ppm	0	0	0

Air Pollutant	Standard/Exceedance	Merced Coffee Street Station 2007	2008	2009
Ozone (O_3)	# Days>Federal 8-hour Std. of >0.075 ppm # Days>California 1-hour Std. of >0.09 ppm # Days>California 8-hour Std. of >0.07 ppm	18 5 25	33 14 54	15 0 35
Nitrogen Dioxide (NO_2)	# Days>California 1-hour Std. of >0.18 ppm	0	0	0

Air Pollutant	Standard/Exceedance	Madera Pump Yard Station 2007	2008	2009
Ozone (O_3)	# Days>Federal 8-hour Std. of >0.075 ppm # Days>California 1-hour Std. of >0.09 ppm # Days>California 8-hour Std. of >0.07 ppm	5 0 12	24 9 46	13 6 27
Nitrogen Dioxide (NO_2)	# Days>California 1-hour Std. of >0.18 ppm	0	0	0

Air Pollutant	Standard/Exceedance	Drummond Street Station 2007	2008	2009
Carbon Monoxide (CO)	# Days>Federal 1-hour Std. of >35 ppm # Days>Federal 8-hour Std. of >9 ppm # Days>California 8-hour Std. of >9.0 ppm	0 0 0	0 0 0	0 0 N/A
Ozone (O_3)	# Days>Federal 8-hour Std. of >0.075 ppm # Days>California 1-hour Std. of >0.09 ppm # Days>California 8-hour Std. of >0.07 ppm	9 2 18	20 19 36	39 25 55
Nitrogen Dioxide (NO_2)	# Days>California 1-hour Std. of >0.18 ppm	0	0	0
Respirable Particulate Matter (PM_{10})	#Days>Fed. 24-hour Std. of >150 μg/m³ #Days>California 24-hour Std. of >50 μg/m³	0 10	0 21	0 12

Source: CARB (2010); U.S. EPA (2010).
MF_EIS_AQ_05 Jun 10, 2011

N
0 10
Miles

UPRR/SR 99 Alternative
BNSF Alternative
Hybrid Alternative
Potential Heavy Maintenance Facility
City Limit
Station Study Area
County Boundary
Railroad
Ambient Air Monitoring Station Used in Study

Figure 3.3-3
Air Quality Ambient Air Monitors

Table 3.3-4
Ambient Criteria Pollutant Concentrations at Air Quality Monitoring Stations Closest to the Project

Air Pollutant	Standard/ Exceedance	Merced Coffee Station			Madera Pump Yard Station			Fresno-Drummond Station			Merced M Street Station		
		2007	2008	2009	2007	2008	2009	2007	2008	2009	2007	2007	2009
Carbon Monoxide (CO)	Year coverage	NM	NM	NM	NM	NM	NM	97	94	95	NM	NM	NM
	Max. 1-hour concentration (ppm)	NM	NM	NM	NM	NM	NM	4.4	2.6	N/A	NM	NM	NM
	Max. 8-hour concentration (ppm)	NM	NM	NM	NM	NM	NM	2.37	2.14	1.95	NM	NM	NM
	# Days>federal 1-hour std. of >35 ppm	NM	NM	NM	NM	NM	NM	0	0	N/A	NM	NM	NM
	# Days>Federal 8-hour Std. of >9 ppm	NM	NM	NM	NM	NM	NM	0	0	0	NM	NM	NM
	# Days>California 8-hour Std. of >9 ppm	NM	NM	NM	NM	NM	NM	0	0	0	NM	NM	NM
Ozone (O_3)	Year Coverage[a]	99	97	100	98	88	92	95	100	98	NM	NM	NM
	Max. 1-hour Concentration (ppm)	0.105	0.131	0.094	0.091	0.120	0.111	0.110	0.124	0.118	NM	NM	NM
	Max. 8-hour Concentration (ppm)	0.096	0.120	0.083	0.083	0.107	0.096	0.092	0.112	0.101	NM	NM	NM
	# Days>Federal 8-hour Std. of >0.075 ppm	18	33	15	5	24	13	9	20	39	NM	NM	NM
	# Days>California 1-hour Std. of >0.09 ppm	5	14	0	0	9	6	2	19	25	NM	NM	NM
	# Days>California 8-hour Std. of >0.07 ppm	25	54	35	12	46	27	18	36	55	NM	NM	NM

Air Pollutant	Standard/ Exceedance	Merced Coffee Station			Madera Pump Yard Station			Fresno-Drummond Station			Merced M Street Station		
		2007	2008	2009	2007	2008	2009	2007	2008	2009	2007	2007	2009
Nitrogen Dioxide (NO_2)	Year Coverage	98	96	95	99	97	97	95	98	98	NM	NM	NM
	Max. 1-hour Concentration (ppm)	0.050	0.060	0.056	0.047	0.053	0.046	0.067	0.076	0.076	NM	NM	NM
	Annual Average (ppm)	0.009	0.009	0.008	0.010	0.010	0.009	0.016	0.015	0.014	NM	NM	NM
	# Days>California 1-hour Std. of >0.18 ppm	0	0	0	0	0	0	0	0	0	NM	NM	NM
Respirable Particulate Matter (PM_{10})	Year Coverage	NM	NM	NM	NM	NM	NM	97	100	100	95	92	94
	Max. 24-hour Concentration (µg/m³)	NM	NM	NM	NM	NM	NM	93.0	99.5	84.0	69.0	76.8	65.1
	#Days>Fed. 24-hour Std. of >150 µg/m³	NM	NM	NM	NM	NM	NM	0	0	0	0	0	0
	#Days>California 24-hour Std. of >50 µg/m³	NM	NM	NM	NM	NM	NM	10	21	12	6	14	5
	Annual Average (µg/m³)	NM	NM	NM	NM	NM	NM	38.1	40.5	35.3	29.7	34.5	26.9
Fine Particulate Matter ($PM_{2.5}$)	Year Coverage	NM	NM	NM	NM	NM	NM	NM	NM	NM	95	97	95
	Max. 24-hour Concentration (µg/m³)	NM	NM	NM	NM	NM	NM	NM	NM	NM	81.6	54.0	53.3
	State Annual Average (µg/m³)	NM	NM	NM	NM	NM	NM	NM	NM	NM	15.2	N/A	13.6
	#Days>Fed. 24-hour Std. of >35 µg/m³	NM	NM	NM	NM	NM	NM	NM	NM	NM	17	9	8
	Annual Average (µg/m³)	NM	NM	NM	NM	NM	NM	NM	NM	NM	15.2	N/A	13.5

[a] Coverage is for an 8-hour standard.

µg/m³ = micrograms per cubic meter
NM = not monitored
N/A = not available
\> = greater than
Std. = standard
Max = maximum

Sources: CARB (2010b); EPA (2010e).

Criteria Pollutants

For these pollutants, both federal and state ambient air quality standards have been established to protect public health and welfare. The following sections briefly describe each pollutant.

Ozone

CARB inventories two classes of hydrocarbons: total organic gases (TOGs) and reactive organic gases (ROGs). ROGs have relatively high photochemical reactivity. The principal nonreactive hydrocarbon is methane, which is also a GHG. The major source of ROG is the incomplete combustion of fossil fuels in internal combustion engines. Other sources of ROG include the evaporative emissions associated with the use of paints and solvents, the application of asphalt paving, and the use of household consumer products. Adverse impacts on human health are not caused directly by ROG, but rather by reactions of ROG that form secondary pollutants. ROGs are also transformed into organic aerosols in the atmosphere, contributing to higher levels of fine particulate matter and lower visibility. CARB uses the term ROG for air quality analysis, and ROG has the same definition as the federal term VOC. In this analysis, ROG is assumed to be equivalent to VOC.

> **Definition of Ozone (O_3)**
>
> O_3 is a colorless toxic gas found in the earth's upper and lower atmospheric levels. In the upper atmosphere, O_3 is naturally occurring and helps to prevent the sun's harmful ultraviolet rays from reaching the earth. In the lower atmosphere, O_3 is man-made. Although O_3 is not directly emitted, it forms in the lower atmosphere through a chemical reaction between hydrocarbons, also referred to as VOC, and NO_x, which are emitted from industrial sources and from automobiles.

Substantial O_3 formations generally require a stable atmosphere with strong sunlight; thus, high levels of O_3 are generally a concern in the summer. O_3 is the main ingredient of smog. O_3 enters the bloodstream through the respiratory system and interferes with the transfer of oxygen, depriving sensitive tissues in the heart and brain of oxygen. O_3 also damages vegetation by inhibiting its growth. This analysis examines the impacts of changes in VOC and nitrogen oxide (NO_x) emissions for the proposed project on a regional and statewide level.

Particulate Matter

Particulate pollution is composed of solid particles or liquid droplets small enough to remain suspended in the air. In general, particulate pollution can include dust, soot, and smoke. These can be irritating but usually are not poisonous. Particulate pollution also can include bits of solid or liquid substances that can be highly toxic. Of particular concern are PM_{10} and $PM_{2.5}$.

> **Definition of Particulate Matter (PM_{10} and $PM_{2.5}$)**
>
> PM_{10} refers to particulate matter less than 10 microns in diameter, about one seventh the thickness of a human hair. Particulate matter pollution consists of small liquid and solid particles floating in the air, which can include smoke, soot, dust, salts, acids, and metals. Particulate matter also forms when gases emitted from motor vehicles undergo chemical reactions in the atmosphere.
>
> $PM_{2.5}$ is a subset of PM_{10} and refers to particulates that are 2.5 microns or less in diameter, roughly 1/28th the diameter of a human hair.

Major sources of PM_{10} include motor vehicles; wood-burning stoves and fireplaces; dust from construction, landfills, and agriculture; wildfires and brush and waste burning; industrial sources; windblown dust from open lands; and atmospheric chemical and photochemical reactions. Suspended particulates produce haze and reduce visibility. Data collected through nationwide studies indicate that most of the PM_{10} comes from fugitive dust, wind erosion, and agricultural and forestry sources.

A small portion of particulate matter is the product of fuel combustion processes. In the case of $PM_{2.5}$, the combustion of fossil fuels accounts for a significant portion of this pollutant. The main health impact of airborne particulate matter is on the respiratory system. $PM_{2.5}$ results from fuel combustion (from motor vehicles, power generation, and industrial facilities), residential fireplaces, and wood stoves. In addition, $PM_{2.5}$ can form in the atmosphere from gases such as SO_2, NO_x, and VOC. Like PM_{10}, $PM_{2.5}$ can penetrate the human respiratory system's natural defenses and damage the respiratory tract when inhaled. Whereas PM_{10} tends to collect in the upper portion of the respiratory system, $PM_{2.5}$ can penetrate deeper into the lungs and damage lung tissues. The impacts of PM_{10} and $PM_{2.5}$ emissions for the project are examined on a localized—or microscale—basis, a regional basis, and a statewide basis.

Carbon Monoxide

In cities, 85% to 95% of CO emissions may come from motor-vehicle exhaust. Prolonged exposure to high levels of CO can cause headaches, drowsiness, loss of equilibrium, or heart disease. CO levels are generally highest in the colder months when inversion conditions (when warmer air traps colder air near the ground) are more frequent.

CO concentrations can vary greatly over relatively short distances. Relatively high concentrations of CO typically occur near congested intersections, along heavily used roadways carrying slow-moving traffic, and in areas where atmospheric dispersion is inhibited by urban “street canyon” conditions. Consequently, CO concentrations must be predicted on a microscale basis.

> **Definition of Carbon Monoxide (CO)**
>
> CO is a colorless gas that interferes with the transfer of oxygen to the brain. CO emits almost exclusively from the incomplete combustion of fossil fuels. On-road motor-vehicle exhaust is the primary source of CO.

Nitrogen Dioxide

Nitrogen oxide (NO) and NO_2, collectively referred to as nitrogen oxides (NO_x), are major contributors to ozone formation. NO_2 also contributes to the formation of $PM_{2.5}$. At atmospheric concentrations, NO_2 is only potentially irritating. In high concentrations, the result is a brownish-red cast to the atmosphere and reduced visibility. There is some indication of a relationship between NO_2 and chronic pulmonary fibrosis. In addition, an increase in bronchitis in children (2 and 3 years old) has been observed at concentrations below 0.3 ppm.

> **Definition of Nitrogen Dioxide (NO_2)**
>
> NO_2 is a brownish gas that irritates the lungs. It can cause breathing difficulties at high concentrations. NO_2 is one of a group of highly reactive gasses known as "oxides of nitrogen," or "nitrogen oxides (NO_x)." As with O_3, NO_2 can be formed through a reaction between nitric oxide and atmospheric oxygen.

Lead

Lead levels from mobile sources in the urban environment have decreased significantly because of the federally mandated switch to lead-free gasoline, and lead levels are expected to continue to decrease. Therefore, an analysis of the impacts of lead emissions from transportation projects is not warranted and not conducted for this project.

Sulfur Dioxide

SO_2 can cause acute respiratory symptoms and diminished ventilation in children. SO_2 can also yellow plant leaves and corrode iron and steel. Although diesel-fueled, heavy-duty vehicles emit SO_2, EPA (and other regulatory agencies) does not consider transportation sources to be significant sources of this pollutant. Therefore, an analysis of the impacts of SO_2 emissions from transportation projects is usually not warranted. However, an analysis of the impacts of SO_2 emissions was conducted for this project.

Toxic Air Contaminants

California law defines a TAC 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.” EPA uses the term “hazardous air pollutant” in a similar sense. Controlling air toxic emissions became a national priority with the passage of the CAA, whereby Congress mandated that EPA regulate 188 air toxics, also known as hazardous air pollutants. Toxic air contaminants can be emitted from stationary and mobile sources.

Stationary sources of TACs from HST operations would include use of solvent-based materials (cleaners and coatings) and combustion of fossil fuel in boilers, heaters, and ovens at maintenance facilities.

Although the HSTs would not emit TACs, MSATs would be associated with the project chiefly through motor vehicle traffic to and from the HST stations.

For MSATs, EPA has assessed the expansive list in its latest rule on the Control of Hazardous Air Pollutants from Mobile Sources, and identified 93 compounds emitted from mobile sources that are listed in its Integrated Risk Information System. EPA identified seven compounds with significant contributions from mobile sources that are among the national- and regional-scale cancer risk drivers from its 1999 National Air Toxics Assessment. These seven compounds are acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. This list, however, is subject to change and may be adjusted in consideration of future EPA rules.

Greenhouse Gases

GHGs trap heat in the atmosphere, keeping the earth's surface warmer than it otherwise would be. According to the National Oceanic and Atmospheric Administration (NOAA) and National Aeronautics and Space Administration (NASA) data, the earth's average surface temperature has increased by 1.2 to 1.4ºF within the last 100 years. Eleven of the last 12 years rank among the 12 warmest years on record (since 1850), with the warmest 2 years being 1998 and 2005. Most of the warming in recent decades is likely the result of human activities. Other aspects of the climate are also changing, such as rainfall patterns, snow and ice cover, and sea level.

Definition of Greenhouse Gases (GHGs)

GHG is any gas that absorbs infrared radiation in the atmosphere. GHGs include water vapor, CO_2, CH_4, N_2O, HCFCs, O_3, HFCs, PFCs, and SF_6. GHGs contribute to the global warming trend, a regional and ultimately a worldwide concern. What was once a natural phenomenon of climate has been changing because of human activities, such as an increase in CO_2.

Some GHGs, such as CO_2, occur naturally and are emitted to the atmosphere through both natural processes and human activities. Other GHGs (e.g., fluorinated gases) are created and emitted solely through human activities. GHGs differ in their ability to trap heat. For example, 1 ton of emissions of CO_2 has a different effect than 1 ton of emissions of methane. To compare emissions of different GHGs, inventory compilers use a weighting factor called a Global Warming Potential (GWP). To use a GWP, the heat-trapping ability of 1 metric ton (1,000 kilograms) of CO_2 is taken as the standard, and emissions are expressed in terms of CO_2 equivalent, but can also be expressed in terms of carbon equivalent. Therefore, the GWP of CO_2 is 1. The GWP of methane is 21, whereas the GWP of nitrous oxide is 310. The principal GHGs that enter the atmosphere because of human activities include CO_2, CH_4, N_2O, HCFCs, HFCs, PFCs, and SF_6. Because of the global nature of GHG emissions and the nature of the electrical grid system, GHG was examined on a statewide level.

3.3.4.4 Attainment Status of Study Area

Both EPA and CARB designate each county (or portions of counties) within California as attainment, maintenance, or nonattainment based on the area's ability to maintain ambient air concentrations below the air quality standards. Areas are designated as attainment if ambient air concentrations of a criteria pollutant are below the ambient standards. Areas are designated as nonattainment if ambient air concentrations are above the ambient standards. Areas previously designated as nonattainment that subsequently demonstrated compliance with the standards are designated as maintenance. Table 3.3-5 shows the designation status of the SJVAB for each criteria pollutant.

Table 3.3-5
Federal and State Attainment Status

Pollutant	Federal Classification	State Classification
O_3	Nonattainment (Extreme)	Nonattainment
PM_{10}	Maintenance	Nonattainment
$PM_{2.5}$	Nonattainment	Nonattainment
CO	Urban portion of Fresno County: Maintenance Remaining basin: Attainment	Attainment
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment
Source: CARB (2009a).		

Under the federal criteria, the SJVAB is currently designated as nonattainment for 8-hour O_3, the 1997 $PM_{2.5}$ standard (annual standard of 15 micrograms/cubic meter [$\mu g/m^3$] and 24-hour standard of 65 $\mu g/m^3$), and the 2006 24-hour $PM_{2.5}$ standard (35 $\mu g/m^3$). The SJVAB is a maintenance area for PM_{10}, and the Fresno Urbanized Area is a maintenance area for CO. The SJVAB is in attainment for the NO_2 and SO_2, and unclassified for lead.

Under the state criteria, the SJVAB is currently designated as nonattainment for 1-hour O_3, 8-hour O_3, PM_{10}, and $PM_{2.5}$. The SJVAB is an attainment/unclassified area for the state CO standard and an attainment area for the state NO_2, SO_2, and lead standards. The SJVAB is an unclassified area for the state hydrogen sulfide standard and the visibility-reducing particle standard; it is an attainment area for sulfates and vinyl chloride.

3.3.4.5 Air Quality Plans and Programs

State Implementation Plan

Planning documents for pollutants for which the study area is classified as a federal nonattainment or maintenance area are developed by the SJVAPCD and CARB and approved by EPA. Table 3.3-6 lists the planning documents relevant to the proposed project.

Table 3.3-6
Planning Documents Relevant to Proposed Project

Type of Plan	Status
1-Hour O_3 Attainment Plan	On March 8, 2010, EPA approved San Joaquin Valley's 2004 Extreme Ozone Plan for the 1-hour O_3 standard. However, effective June 15, 2005, EPA revoked the federal 1-hour O_3 standard for areas including the SJVAB.[a]
8-Hour O_3 Attainment Plan	On May 5, 2010, EPA reclassified the 8-hour O_3 nonattainment status of San Joaquin Valley from "serious" to "extreme." The reclassification requires the state to incorporate more-stringent requirements, such as lower permitting thresholds and implementing reasonably available control technologies at more sources.[b] The 2007 8-hour Ozone Plan contained a comprehensive and exhaustive list of regulatory and incentive-based measures to reduce emissions of O_3 and particulate matter 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, EPA 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.[a]
PM_{10} Maintenance Plan	On September 25, 2008, EPA redesignated the San Joaquin Valley to attainment for the PM_{10} NAAQS and approved the 2007 PM_{10} Maintenance Plan.[c]
$PM_{2.5}$ Attainment Plan	The SJVAPCD Governing Board adopted the 2008 $PM_{2.5}$ Plan on May 22, 2008, following a public hearing. This plan includes measures to attain the 1997 and 2006 federal standards as well as the state standard.[d] EPA designated the SJVAB under the new $PM_{2.5}$ national standard on October 8, 2009, and state implementation plans for the 2006 $PM_{2.5}$ standards will be due to EPA within 3 years of final designation.
CO Maintenance Plan	On July 22, 2004, CARB approved an update to the SIP that shows how 10 areas, including the SJVAB, will maintain the CO standard through 2018. On November 30, 2005, EPA approved and promulgated the implementation plans and designation of areas for air quality purposes.[e]

[a] SJVAPCD (2010b).
[b] SJVAPCD (2007a).
[c] SJVAPCD (2007b).
[d] SJVAPCD (2008).
[e] CARB (2004); EPA (2005a).

Transportation Plans and Programs

Regional Transportation Planning Agencies (RTPAs) and MPOs within the SJVAB and the study area (i.e., the Merced County Association of Governments [MCAG], the Madera County Transportation Commission [MCTC], and the Council of Fresno County Governments [Fresno COG]) are responsible for preparing regional transportation plans. RTPs address a region's transportation goals, objectives, and policies for the next 20 to 25 years and identifies the actions necessary to achieve those goals. MPOs prepare Federal Transportation Improvement Programs (FTIPs), which are 5-year programs of proposed projects that incrementally develop the RTP and contain a listing of proposed transportation projects committed for funding. Transportation projects are analyzed for air quality conformity with the SIP as components of RTPs and FTIPs.

The MCAG and MCTC adopted their respective 2011 RTPs and updated conformity analyses in July 2010. Both RTPs discuss the HST project. However, the HST project is not included in the project list in Appendix D of the MCAG 2011 RTP or the project lists in Appendix C-D of the MCTC 2011 RTP or the 2011 FTIPs, and is therefore not included in the conformity determination (MCAG 2010; MCTC 2010).

The Fresno COG adopted the 2011 RTP and associated conformity determination on July 29, 2010. The Fresno COG's Final RTP supports the high-speed rail and corridor alignment option that provides service to major population centers within the Central Valley (Fresno COG 2010). The relocation and minor expansion of part of SR 99, which would be part of the HST project, is included as an unconstrained project in the Final RTP. However, the rest of the project is not included in the unconstrained project list in Appendix D of the Fresno COG 2011 RTP or the 2011 FTIP; therefore, it is not included in the conformity determination (Fresno COG 2010). Although the HST project is not currently included in the MCAG, MCTC, or Fresno COG transportation conformity determination, the next revisions of the MCTC, MCAG, and Fresno COG RTPs will likely include the operation of the HST and the associated conformity determination will likely include the HST project.

3.3.5 Environmental Consequences

3.3.5.1 Overview

Construction: Construction of the HST alternatives has the potential to cause temporary and significant localized air quality impacts. Overall, longer project alternatives have greater construction emissions than shorter alternatives. Additionally, alternatives with more elevated guideway could have a greater impact because of the extensive construction activity. Therefore, although construction of all HST alternatives would cause a significant impact under CEQA and substantial impact under NEPA on air quality, the extent of the impact would vary slightly based on alternative. The UPRR/SR 99 Alternative would have the most impacts, or greatest construction-related emissions. The Hybrid Alternative would have the least impacts, or least construction-related emissions. The BNSF Alternative would have construction-related emissions similar to or slightly less than those under the UPRR/SR 99 Alternative.

Implementation of mitigation measures during construction phases could reduce PM_{10} and $PM_{2.5}$ emissions by reducing fugitive dust and exhaust from construction and on-road vehicles. Mitigation measures could also reduce the quantity of other criteria pollutants (NO_x, VOC, CO) and GHG emissions by controlling exhaust emissions from construction and on-road vehicles.

Operation: Operation of the HST alternatives would provide a net regional air quality benefit. Operation of the HST alternatives would generally reduce regional criteria pollutants and GHG emissions and would have a beneficial impact under NEPA and a less than significant impact under CEQA on air quality.

There is no appreciable difference in localized operation impacts among the HST alternatives, except for the operation of the HMF. Operation of the HMF may have the potential to cause a significant localized impact under CEQA and a substantial impact under NEPA for PM_{10} and $PM_{2.5}$ due to the existing exceedance of CAAQS and NAAQS in the area. In addition, because sensitive receptors located near the HMF facility could potentially be exposed to cancer risks greater than 10 in a million for three of the five HMF sites, HMF TAC emissions could result in a significant health impact under CEQA and a moderate impact under NEPA to those sensitive receptors. Regarding other emissions, while operation of the HMF (all of them) could cause localized increases in criteria pollutants due to HMF onsite equipment operation, as well as localized CO impacts at intersections near the facility, associated impacts would be less than significant under CEQA and negligible under NEPA.

Section 3.3.6 provides strategies to reduce potential operational emissions further, as well as measures to avoid or minimize significant localized impacts from the HMF. Implementation of mitigation measures would reduce the exposure of nearby populations from pollutants associated with HMF operations.

3.3.5.2 No Project Alternative

The No Project Alternative represents future year 2035 conditions without the HST project. The general plans of Merced, Madera, and Fresno counties indicate continued land development and population growth within the region over the next 25 years, which would increase emissions under the No Project Alternative. However, increasingly stringent federal and state emission control requirements and the replacement of older, higher polluting vehicles with newer, less-polluting ones would reduce basin-wide emissions under the No Project Alternative. In addition, SJVAPCD rules and plans have been established to bring the SJVAB into compliance with the NAAQS and CAAQS, which would reduce emissions under the No Project Alternative. Therefore, air quality is expected to improve in the basin under the No Project Alternative compared to existing conditions.

3.3.5.3 High-Speed Train Alternatives

Construction Period Impacts

Common Air Quality Impacts

Common effects are those effects that would occur with implementation of any of the HST alternatives and do not differ depending on the HST alternative chosen. Common effects would include regional emissions from construction and the potential effects of construction on sensitive receptors in proximity to the HST alternatives. Another common effect of construction in general would be to cause or contribute to a localized exceedance of an ambient air quality standard or to affect compliance with air quality plans.

The main difference in construction emissions among the HST alternatives would be from the differences in the length and alignment profiles. The other project components (HST stations, substations, and HMF) would cause the same construction emissions for all HST alternatives.

***NEPA Impacts*:** As discussed in detail in the following sections, direct emissions from the construction phase before mitigation would exceed the GC thresholds and trigger the need for a full GC compliance demonstration for all calendar years in which construction would occur for VOC, CO, and NO_x. VOC, CO, and NO_x are therefore considered to have the potential to cause substantial air quality impacts during project construction before mitigation. The PM_{10} GC threshold would be exceeded and cause potentially substantial impacts during several, but not all, years of construction. The SO_2 GC threshold would not be exceeded during any years of construction such that SO_2 emissions would have negligible impacts. $PM_{2.5}$ emissions would be below the GC thresholds for all construction years except 2013. $PM_{2.5}$ impacts would be moderate under NEPA.

During construction, programmatic emissions reduction measures would be applied, including watering exposed surfaces twice daily, watering unpaved roads three times daily, reducing vehicle speeds on unpaved roads to 15 mph, and ensuring that haul trucks are covered. With this mitigation, and using construction equipment that meets Tier 4 emissions standards, as discussed in Section 3.3.6, VOC, CO, and NO_x impacts would be reduced but would remain substantial for most of the construction phase under NEPA because emissions would still exceed GC thresholds for all construction years. PM_{10} impacts would be reduced to moderate under NEPA, lowering emissions below the GC threshold for all years except 2013 with the application of mitigation measures (refer to Section 3.3.6, Mitigation Measures). SO_2 impacts would remain negligible and $PM_{2.5}$ impacts would be reduced to negligible under NEPA.

CEQA Impacts: Emissions from construction would exceed the SJVAPCD CEQA thresholds for VOC, NO_x, PM_{10}, and $PM_{2.5}$ before mitigation. Therefore, construction emissions of VOC, NO_x, $PM_{10,}$ and $PM_{2.5}$ may cause significant impacts on air quality under CEQA and may impede or obstruct implementation of the 8-hour SJVAPCD 2007 Ozone Plan, the 2004 Extreme Ozone 1-hour Plan[2], the 2007 PM_{10} Maintenance Plan, and the 2008 $PM_{2.5}$ Plan. Operation of concrete batch plants could cause localized particulate matter impacts. There is no CEQA threshold for SO_2 from SJVAPCD; however, SO_2 impacts are expected to be less than significant due to the state requirement of using ultra-low sulfur diesel.

With mitigation, VOC, NO_x, and PM_{10} impacts would be reduced but would remain significant for most of the construction phase under CEQA. $PM_{2.5}$ impacts would remain significant in 2013, but would be reduced to less than significant for all other construction years by lowering the emissions to below the

[2] The 1-hour ozone standard was revoked by the EPA effective June 15, 2005, for areas including the SJVAB. However, EPA still approved the 2004 Extreme Ozone Plan for 1-hour ozone on March 8, 2010 (SJVAPCD 2010b).

CEAQ threshold. Local impacts from concrete batch plants would be reduced to negligible and less than significant by locating them at least 1,000 feet from sensitive receptors.

Construction-phase impacts were evaluated starting in 2013. Future natural growth, including improvements not associated with the HST project, were not considered in the project construction impacts analysis. Therefore, the construction-phase impacts are in comparison to both the No Project Alternative and existing conditions.

Regional Impacts

Criteria pollutant emissions were estimated for each year of construction. The HST construction schedule is included in Chapter 2, Alternatives. The HST construction activities during each calendar year were summed based on the construction schedule. The *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a) provides information on the assumptions for the construction quantities, building square footages, construction equipment fleets for each unit operation, and URBEMIS 2007 files.

The predominant pollutant associated with construction of the alignment, guideway, stations, and maintenance facilities would be fugitive dust (PM_{10} and $PM_{2.5}$) from earthmoving and disturbed earth surfaces, and combustion pollutants, particularly O_3 precursors (NO_x and VOC), from heavy equipment and trucks. Construction emissions related to the HST stations, power substations, and maintenance facilities would be the same for all HST alternatives; however, emissions generated from construction of the alignment, including the material hauled to the site and the regional roadway realignment construction emissions, would vary among HST alternatives.

Project alternative impacts vary by pollutant and construction year. Of the three alternatives, the UPRR/SR 99 Alternative would result in the highest amount of total emissions during the construction phase, the BNSF Alternative would result in the second-highest amount of construction emissions, and the Hybrid Alternative would have the lowest construction emissions.

NEPA Impacts: Construction of the HST alternatives could cause a substantial impact on air quality under NEPA for VOC, CO, NO_x, and PM_{10} because the emissions of these pollutants would exceed the GC thresholds during construction. Emissions of $PM_{2.5}$ would be below the GC thresholds for all construction years for all alternatives except 2013 for the UPRR/SR 99 Alternative and may have moderate impacts on air quality. Emissions of SO_2 would be below the GC thresholds for all construction years and thus would have a negligible impact on air quality. The impacts from construction emissions would be temporary, would only take place over 8 years, and would cease once construction is completed.

CEQA Impacts: The SJVAPCD CEQA significance thresholds could be exceeded for VOC, NO_x, PM_{10}, and $PM_{2.5}$. Therefore, the project has the potential to violate an air quality standard or contribute substantially to an existing or projected air quality violation for VOC, NO_x, PM_{10}, and $PM_{2.5}$ and result in a significant impact under CEQA. There is no CEQA threshold for SO_2 from SJVAPCD; with the requirements of using ultra-low sulfur diesel in California, SO_2 emissions are expected to have less-than-significant impacts.

UPRR/SR 99 Alternative

The UPRR/SR 99 Alternative has two options for the wye locations: Ave 21 and Ave 24. Both wye options were evaluated, and Ave 21 Wye emissions were generally 1% to 3% higher than Ave 24 Wye emissions for the entire construction duration due to its longer elevated track length. The unmitigated emissions for construction of the UPRR/SR 99 Alternative with both wye options are included in the *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a).

Table 3.3-7 presents the emissions with programmatic and regulatory required control measures and identifies the years in which the UPRR/SR 99 Alternative could exceed either the GC thresholds or the SJVAPCD CEQA thresholds; a comparison for 2020 has not been included as no construction activities occur during that time. Mitigated emissions after implementing additional mitigation measures beyond regulatory requirements and comparisons to the thresholds are shown in Table 3.3-29, in Section 3.3.6.2, CEQA and NEPA Levels of Impact after Mitigation.

NEPA Impacts: The UPRR/SR 99 Alternative construction emissions would exceed the GC threshold for VOC, CO, and NO_X for the entire construction duration. The PM_{10} emissions would exceed the GC threshold for 3 of the 8 construction years. VOC, CO, NO_x, and PM_{10} would cause substantial impacts on air quality under NEPA. Emissions of $PM_{2.5}$ would be below the GC thresholds for all construction years except 2013 and may have moderate impacts on air quality. The SO_2 emissions would be lower than the GC thresholds for the entire construction duration.

CEQA Impacts: Construction emissions would exceed the VOC, NO_X, PM_{10}, and $PM_{2.5}$ CEQA thresholds for the entire construction duration and cause significant impacts. The background concentrations of CO in the SJVAB are low (approximately 12% of the 1-hour standard and 25% of the 8-hour standard); therefore, it is not expected that CO emissions from the proposed project would cause or contribute to an air quality violation or conflict with or obstruct implementation of the CO SIP.

Table 3.3-7
UPRR/SR 99 Alternative Programmatic Construction Emissions for Years 2013–2021
(tons/year)

Activities	VOC	CO	NO_x	SO_2	PM_{10}[c]	$PM_{2.5}$[c]
SJVAPCD annual CEQA significance thresholds[a]	10	NA	10	N/A	15	15
Annual GC thresholds applicable to the SJVAB[b]	10	100	10	100	100	100
Year 2013						
Exceeds SJVAPCD CEQA thresholds?	Yes	N/A	Yes	N/A	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	Yes	Yes
Year 2014						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	Yes	No
Year 2015						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	Yes	No
Year 2016						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2017						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2018						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2019						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No

Activities	VOC	CO	NO_x	SO_2	PM_{10}[c]	$PM_{2.5}$[c]
Year 2021						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No

NA = not applicable

[a] The SJVAPCD has significance thresholds for NO_x, PM_{10}, $PM_{2.5}$, and ROG/VOC. The district currently does not have thresholds for CO and SO_2. Section 3.1.8 summarizes the CEQA significance for these pollutants.

[b] The GC thresholds for criteria pollutants are based on the SJVAB federal attainment status. The SJVAB is considered in extreme nonattainment for the O_3 NAAQS, is a nonattainment area for $PM_{2.5}$, and is a maintenance area for the CO and PM_{10} NAAQS.

[c] PM_{10} and $PM_{2.5}$ emissions have incorporated the SJVAPCD Regulation VIII requirements and dust control measures the Authority committed to in the Statewide Program EIR/EIS.

BNSF Alternative

The BNSF Alternative has two options for the wye locations: Ave 21 and Ave 24. Both wye options were evaluated, and Ave 24 Wye emissions were generally 3% to 5% higher than Ave 21 Wye emissions for the entire construction duration due to its longer elevated track length. The unmitigated emissions for construction of the BNSF Alternative with both wye options are included in the *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a).

Table 3.3-8 presents the emissions with programmatic and regulatory required control measures and identifies the years in which the BNSF Alternative could exceed either the GC thresholds or the SJVAPCD CEQA thresholds; a comparison for 2020 has not been included as no construction activities occur during that time. Mitigated emissions after implementing additional mitigation measures beyond regulatory requirements and comparisons to the thresholds are shown in Table 3.3-30, in Section 3.3.6.2, CEQA and NEPA Levels of Impact after Mitigation.

NEPA Impacts: The BNSF Alternative construction emissions would be similar or slightly lower than the emissions associated with the UPRR/SR 99 Alternative such that emissions would exceed the GC threshold for VOC, CO, and NO_X for the entire construction duration. The PM_{10} emissions would exceed the GC threshold for 3 of the 8 construction years. VOC, CO, NO_x, and PM_{10} would cause substantial impacts on air quality under NEPA. The SO_2 and $PM_{2.5}$ emissions would be lower than the GC thresholds for the entire construction duration and would have negligible impacts on air quality.

CEQA Impacts: The BNSF Alternative construction impact would be the same as the UPRR/SR 99 Alternative under CEQA. Construction emissions would exceed the VOC, NO_X, PM_{10}, and $PM_{2.5}$ CEQA thresholds for the entire construction duration to cause significant air impacts. The background concentrations of CO in the SJVAB are low (approximately 12% of the 1-hour standard and 25% of the 8-hour standard); therefore it is not expected that CO emissions from the proposed project would cause or contribute to an air quality violation or conflict with or obstruct implementation of the CO SIP. Air quality impacts due to CO emissions would be negligible.

Table 3.3-8
BNSF Alternative Programmatic Construction Emissions for Years 2013–2021 (tons/year)

Activities	VOC	CO	NO_x	SO_2	PM_{10}[c]	$PM_{2.5}$[c]
SJVAPCD annual CEQA significance thresholds[a]	10	NA	10	NA	15	15
Annual GC thresholds applicable to the SJVAB[b]	10	100	10	100	100	100
Year 2013						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	Yes	No
Year 2014						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	Yes	No
Year 2015						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	Yes	No
Year 2016						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2017						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2018						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2019						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2021						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No

NA = not applicable

[a] The SJVAPCD has significance thresholds for NO_x, PM_{10}, $PM_{2.5}$, and ROG/VOC. The district currently does not have thresholds for CO. Section 3.1.8 summarizes the CEQA significance for these pollutants.

[b] The GC thresholds for criteria pollutants are based on the SJVAB federal attainment status. The SJVAB is considered in extreme nonattainment for the O_3 NAAQS, is a nonattainment area for $PM_{2.5}$, and is a maintenance area for the CO and PM_{10} NAAQS.

[c] PM_{10} and $PM_{2.5}$ emissions have incorporated the SJVAPCD Regulation VIII requirements and dust control measures the Authority committed to in the Statewide Program EIR/EIS.

Hybrid Alternative

The Hybrid Alternative has two options for the wye connections: Ave 21 and Ave 24. Both wye options were evaluated, and Ave 21 Wye emissions were generally 10% to 18% higher than Ave 24 Wye emissions for the entire construction duration due to its longer elevated track length. The unmitigated emissions for construction of the Hybrid Alternative with both wye options are included in the *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a).

Table 3.3-9 presents the emissions with programmatic and regulatory control measures and identifies the years in which the Hybrid Alternative could exceed either the GC thresholds or the SJVAPCD CEQA thresholds; a comparison for 2020 has not been included as no construction activities would occur during that time. Mitigated emissions after implementing additional mitigation measures beyond regulatory requirements and comparisons to the thresholds are shown in Table 3.3-31, in Section 3.3.6.2, CEQA and NEPA Levels of Impact after Mitigation.

NEPA Impacts: The Hybrid Alternative construction emissions would be the lowest of the three alternatives. However, the Hybrid Alternative construction emissions would still exceed the GC thresholds for VOC, NO_X, and CO for the same duration as the UPRR/SR 99 and BNSF alternatives. The PM_{10} emissions would exceed the GC threshold for 2 of the 8 construction years. VOC, CO, NO_x, and PM_{10} would potentially cause substantial impacts on air quality under NEPA. As with the UPRR/SR 99 and BNSF alternatives, the SO_2 and $PM_{2.5}$ emissions would be lower than the GC thresholds for the entire construction duration.

CEQA Impacts: The Hybrid Alternative construction impact would be the same as the UPRR/SR 99 and BNSF alternatives under CEQA. Construction emissions would exceed the VOC, NO_X, PM_{10}, and $PM_{2.5}$ CEQA thresholds for the entire construction duration and cause significant impacts. The background concentrations of CO in the SJVAB are low (approximately 12% of the 1-hour standard and 25% of the 8-hour standard); therefore, it is not expected that CO emissions from the proposed project would cause or contribute to an air quality violation or conflict with or obstruct implementation of the CO SIP.

Table 3.3-9
Hybrid Alternative Programmatic Construction Emissions for Years 2013–2021 (tons/year)

Activities	VOC	CO	NO_x	SO_2	PM_{10}[c]	$PM_{2.5}$[c]
SJVAPCD annual CEQA significance thresholds[a]	10	NA	10	NA	15	15
Annual GC thresholds applicable to the SJVAB[b]	10	100	10	100	100	100
Year 2013						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	Yes	No
Year 2014						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	Yes	No
Year 2015						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2016						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes

Activities	VOC	CO	NO_x	SO_2	PM_{10}[c]	$PM_{2.5}$[c]
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2017						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2018						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2019						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2021						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No

NA = not applicable

[a] The SJVAPCD has significance thresholds for NO_x, PM_{10}, $PM_{2.5}$, and ROG/VOC. The district currently does not have thresholds for CO. Section 3.1.8 summarizes the CEQA significance for these pollutants.

[b] The GC thresholds for criteria pollutants are based on the SJVAB federal attainment status. The SJVAB is considered in extreme nonattainment for the O_3 NAAQS, is a nonattainment area for $PM_{2.5}$, and is a maintenance area for the CO and PM_{10} NAAQS.

[c] PM_{10} and $PM_{2.5}$ emissions have incorporated the SJVAPCD Regulation VIII requirements and dust control measures the Authority committed to in the Statewide Program EIR/EIS.

Compliance with Air Quality Plans

Emissions from project construction would be temporary, occurring for 8 years, from March 2013 through July 2021; no construction activities would occur in 2020. However, based on the amount of construction to be completed, construction activities would involve a large amount of construction equipment and would have substantial emissions and the potential to cause adverse air quality impacts.

Impacts affecting air quality plan compliance would last the entire construction phase (8 years) and would increase nonattainment pollutant emissions, which would conflict with the ultimate goal of the air quality plans, which is to bring the air basin into compliance. With mitigation, the annual construction emissions would exceed the SJVAPCD CEQA thresholds for VOC, NO_x, and $PM_{2.5}$ for the entire construction duration and the PM_{10} SJVAPCD CEQA threshold for half of the construction duration. Therefore, project construction may impede implementation of the 8-hour SJVAPCD 2007 Ozone Plan, the 2004 Extreme Ozone 1-hour Plan[3], the 2007 PM_{10} Maintenance Plan, and 2008 $PM_{2.5}$ Plan.

The background concentrations of CO in the SJVAB are low (approximately 12% of the 1-hour standard and 25% of the 8-hour standard); therefore, it is not expected that CO emissions from the proposed project would impede implementation of the SJVAPCD CO SIP.

[3] The 1-hour ozone standard was revoked by the EPA effective June 15, 2005, for areas including the SJVAB. However, the EPA still approved the 2004 Extreme Ozone Plan for 1-hour ozone on March 8, 2010 (SJVAPCD 2010b).

Material Hauling Emissions Outside the SJVAB

Construction emissions included in the regional impacts analysis considered emissions within the SJVAB. Rail would be constructed using 100% ballast and sub-ballast. Material other than the ballast and the sub-ballast would be available within the SJVAB; however, the ballast and sub-ballast material could potentially be transported from areas outside the SJVAB. A preliminary emission evaluation was conducted for transporting ballast materials from outside the SJVAB to the border of the air basin.

It is possible that the final design might consider approximately 30% ballast and sub-ballast and 70% concrete slabs. This would result in a significant reduction in air quality emissions associated with hauling the ballast and sub-ballast. The impact conclusions presented for the 100% ballast and sub-ballast case are the most conservative and impacts are expected to be reduced if the 30% ballast and sub-ballast case is designed.

NEPA Impacts*:* The emission results demonstrated that the worst-case emissions from all scenarios would be above the GC thresholds for NO_x in the South Coast Air Basin and the Mojave Air Basin. The emissions for NO_x in the other air basins (Sacramento Valley Air Basin, San Francisco Bay Area Air Basin, and the San Joaquin Valley Air Basin: Eastern Kern portion) would be below the GC thresholds for all scenarios. The emissions for all other pollutants would be below the GC thresholds for all scenarios in all air basins. Therefore, under NEPA the material-hauling emissions outside of SJVAB would be substantial for NO_x emissions in the South Coast Air Basin and the Mojave Air Basin but would be negligible for all other pollutants in these air basins. Under NEPA the material hauling emissions would be negligible for all pollutants in the other air basins. Mitigation measures to reduce the material-hauling emission impacts are discussed in Section 3.3.6.

CEQA Impacts: Emission results would exceed the CEQA thresholds for NO_x for all scenarios in multiple air quality management districts (AQMDs) or air pollution control districts (APCDs). All other pollutants for these scenarios would be below the CEQA thresholds. Under CEQA, the material-hauling emissions outside the SJVAB would exceed the NO_x CEQA thresholds in the Mojave Desert AQMD, South Coast AQMD, Bay Area AQMD, and East Kern County APCD and would therefore be significant for NO_x. The material hauling emissions would be less the CEQA thresholds for other pollutants in these AQMDs and APCDs and would therefore be less than significant for all other pollutants. The material hauling emissions would be less than the CEQA thresholds for all pollutants in the Sacramento Metropolitan AQMD and the Butte County AQMD and therefore would be less than significant. Mitigation measures to reduce the material-hauling emission impacts are discussed in Section 3.3.6.

Detailed analysis for material hauling emissions is presented in the *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a).

Greenhouse Gas Emissions

GHG emissions generated from construction of the project would be temporary. Because the time that CO_2 remains in the atmosphere cannot be definitively quantified because of the wide range of time scales in which carbon reservoirs exchange CO_2 with the atmosphere, there is no single value for the half-life of CO_2 in the atmosphere (IPCC 1997). Therefore, the duration that CO_2 emissions from a short-term project would remain in the atmosphere is unknown.

As shown in Table 3.3-10, GHG emissions from the construction phase of each alternative were quantified per the CEQ guidelines (CEQ 2010), because the emissions would be greater than the 25,000 metric tons of CO_2e.. The GHG construction emissions would be less than 0.2% of the total statewide GHG emissions.[4] The half-life of CO_2 is not defined, and other GHG pollutants such as N_2O can remain in the atmosphere for 120 years (IPCC 1997). To conservatively estimate the amortized GHG emissions, the HST project life is conservatively assumed to be only 25 years (although the actual project life will be

[4] A GHG emission inventory for the SJVAPCD was not available at the time of the release of this document so the comparison was made to the most recent CARB emissions inventory (2006) that estimated the annual CO_2e emissions in California are about 484 million metric tons (CARB 2009b).

much longer) (Barber 2010). The estimated amortized GHG construction emissions for each alternative would be less than 39,000 metric tons CO_2e per year as shown in Table 3.3-10. The increase in GHG emissions generated during construction would be offset by the net GHG reductions in operation (because of car and plane trips removed) in a little over 1 year for the UPRR/SR 99, BNSF, and Hybrid alternatives. Additional comparison of the GHG emissions from construction relative to the operational GHG emissions is included in Section D.

Table 3.3-10
HST Alternatives Amortized GHG Construction Emissions (metric tons/year) [a, b]

Construction Emission	Alternative		
	UPRR/SR 99	BNSF	Hybrid
CO_2	933,161	888,377	821,783
CO_2e[b]	979,819	932,796	862,872
Amortized GHG Emissions	**(metric tons/year)**		
CO_2	37,326	35,535	32,871
CO_2e[b]	39,193	37,312	34,515
Payback of GHG Emissions	**(years)**		
Period	1.6	1.5	1.4

Note: Emissions presented are the higher of the two wye design options. Emission factors for CO_2 do not account for improvements in technology.

[a] The CO_2 emissions for each year of construction are included in the *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a).

[b] Project life assumed to be 25 years.

[c] According to EPA, emissions of CH_4 and N_2O from passenger vehicles are much lower than emissions of CO_2, contributing in the range of 5 to 6% of the CO_2-equivalent emissions. In addition, the URBEMIS 2007 model does not estimate CH_4 and N_2O emissions. Therefore, to account for the CH_4 and N_2O emissions, the CO_2 emissions were conservatively increased by 5% to calculate the CO_2-equivalent emissions. This approach for passenger vehicles was assumed to be applicable to all emissions sources evaluated.

Source: EPA (2005b).

Local Impacts

Asbestos

The demolition of asbestos-containing materials is subject to the limitations of the National Emissions Standards for Hazardous Air Pollutants (NESHAP) regulations and would require an asbestos inspection. The SJVAPCD's Compliance Division would be consulted before demolition begins. Strict compliance with existing asbestos regulations would prevent asbestos from being a significant impact under CEQA (SJVAPCD 2002) or a substantial impact under NEPA

Merced, Madera, and Fresno counties are designated by California Department of Conservation Division of Mines and Geology (CDMG) as areas likely to contain NOA. However, the specific locations of the counties where project construction would occur are in areas designated not likely to contain NOA (CDMG 2000). Therefore, NOA would not likely be disturbed during construction.

Guideway/Alignment Construction

Sensitive receptors such as schools, daycare centers, hospitals, and residents are located near the construction areas in Merced, Madera, and Fresno counties. During construction, sensitive receptors would be exposed to diesel particulate matter exhaust, which CARB classifies as a carcinogen. Cancer risk from exposure to carcinogens is evaluated based on a long-term (70-year) continuous exposure. The period of construction for the portions of the alignment that run past receptors within these communities would be less than 1 year because it is expected that 1,000 feet of guideway could be constructed in 1 year. This short period of exposure is not comparable to chronic exposure and is not expected to increase the cancer risk to sensitive receptors.

Concrete Batch Plants

The emissions generated from operation of concrete batch plants are included in the total regional construction emissions for each alternative. The concrete batch plants are estimated to generate 18 tons/year of particulate emissions for the Hybrid Alternative, 20 tons/year for the BNSF Alternative, and 29 tons/year for the UPRR/SR 99 Alternative. The concrete generated would include concrete for the elevated structures (elevated rail) and retaining wall (retained fill rail).
The concrete batch plants would be located along the alignment. According to California EPA and CARB's *Air Quality and Land Use Handbook: A Community Health Perspective* (CEPA and CARB 2005), emission impacts at receptors would be greatly reduced by locating a facility 1,000 feet from sensitive receptors. To mitigate localized impacts from the plants, Mitigation Measure AQ-MM#8 would be implemented (see Section 3.3.6, Mitigation Measures). This would require concrete batch plants to be at least 1,000 feet from sensitive receptors, such as schools and hospitals.

HMF Construction

Air emissions associated with construction of the HMF would be small relative to the quantity of emissions from construction of the alignment/guideway. However, unlike construction of the guideway/alignment, which would be spread out over about 80 miles, emissions from HMF construction would be located in one area. TACs, mostly DPM exhaust from construction equipment, and criteria pollutants would be emitted during construction of the HMF. DPM emission impacts tend to be localized; therefore, sensitive receptors were evaluated for potential exposure to DPM.

The majority of the construction emissions would be DPM from diesel construction equipment used for mass site grading, building construction, and the HMF guideway construction. The main health risk concern of DPM is cancer and chronic risks. Cancer risk from exposure to carcinogens is typically evaluated based on a long-term (70-year) continuous exposure, and chronic risks are also typically evaluated for long term exposure. The period of construction for the HMF would be approximately 18 months, spread between August 2017 and July 2021. This short period of exposure is not expected to increase the cancer risk or non-cancer chronic health risks to sensitive receptors.

Under NEPA, the local impact of the HMF construction would be negligible, because sensitive receptors are not expected to be exposed to long-term DPM emissions during HMF construction to cause substantial cancer or chronic health risks, and the acute risks due to DPM would be minimal.

Under CEQA, the local impact of the HMF construction would be less than significant because sensitive receptors are not expected to be exposed to long-term DPM emissions during HMF construction to cause substantial cancer or chronic health risks, and the acute risks due to DPM would be minimal.

Project/Operational Impacts

Common Air Quality Impacts

Common benefits to regional air quality would come from a reduction of VMT and airplane emissions, which would reduce criteria, mobile source air toxics, and GHG emissions. Additionally, the project would have the common benefit of meeting a GHG reduction measure identified in the AB 32 scoping plan. At the local level, negligible localized increases of CO and particulates (PM_{10} and $PM_{2.5}$) emissions would not cause violations of NAAQS, but the operation of the HMF could increase sensitive receptor exposure to air pollutants.

Statewide and Regional Impacts

Statewide Emissions

Table 3.3-11 summarizes statewide emission changes resulting from the project in 2035 compared to the No Project Alternative. The project is predicted to have a beneficial effect on (i.e., reduce) statewide emissions of all criteria pollutants. The analysis estimated the emission changes due to projected reductions of on-road VMT and intrastate plane travel, and increases in electrical demand (required to power the HST).

In the existing condition plus project versus existing condition scenario, the project is also predicted to have a beneficial effect (i.e. reduce) statewide emissions of all applicable pollutants, as compared to the existing scenario (Table 3.3-12). Details of the existing condition plus project analysis are presented in the *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a).

Table 3.3-11
Summary of Estimated 2035 Statewide Emission Burden Changes (Project vs. No Project 2035)

Project Element	VOC (tons/ year)	CO (tons/ year)	NO_x (tons/ year)	SO_2 (tons/ year)	PM_{10} (tons/ year)	$PM_{2.5}$ (tons/ year)
Roadways	-525	-10,572	-2,775	-55	-535	-323
Airport	-237	-2,154	-2,884	-201	-22	-22
Energy (Power Plants)	37	376	252	33	51	47
Total	**-725**	**-12,350**	**-5,407**	**-223**	**-506**	**-298**

Table 3.3-12
Summary of Estimated 2009 Statewide Emission Burden Changes (Existing plus Project Vs Existing Condition)

Project Element	VOC (tons/ year)	CO (tons/ year)	NO_x (tons/ year)	SO_2 (tons/ year)	PM_{10} (tons/ year)	$PM_{2.5}$ (tons/ year)
Roadways	-1,299	-25,430	-8,873	-29	-442	-329
Airport	-135	-1,248	-1,672	-117	-15	-15
Energy (Power Plants)	37	376	252	33	51	47
Total	**-1,397**	**-26,302**	**-10,293**	**-113**	**-406**	**-297**

Regional Criteria Pollutant Emissions

Motor vehicle emissions would decrease in the region because of the project. These reductions, however, would be partially offset by operational emissions associated with the train itself (the HST would be powered by electricity from the regional power grid), by station operations, and by HMF operations. These emissions were analyzed for the No Project Alternative versus the HST alternatives scenario in 2035 and the existing condition versus existing condition plus project scenario in 2009.

As described in the sections below, the project would result in a net regional decrease in emissions of criteria pollutants compared to the No Project (Table 3.3-13). The existing condition plus project would have a net regional emission decrease of VOC, CO, NO_x, and $PM_{2.5}$ compared to the existing condition. PM_{10} and SO_2 would have a small emission increase for the existing condition plus project, but the increase is below both the CEQA and GC thresholds (refer to Table 3.3-14). Emission decreases would be beneficial to the air basin and help the SJVAB meet its attainment goals for ozone and particulates. However, lower ridership than that presented in Chapter 2, Alternatives, in the design and planning values would result in fewer, but still positive, regional benefits.

Table 3.3-13
Summary of Regional Changes in Operational Emissions (Project vs. No Project 2035) (tons/year)

Activities	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Indirect Emissions						
Changes in VMT emissions	-76	-1,532	-415	-7.7	-79	-46
Changes in airplane emissions	0.00	-7.3	-7.3	0.52	0.00	0.00
Changes in power plant emissions [a]	3.7	38	25	3.3	5.2	4.8
Direct Emissions						
Station operation	1.4	105	8.2	0.63	6.1	3.5
HMF onsite emissions	0.77	10	3.7	0.030	0.14	0.13
HMF offsite mobile source emissions	0.21	12	1.6	0.072	0.70	0.40
Overnight layover/servicing maintenance facility offsite emissions	0.0039	0.30	0.021	0.0018	0.018	0.010
Fugitive dust from train operations	NA	NA	NA	NA	22	3.2
Total [b]	**-70**	**-1,374**	**-384**	**-4.2**	**-45**	**-34**
SJVAPCD CEQA significance thresholds	10	NA	10	NA	15	15
Exceeds SJVAPCD CEQA thresholds? [c]	No	NA	No	NA	No	No
GC thresholds [d]	10	100	10	100	100	100
Exceeds GC thresholds?	No	No	No	No	No	No

NA = not applicable

[a] The changes in power plant emissions are presented for the longest alternative.

[b] The total includes the indirect and direct emissions.

[c] The SJVAPCD has significance thresholds for NO_x, ROG/VOC, PM_{10}, and $PM_{2.5}$. The district currently does not have thresholds for CO or SO_2. Section 3.1.8 summarizes the CEQA significance for these pollutants.

[d] The GC thresholds for criteria pollutants are based on the SJVAB federal attainment status. The SJVAB is considered an extreme nonattainment area for the O_3 NAAQS, is a nonattainment area for $PM_{2.5}$, and is a maintenance area for the CO and PM_{10} NAAQS.

Table 3.3-14
Summary of Regional Changes in Operational Emissions (Existing Plus Project vs. Existing Condition 2009) (tons/year)

Activities	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Indirect Emissions						
Changes in VMT emissions	-58	-1,022	-668	-1.4	-29	-22
Changes in airplane emissions	0.00	-7.3	-7.3	-0.52	0.00	0.00
Changes in power plant emissions [a]	3.7	38	25	3.3	5.2	4.8
Direct Emissions						
Station operation	21	601	69	0.63	6.3	3.6
HMF onsite emissions	0.77	10	3.7	0.030	0.14	0.13
HMF offsite mobile source emissions	2.4	66	11	0.072	0.74	0.44
Overnight layover/servicing maintenance facility offsite emissions	0.059	1.7	0.18	0.0018	0.018	0.010
Fugitive dust from train operations	NA	NA	NA	NA	22	3.2
Total [b]	**-31**	**-313**	**-566**	**2.1**	**4.7**	**-9.7**
SJVAPCD CEQA significance thresholds	10	NA	10	NA	15	15
Exceeds SJVAPCD CEQA thresholds? [c]	No	NA	No	NA	No	No
GC thresholds [d]	10	100	10	100	100	100
Exceeds GC thresholds?	No	No	No	No	No	No

NA = not applicable

[a] The changes in power plant emissions are presented for the longest alternative.

[b] The total includes the indirect and direct emissions.

[c] The SJVAPCD has significance thresholds for NO_x, ROG/VOC, PM_{10}, and $PM_{2.5}$. The district currently does not have thresholds for CO or SO_2. Section 3.1.8 summarizes the CEQA significance for these pollutants.

[d] The GC thresholds for criteria pollutants are based on the SJVAB federal attainment status. The SJVAB is considered an extreme nonattainment area for the O_3 NAAQS, is a nonattainment area for $PM_{2.5}$, and is a maintenance area for the CO and PM_{10} NAAQS.

Mobile Source Emissions

The project would decrease VMT from other modes of travel (passenger cars, buses, diesel trains, and airports) and their associated emissions. The Statewide Program EIR/EIS (Authority and FRA 2005) demonstrated that the overall statewide project would reduce long-distance, city-to-city travel along freeways and state highways within the SJVAB and would reduce long-distance, city-to-city aircraft take-offs and landings within the air basin.

At the regional level, the air quality analysis is based primarily on regional VMT. According to the traffic analysis, all the HST alternatives would have the same regional VMT effects (Authority and FRA 2011b). Therefore, the HST alternatives would have the same regional impact on air quality.

The regional VMT for the HST alternatives would decrease by about 10% compared to the No Project Alternative (2035) and about 2% compared to existing conditions. These reductions would result in lower pollutant emissions. Therefore, according to NEPA, and under CEQA guidelines, there would be a beneficial impact on air quality from the operation of regional on-road vehicles for the HST alternatives.

Despite overall projected VMT growth between existing conditions and the no project conditions in 2035, emission factors for 2035, which take into account improved technology designed to meet higher emission standards in the future, would be lower than existing values. Regional on-road vehicle emissions for 2035 with the UPRR/SR 99, BNSF, and Hybrid alternatives would be less than emissions estimated under existing conditions.

In conclusion, under NEPA, there would be a benefit to regional air quality from operation of the HST, and under CEQA, operational air quality effects would be less than significant because of the reduction of VMT in the region. Table 3.3-13 summarizes the reduction in VMT and criteria pollutant emissions in the regional study area between the 2035 No Project Alternative and the 2035 Project Alternative based on travel mode projections developed for the project. Table 3.3-14 summarizes the reduction in criteria pollutant emissions in the regional study area between the 2009 existing condition and the 2009 existing condition plus project scenario based on travel mode projections of VMT developed for the project. Details of the VMT comparison of the HST alternatives to existing conditions are included in the *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a).

Emissions from Train Operations

The HST project would use electric multiple unit (EMU) trains, with the power distributed through the overhead contact system. Combustion of fossil fuels and associated emissions from HST trains would not occur. However, trains traveling at high velocities, such as those associated with the proposed HST, create sideways turbulence and rear wake, which re-suspend particulates from the surface surrounding the track, resulting in fugitive dust emissions. Assuming a friction velocity of 0.19 meter/second (m/s) to re-suspend soils in the project region, an HST passing at 220 mph could re-suspend soil particles out to approximately 10 feet from the train (Watson 1996). According to EPA methodology for estimating emissions from wind erosion (EPA 2006b), HST operations would generate approximately 22 tons per year of PM_{10} and 3.2 tons per year of $PM_{2.5.}$ These emissions would be the same for the 2035 No Project Alternative compared to the HST alternatives and the 2009 existing condition compared to the 2009 existing condition plus project scenario (refer to Tables 3.3-13 and 3.3-14).

Emissions from Power Generating Facilities

The HST project would increase electrical requirements compared to the No Project Alternative and existing conditions. Analysts conservatively estimated the electrical demands resulting from the propulsion of the trains to be 8.32 gigawatt hours per day compared to the No Project Alternative in 2035 and 8.24 gigawatts hours per day for the existing plus project compared to the existing condition in 2009. The state's electrical grid would power the HST System; therefore, no one generation source for the electrical power requirements can be identified. Project-related emission changes from power generation were, therefore, predicted on a statewide level only. To derive the portion of electricity usage required by the Merced to Fresno Section of the HST, the electricity usage is assumed to be proportional to the track alignment length. The alignment distance for each alternative was divided by the total HST distance of 830 miles to estimate the percentages of the statewide electricity consumed by each alternative. Tables 3.3-13 and 3.3-14 provide the emissions estimated for the Merced to Fresno Section for the project compared to No Project in 2035 and existing condition in 2009, respectively.

The estimated emission changes shown in Table 3.3-13 and Table 3.3-14 represent the portion of the emissions generated by HST electricity usage allocated to the SJVAB based on the alignment distance within the SJVAB. The state of California requires that an increasing fraction (33% by 2020) of the electricity generated for the state's power portfolio come from renewable energy sources. As such, the emissions generated for powering the HST System are expected to be lower in the future compared to the emission estimates used in this analysis based on existing state power portfolio. In addition, the Authority has adopted a goal to purchase the HST System's power from renewable energy sources, which would further reduce the emissions compared to the existing estimates.

Airport Emissions

The HST project is projected to affect travel at four regional airports in the study area: Fresno Yosemite International Airport, Merced Municipal/Macready Field Airport, Chowchilla Municipal Airport, and Madera

Municipal Airport. The Statewide Program EIR/EIS (Authority and FRA 2005) demonstrated that the long-distance, city-to-city aircraft take-offs and landings within the Merced to Fresno Section would reduce by about one flight per day. This would reduce regional airport-related emissions of CO and NO_x relative to the No Project Alternative and existing conditions. Table 3.3-13 and Table 3.3-14 summarize the estimated effects of this reduction relative to the No Project Alternative and to existing conditions, respectively. Details of the aircraft comparison of the HST alternatives to existing conditions are included in the *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a).

Station Emissions

Emissions associated with the operation of the Merced and Fresno HST stations are expected as a result of combustion sources used primarily for space heating and facility landscaping (backup emergency generators), energy consumption for facility lighting, minor solvent and paint usage, and employee and passenger traffic. Deliveries to the HST stations were considered negligible. URBEMIS 2007 was used to estimate these emissions from each station, based on the square footage of the stations. Table 3.3-13 and Table 3.3-14 summarize the annual emissions from the stations for 2035 and 2009 conditions, respectively.

HMF Emissions

Typical activities expected at the HMF include in-service monitoring, inspections and testing, toilet servicing, train car washing, minor and major repair of mechanical components, exterior maintenance (grinding, painting, and cutting activities), parts cleaning, heating, ventilation, and air-conditioning repair, welding, and fabrication. As site-specific information for all activities at the HMF is not available at this time, reasonable assumptions were made based on the types of activities that would occur at the facility, and emissions from these emissions sources as well as from mobile sources operating onsite were estimated based on these assumptions. The emissions from the HMF are compared to the GC thresholds and are presented in Tables 3.3-13 and 3.3-14 for the No Project Alternative compared to the HST alternatives and the existing plus project compared to the existing conditions, respectively.

Air dispersion modeling was performed to determine the potential impact on local air quality and is discussed in the local impacts section. The stationary sources required for the HMF operation would require permits from the SJVAPCD unless they are exempt. Evaluation of applicable permitting requirements and the subsequent emission estimates for permitting purposes will be performed during permitting processes thus are not discussed in this report. Details of the sources associated with the HMF are included in the *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a).

Mobile Source Air Toxics Analysis

This MSAT analysis is a qualitative comparison between HST alternatives. An MSAT impact would occur if an HST alternative has a higher potential for MSAT emissions than the No Project Alternative or existing conditions. The MSAT analysis indicated that the impacts from MSAT emissions are similar for the three HST alternatives. Under NEPA, the HST alternatives would have a negligible MSAT impact. Under CEQA, the MSAT impact would be less than significant.

No Project Alternative

MSAT emissions from the No Project Alternative in 2035 would likely be lower than existing conditions as a result of EPA's national control programs that would reduce annual MSAT emissions by 72% from 1999 to 2050 (FHWA 2009). Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area would likely be lower in the future when compared to existing conditions.

HST Alternatives

The HST project would provide another option for intercity travel in California that does not emit air pollutants, including MSATs, into the local atmosphere. The Merced to Fresno Section of the HST would decrease overall VMTs from passenger vehicles compared to the No Project Alternative and the existing conditions, thus decrease MSATs associated with passenger vehicles. MSATs would also decrease because of a reduction in travel modes involving diesel and aviation fuel (buses, diesel Amtrak trains, and airplanes).

The HST alternatives would reduce traffic congestion and increase vehicle speed as more people use the HST instead of driving when compared to the No Project Alternative. According to EPA's MOBILE6.2 model, emissions of priority MSATs, except for diesel PM, decrease as speed increases (EPA 2009). Therefore, the HST alternatives would decrease MSAT emissions compared to the No Project Alternative. HST alternatives would reduce regional VMT by 2% from existing conditions; therefore, MSAT emissions from the HST alternatives would similarly decrease MSAT emissions to existing conditions.

The operation of the EMU used by HST alternatives would not have combustion emissions, so no toxic emissions would be expected from operation of the HSTs. The potential MSAT emission sources directly related to the project operation would be from vehicles used at maintenance facilities and the passenger vehicles travelling to and from the HST stations. Buses serving the stations would be mostly fuelled by natural gas and would not generate a substantial amount of diesel PM emissions. Localized increases in MSAT emissions may occur near the HST stations because of passenger commutes and near the HMF, where diesel vehicles would be used.

This evaluation includes a basic analysis of the likely MSAT emission impacts of the HST alternatives. The lack of a national consensus on an acceptable level of risk and other air quality criteria assumed to protect the public health and welfare, as well as the reliability of available technical tools, do not allow predicting, with confidence, the project-specific health impacts of the emission changes associated with the alternatives (FHWA 2009). The outcome of such an assessment would be influenced more by the uncertainty introduced into the process by the assumptions made rather than insight into the actual health impacts from MSAT exposure directly attributable to the HST alternatives (FHWA 2009). As reductions in MSAT emissions are predicted with the HST alternatives, further MSAT analysis would not be suggested even if it were practical to accomplish.

Greenhouse Gas Analysis

The SJVAPCD released a guidance document in December 2009 for addressing GHG impacts within the context of CEQA. For projects to have a less than significant impact on an individual and cumulative basis, the project must comply with an approved Climate Change Action Plan, demonstrate that it would not impede the state from meeting the statewide 2020 GHG emissions target, adopt the SJVAPCD's Best Performance Standards for stationary sources, or reduce or mitigate GHG emissions by 29% (SJVAPCD 2009b).

The HST project, which is included in the AB 32 scoping plan as Measure #T-9, would help the state meet the 29% reduction in GHG emissions by 2020 (CARB 2008). Overall, the project operation would have a net beneficial impact on GHG emissions. Table 3.3-15 summarizes the statewide GHG emission changes from the No Project Alternative (expressed in terms of CO_2) resulting from the operation of the project. As shown, the project would have a beneficial effect on statewide GHG emissions. The analysis estimated the emission changes from reduced on-road VMT, reduced intrastate plane travel, and increased electrical demand.

Table 3.3-15
2035 Estimated Statewide GHG Emission Changes
(Project vs. No Project) (metric tons/year)

Project Element	Change in CO_2 Emissions
Roadways	-5,231,496
Airports	-481,252
Energy	903,974
Total	**-4,808,774**
Note: Totals may not add up exactly because of rounding.	

As compared to existing conditions of 2009, the HST alternatives would reduce GHG emissions due to the reduction in VMT. Table 3.3-16 presents the statewide GHG emission changes for the existing condition plus project compared to existing conditions (expressed in CO_2). The decrease in statewide GHG emissions is a result of reduced on-road miles traveled, reduced intrastate plane travel, and increased electrical demand compared to existing conditions.

Table 3.3-16
2009 Estimated Statewide GHG Emission Changes
(Existing Plus Project vs. Existing Condition) (metric tons/year)

Project Element	Change in CO_2 Emissions
Roadways	-2,950,079
Airports	-279,126
Energy	903,973
Total	**-2,325,232**
Note: Totals may not add up exactly because of rounding.	

Details of the GHG comparison of the HST alternatives to existing conditions are included in the *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a).

On-Road Vehicles

The HST alternatives would reduce statewide daily roadway VMT by more than 30 million miles because of travelers using the HST rather than driving. This equates to approximately 15,800 tons of CO_2 per day, or approximately 33,000 barrels of oil consumed per day. As shown in Tables 3.3-15 and 3.3-16, the proposed project would reduce statewide GHG emissions compared to the No Project Alternative and existing conditions, respectively.

On a regional basis, under the HST alternatives, Fresno and Merced counties would have some of the larger VMT reductions in the state. As shown in Table 3.3-17, annual on-road vehicle GHG emissions would be lower than the No Project Alternative emissions for the design year for the Merced to Fresno Section and would contribute to an overall reduction throughout the state. Table 3.3-18 presents the reduction in annual on-road vehicle GHG emissions for the existing condition plus project compared to the existing condition in 2009.

Table 3.3-17
2035 On-Road Vehicles Regional GHG Emissions (Project vs. No Project) (metric tons/year)

County	No Project Daily VMT Total Traffic	HST Alternative Daily VMT Total Traffic	Change in CO_2 Emissions with HST (metric tons/year)
Fresno	27,367,949	24,364,285	-474,462
Madera	8,532,552	8,256,392	-43,848
Merced	13,534,370	12,018,453	-238,931
Statewide	1,254,604,293	1,223,330,976	-5,231,496

Table 3.3-18
2009 On-Road Vehicles Regional GHG Emissions (Existing Plus Project vs. Existing Condition) (metric tons/year)

County	No Project Daily VMT Total Traffic	HST Alternative Daily VMT Total Traffic	Change in CO_2 Emissions with HST (metric tons/year)
Fresno	22,500,000	22,050,000	-84,096
Madera	4,177,690	4,094,136	-15,632
Merced	7,000,000	6,860,000	-30,543
Statewide	888,400,000	870,632,000	-2,950,079

Airport Operations

The HST Project would reduce the number of plane flights statewide, because of travelers using the HST rather than flying. Therefore, the project would have no measurable effect or it would slightly reduce regional emissions because of the HST (compared to the No Project Alternative). The Statewide Program EIR/EIS (Authority and FRA 2005) demonstrated that the long-distance, city-to-city aircraft take-offs and landings within the Merced to Fresno Section would reduce by about one flight per day. This would reduce regional airport-related emissions of CO_2 emissions relative to the No Project Alternative, as shown in Table 3.3-19.

The existing condition plus project compared to the existing condition would also reduce the long-distance, city-to-city airport take-offs and landings within the Merced to Fresno Section by one flight per day. This would reduce regional airport-related emissions of CO_2 emissions from the existing condition plus project compared to the existing condition, as shown in Table 3.3-20.

Power Plant Operations

The HST would increase electrical requirements compared to the No Project Alternative and the existing condition. The electrical demands from propulsion of the trains and the operation of the trains at terminal stations, in storage depots, and in maintenance facilities were conservatively estimated to be 8 gigawatt hours per day. As shown in Tables 3.3-15 and 3.3-16, the project would increase statewide indirect GHG emissions.

To derive the portion of electricity usage required by the Merced to Fresno Section of the HST, the electricity usage is assumed to be proportional to the track alignment length. The alignment distance for each alternative was divided by the total HST distance of 830 miles to estimate the percentages of the statewide electricity consumed by each alternative. Table 3.3-19 summarizes the regional indirect CO_2 emissions compared to No Project Alternative for the Merced to Fresno Section. Table 3.3-20 summarizes the regional indirect CO_2 emissions for the existing condition plus project compared to the existing condition.

The state's electrical grid would power the HST System, and, therefore, no one generation source for the electrical power requirements can be identified. The estimated emission changes for power plants are considered conservative because they are based on the current electric generation profile of the state. As previously discussed, the state requires an increasing fraction (33%) of electricity generated for the state's power portfolio to come from renewable energy sources and the Authority has a policy goal to use 100% renewable energy plus power the HST. As such, the GHG emissions generated for powering the HST System are expected to be lower in the future compared to emission estimates used in this analysis.

HST Station and HMF Operations

Operation of the HST would result in GHG emissions from the combustion of fossil fuels through onsite sources used and offsite mobile sources used for employee commutes and vendor trips to the maintenance facilities and HST stations. No direct GHG emissions would result from operation of the trains on the alignment because the trains would be electrically powered. The operation of the train would only result in indirect GHG emissions from energy consumption, as discussed in the power plant analysis.

Table 3.3-19 shows the total regional GHG emissions changes from the HST project operation when compared to the No Project Alternative in 2035. The proposed project would reduce regional GHG emissions when compared to the No Project Alternative in 2035.

As previously discussed, there is no defined time for the half-life of CO_2 in the atmosphere. Therefore, it is reasonable to address GHG construction emissions by looking at the payback period. Because of the large reduction of GHG emissions during the operational phase, the GHG emissions from construction would be "paid back," meaning it would offset for the increases in construction emissions, in a little over 1 year of the HST operation under the worst-case construction-phase emission scenario. Therefore, the operation and construction of the project would result in a benefit under NEPA and a less-than-significant GHG impact under CEQA when compared to the No Project Alternative.

Table 3.3-20 shows the total regional GHG emissions changes from the HST project operation when compared to the existing condition in 2009. The existing condition plus project would have a net GHG emission increase compared to the existing condition.

Table 3.3-19
2035 Project Alternatives Regional GHG Emissions (Project vs. No Project) (metric tons/year)

2035 Operational Emissions CO_2 [a]	2035 CO_2 Emissions		
	UPRR/SR 99 Alternative	BNSF Alternative	Hybrid Alternative
Regional Vehicle Travel	-757,241	-757,241	-757,241
Regional Airport (Fresno-Yosemite International)	-1,245	-1,245	-1,245
Indirect Regional Power	80,990	91,314	79,242
HST Station and HMF Operations	66,157	66,157	66,157
Net Regional Difference	-611,339	-601,016	-613,087
Construction Emissions	922,228	876,430	811,271
Payback Period (years of project operations)	1.5	1.5	1.3

[a] Emission factors for CO_2 do not account for improvements in technology.

Table 3.3-20
2009 Project Alternatives Regional GHG Emissions (Existing Plus Project vs. Existing Condition)
(metric tons/year)

2009 Operational Emissions CO_2 [a]	2009 CO_2 Emissions		
	UPRR/SR 99 Alternative	BNSF Alternative	Hybrid Alternative
Regional Vehicle Travel	-130,272	-130,272	-130,272
Regional Airport (Fresno-Yosemite International)	-1,245	-1,245	-1,245
Indirect Regional Power	80,990	91,314	79,242
HST Station and HMF Operations	58,415	58,415	58,415
Net Regional Difference	7,888	18,212	6,140
Construction Emissions	922,228	876,430	811,271

[a] Emission factors for CO_2 do not account for improvements in technology.

Local Impacts

Local impacts on air quality would occur if the project causes or exacerbates a localized exceedance of a CO or PM ambient air quality standard. The result of the localized analyses, which are the same for all HST alternatives evaluated, is that the project would not cause or exacerbate a violation of a NAAQS and impacts would be negligible under NEPA and less than significant under CEQA. The operation of the Castle Commerce Center HMF (but none of the other HMF sites) could cause potential moderate under NEPA and significant under CEQA impact on sensitive receptors located within 1,000 feet of the facility boundary.

Microscale CO Analysis

The project would not worsen traffic conditions at intersections along the alignment because the alignment and roadways would be grade-separated. Therefore, the CO analysis did not consider every intersection along the alignment; instead, the analysis focused on locations near the HST stations and the HMF and locations that would experience a change in roadway structure (such as closure of existing crossings along the alignment if closure would result in traffic congestion) or traffic conditions. These areas of potential elevated CO concentrations are referred to as hot spots.

CO concentrations were modeled at three intersections near the proposed Merced HST station, three intersections near the proposed Fresno HST station, three intersections near the proposed Castle Commerce Center HMF, and two intersections between Herndon Avenue and Shaw Avenue north of SR 99. Additionally, three intersections affected by the realignment and widening of SR 99 were evaluated. The *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a) lists the intersections chosen for analysis, based on peak-hour volumes, delay time, and LOS. Receptors were placed at worst-case locations adjacent to the intersections to calculate maximum 1-hour and 8-hour CO concentrations.

Project vs. No Project

Intersections modeled in this analysis are signalized, as traffic volumes at the unsignalized intersections in the study area are less than signalized intersections. Figure 3.3-4 shows the intersections included in the CO hot-spot analysis for the Project vs. No Project condition. Table 3.3-21 summarizes the modeled

CO concentrations at the intersections around the proposed Merced station and Castle Commerce Center HMF. Table 3.3-22 summarizes the modeled CO concentrations around the Fresno HST station and at the Herndon and Shaw area intersections. Table 3.3-23 summarizes the modeled CO concentrations at the intersections along SR 99.

The results presented in Tables 3.3-21, 3.3-22, and 3.3-23 include the HST alternatives as well as the No Project Alternative growth and other transportation improvement projects in the region, as described in Chapter 2, Alternatives. Results in Tables 3.3-21, 3.3-22, and 3.3-23 include background concentrations of CO. As shown in the tables, CO concentrations at affected intersections in 2035 for both the No Project and HST alternatives are expected to be lower than existing conditions in 2009. HST alternatives would have slightly higher CO concentration at intersections than the No Project Alternative in 2035 due to the additional traffic cause by the station or HMF operation. Predicted CO concentrations for all modeled intersections are below NAAQS and CAAQS, therefore, are not expected to cause violations of CO NAAQS during project operation so impacts would be less than significant under CEQA and negligible under NEPA.

In addition to evaluating the potential CO hot spots associated with changes in traffic near intersections, maximum 1-hour and 8-hour CO concentrations were estimated near HST station parking structures. Figure 3.3-4 shows the approximate locations of the HST station parking structures. To be conservative, for the Merced Station it was assumed that three parking structures, at full capacity (2 structures with 7 levels and 2,850 parking spaces each, and 1 structure with 5 levels and 2,000 parking spaces), would have vehicles departing within the same hour each day. To be conservative, the 8-hour CO impacts were based on this 1-hour scenario. There are two alternatives for the Fresno station. Modeling results for the Fresno Station parking structures were taken from *Fresno to Bakersfield Section Air Quality Technical Report* (Authority and FRA 2011c). Tables 3.3-24 and 3.3-25 summarize the modeled CO concentrations at the Merced and Fresno parking structures, including ambient background, respectively. For this analysis, only vehicles within the parking structures were evaluated as contributing to CO hot spots. Vehicle travel outside the parking structure are evaluated in the CO hot-spot analysis for the intersections, therefore, are not included in the parking structure analysis.

As shown in Tables 3.3-21 through 3.3-25, the intersections and parking structures evaluated would have CO concentrations lower than the NAAQS and the CAAQS. Therefore, the localized CO impacts from the project operation would be less than significant under CEQA and negligible under NEPA.

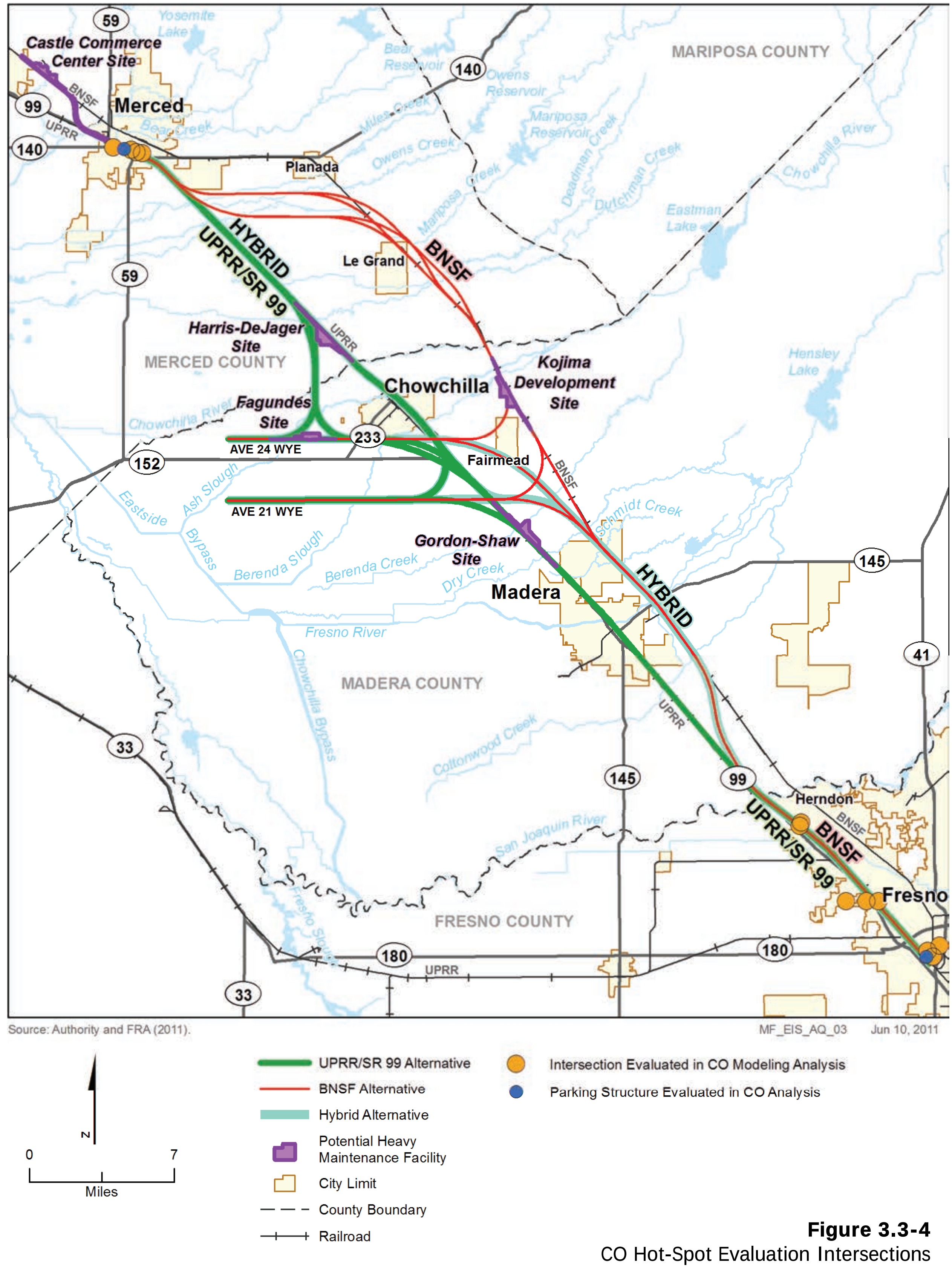


Figure 3.3-4
CO Hot-Spot Evaluation Intersections
(Project vs. No Project 2035)

Table 3.3-21
Maximum Modeled CO Concentrations at Intersections near the Merced HST Stations and Castle Commerce Center HMF Site[a]

	Existing Conditions		2035 No Project / No Action		2035 Project Option A (Local Parking Option)		2035 Project Option B (Remote Parking Option)	
	Max 1-Hour CO	Max 8-Hour CO	Max 1-Hour CO	Max 8-Hour CO	Max 1-Hour CO	Max 8-Hour CO	Max 1-Hour CO	Max 8-Hour CO
Inter-section	Concentra-tion (ppm)	Concentra-tion (ppm)[b]	Concentra-tion (ppm)	Concentra-tion (ppm)[b]	Concentra-tion (ppm)	Concentra-tion (ppm)[b]	Concentra-tion (ppm)	Concentra-tion (ppm)[b]
Merced HST Station Area								
13th St - SR-99 SB Off-Ramp / V St – AM[d]	5.30	3.40	4.20	2.63	4.20	2.63	4.20	2.63
16th St / Martin Luther King Wy - PM	5.20	3.33	4.20	2.63	4.20	2.63	4.20	2.63
Main St / G St - PM[d]	4.10	2.56	3.70	2.28	4.10	2.56	4.10	2.56
Castle Commerce Center HMF Area c								
16th St/ M St – PM	5.2	3.33	4.2	2.63	4.3	2.70	4.3	2.70
Ambient Air Quality Standards								
CAAQS	20	9	20	9	20	9	20	9
NAAQS	35	9	35	9	35	9	35	9

[a] Concentrations include a predicted 1-hour background concentration of 3.5 ppm and an 8-hour background concentration of 2.14 ppm, representing the second-highest measured CO concentrations in years 2007-2009.
[b] A persistence factor of 0.7 was used to estimate the 8-hour CO concentrations based on the generalized persistence factor for urban locations in the CO Protocol (Caltrans 1997).
[c] This worst-case intersection associated with the Merced train station was also identified as a worst-case intersection for the Castle Commerce Center HMF. Only the Merced Station contributes to the modeled impacts; therefore additional modeling was not done for the Castle Commerce Center HMF.

Table 3.3-22
Maximum Modeled CO Concentrations at Intersections near the Fresno HST Station and Herndon Avenue and Shaw Avenue[a]

Intersection	Existing Conditions		2035 No Project/No Action		2035 Project Option	
	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[b]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[b]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[b]
Fresno Train Station Area						
Van Ness St/ Inyo St	3.5	2.6	3.3	2.5	3.3	2.5
S St/ Tulare St	3.5	2.6	3.4	2.6	3.4	2.6
Van Ness Ave/ Fresno St	3.7	2.8	3.4	2.6	3.5	2.6
Herndon and Shaw Avenue						
Veterans Blvd / Bullard Ave - AM	NA[d]	NA[d]	4.4	2.77	4.6	2.91
Veterans Blvd / Bullard Ave - PM	NA[d]	NA[d]	4.4	2.77	4.6	2.91
Veterans Blvd / Golden State Blvd Connector South - AM	NA[d]	NA[d]	4.4	2.77	4.6	2.91
Veterans Blvd / Golden State Blvd Connector South - PM	NA[d]	NA[d]	4.4	2.77	4.6	2.91
Ambient Air Quality Standards						
CAAQS	20	9	20	9	20	9
NAAQS	35	9	35	9	35	9

NA = not applicable
[a] Background CO data taken from Fresno First Street monitoring station were found to be 3.10 ppm for 1-hour CO concentration and 2.34 ppm for 8-hour CO concentration.
[b] Concentrations include a predicted 1-hour background concentration of 3.5 ppm and an 8-hour background concentration of 2.14 ppm, representing the second-highest measured CO concentrations in years 2007-2009.
[c] A persistence factor of 0.7 was used to estimate the 8-hour CO concentrations based on the generalized persistence factor for urban locations in the CO Protocol (Caltrans 1997).
[d] These intersections do not exist in 2009 but were included in the 2035 analysis based on the screening criteria.

Table 3.3-23
Maximum Modeled CO Concentrations at Intersections along SR 99[a]

Intersection	Existing Conditions		2035 No Project/No Action		2035 Project Option		2035 Project Option with Mitigation	
	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[b]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[b]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[b]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[b]
SR 99								
Clinton Ave / Brawley Ave – PM	4.6	2.91	4.1	2.56	4.2	2.63	4.1	2.56
Clinton Ave / Marks Ave – AM	5.0	3.19	4.2	2.63	4.4	2.77	4.4	2.77
Clinton Ave / Marks Ave – PM	5.7	3.68	4.1	2.56	4.3	2.7	4.3	2.7
Clinton Ave / Weber Ave - AM	5.4	3.47	4.3	2.7	4.4	2.77	4.4	2.77
Ambient Air Quality Standards								
CAAQS	20	9	20	9	20	9	20	9
NAAQS	35	9	35	9	35	9	35	9

[a] Concentrations include a predicted 1-hour background concentration of 3.5 ppm and an 8-hour background concentration of 2.14 ppm, representing the second-highest measured CO concentrations in years 2007-2009.

[b] A persistence factor of 0.7 was used to estimate the 8-hour CO concentrations based on the generalized persistence factor for urban locations in the CO Protocol (Caltrans 1997).

Table 3.3-24
Maximum Modeled 2035 CO Concentrations at Merced HST Station Parking Structures

Park-and-Ride Station	1-Hour Concentration (ppm)		8-Hour Concentration (ppm)	
	Maximum Modeled Increase[a]	Total Concentration[b]	Maximum Modeled Increase[c]	Total Concentration[d]
Station Parking Structure A	1.4	4.9	1.0	3.1
Station Parking Structure B	1.4	4.9	1.0	3.1
Station Parking Structure C	0.5	4.0	0.4	2.5
Total Merced Parking Structure CO Concentrations	3.3	6.8	2.4	4.5
CAAQS	N/A	20	N/A	9
NAAQS	N/A	35	N/A	9

N/A = not available
[a] The total concentrations assume that all three parking structures (A, B, and C) would be operating at maximum capacity.
[b] 1-hour background CO concentration of 3.50 ppm.
[c] 8-hour CO concentrations determined by multiplying the 1-hour concentrations by a persistence factor of 0.7.
[d] 8-hour background CO concentration of 2.14 ppm.

Table 3.3-25
Maximum Modeled 2035 CO Concentrations at Fresno Station Parking Facilities

Station Option	1-Hour Concentration (ppm)		8-Hour Concentration (ppm)	
	Maximum Modeled Increase	Total Concentration[a,b]	Maximum Modeled Increase	Total Concentration[a,b]
Fresno Station–Mariposa Street Alternative[c]	0.5	3.6	0.35	2.69
Fresno Station–Kern Street Alternative[c]	0.6	3.7	0.42	2.76

[a] 8-hour CO concentrations at the parking garages were compared to the federal and state 8-hour CO standard of 9 ppm. 1-hour CO concentrations at the parking garages were compared to the federal 1-hour CO standard of 35 ppm and to the state 1-hour CO standard of 20 ppm. There were no exceedances of any standards due to CO concentrations at parking garages.
[b] 8-hour CO concentrations determined by multiplying the 1-hour concentrations by a persistence factor of 0.7.
[c] Background CO data taken from Fresno First Street monitoring station for all Fresno station parking structures were found to be 3.10 ppm for 1-hour CO concentration and 2.34 ppm for 8-hour CO concentration.

Existing Condition Plus Project vs. Existing Condition

In addition to the analysis for the Project vs. No Project, a comparison between the HST alternatives, not accounting for natural growth and other transportation improvement projects in the region (i.e., existing condition plus project), relative to existing conditions was performed. According to this analysis, the project would not cause violations of CO NAAQS at affected intersections. Details of the CO hot-spot analysis of the HST alternatives compared to existing conditions are included in the *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a).

Intersections included in the CO hot-spot modeling were selected based on comparisons of level of service, traffic volumes, and delay time under the existing condition and the existing condition plus project at the intersections. Figure 3.3-5 demonstrates the intersections included in the modeling. Tables 3.3-26 through 3.3-28 summarize the modeled CO concentrations for the selected intersections. The CO hot-spot analysis results presented in the tables include the modeled concentrations plus the background concentrations. The background CO concentrations are from monitored data representing existing conditions (2007 – 2009). Modeling results for intersections near the Fresno Station were taken from *Fresno to Bakersfield Section Air Quality Technical Report* (Authority and FRA 2011c).

As shown in Tables 3.3-26 through 3.3-28, the intersections evaluated would have CO concentrations lower than the NAAQS and the CAAQS for both the existing condition and the existing condition plus project. Therefore, the localized CO emissions from the existing condition plus project would not be expected to cause a violation of the ambient air standards, and the localized impacts at affected intersections would be less than significant under CEQA and negligible under NEPA. CO impacts at parking structures are assumed to be the same as the Project vs. No Project analysis as shown in Table 3.3-24 and Table 3.3-25, because traffic patterns in the parking structure described for the Project vs. No Project analysis are not expected to change in the existing plus project vs. existing condition analysis.

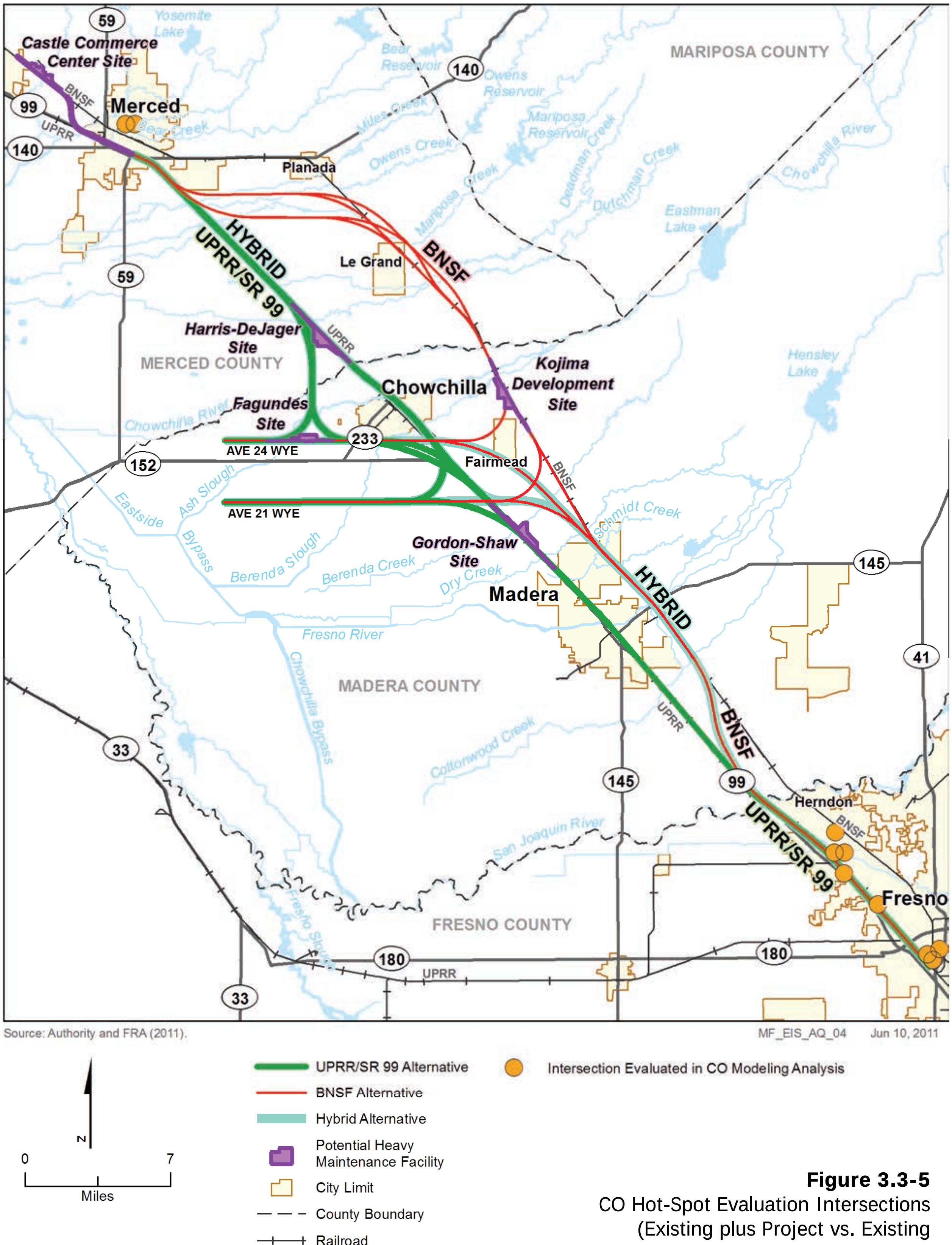


Figure 3.3-5
CO Hot-Spot Evaluation Intersections
(Existing plus Project vs. Existing
Conditions 2009)

Table 3.3-26
Maximum Modeled 2009 CO Concentrations at Intersections near the Merced HST Station and Castle Commerce Center HMF Site[a, b]

Intersection	Existing Conditions		Existing Plus Project Option A (Local Parking Option)		Existing Plus Project Option B (Remote Parking Option)	
	Max 1-Hour CO	Max 8-Hour CO	Max 1-Hour CO	Max 8-Hour CO	Max 1-Hour CO	Max 8-Hour CO
	Concentration (ppm)	Concentration (ppm)[c]	Concentration (ppm)	Concentration (ppm)[c]	Concentration (ppm)	Concentration (ppm)[c]
Olive Ave / R St – PM	5.90	3.82	5.90	3.82	5.90	3.82
Olive Ave / M St – PM	5.90	3.82	6.00	3.89	6.00	3.89
Ambient Air Quality Standards						
CAAQS	20	9	20	9	20	9
NAAQS	35	9	35	9	35	9

[a] Concentrations include a predicted 1-hour background concentration of 3.5 ppm and an 8-hour background concentration of 2.14 ppm, representing the second-highest measured CO concentrations in years 2007-2009.
[b] The worst-case intersection associated with the Merced Station was also identified as a worst-case intersection for the Castle Commerce Center HMF. Only the Merced Station contributes to the modeled impacts, so additional modeling was not done for the Castle Commerce Center HMF.
[c] A persistence factor of 0.7 was used to estimate the 8-hour CO concentrations based on the generalized persistence factor for urban locations in the CO Protocol (Caltrans 1997).

Table 3.3-27
Maximum Modeled 2009 CO Concentrations at Intersections near the Fresno HST Station[a] and Herndon Ave and Shaw Ave[b]

Intersection	Existing Conditions		Existing Plus Project Option	
	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[c]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[c]
Fresno Train Station Area				
Van Ness St/ Inyo St	3.5	2.6	3.5	2.6
S St/ Tulare St	3.5	2.6	3.6	2.7
Van Ness Ave/ Fresno St	3.7	2.8	3.8	2.8
Herndon Ave and Shaw Ave				
Blythe Ave & Shaw Ave -AM	4.5	2.84	4.5	2.84
Brawley Ave & Shaw Ave - PM	6.9	4.52	6.9	4.52
Figarden Dr & Bullard Ave - AM	6	3.89	6.2	4.03
Figarden Dr & Bullard Ave - PM	6.1	3.96	5.9	3.82
Ambient Air Quality Standards				
CAAQS	20	9	20	9
NAAQS	35	9	35	9

[a] Background CO data taken from Fresno First Street monitoring station were found to be 3.10 ppm for 1-hour CO concentration and 2.34 ppm for 8-hour CO concentration.
[b] Concentrations include a predicted 1-hour background concentration of 3.5 ppm and an 8-hour background concentration of 2.14 ppm, representing the second-highest measured CO concentrations in years 2007-2009.
[c] A persistence factor of 0.7 was used to estimate the 8-hour CO concentrations based on the generalized persistence factor for urban locations in the CO Protocol (Caltrans 1997).

Table 3.3-28
Maximum 2009 Modeled CO Concentrations at Intersections along SR 99 [a]

Intersection	Existing Conditions		Existing Plus Project		Existing Plus Mitigated Project	
	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[b]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[b]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[b]
SR 99						
Clinton Ave / Weber Ave - PM	6.3	4.10	6.1	3.96	5.9	3.82
Ashlan & Brawley/SR 99 NB Ramp – PM	6.8	4.45	6.8	4.45	N/A	N/A
Ambient Air Quality Standards						
CAAQS	20	9	20	9	20	9
NAAQS	35	9	35	9	35	9

N/A = not available

[a] Concentrations include a predicted 1-hour background concentration of 3.5 ppm and an 8-hour background concentration of 2.14 ppm, representing the second-highest measured CO concentrations in years 2007-2009.
[b] A persistence factor of 0.7 was used to estimate the 8-hour CO concentrations based on the generalized persistence factor for urban locations in the CO Protocol (Caltrans 1997).

PM_{10}/$PM_{2.5}$ Hot-Spot Analysis

Based on the PM hot-spot analysis performed and as discussed below, the project would provide regional benefits of reducing the regional VMT by approximately 10% compared to the No Project Alternative and 2% compared to existing conditions, which would reduce PM_{10} and $PM_{2.5}$ from regional vehicle travel proportionally. Because the area where the project is located is designated nonattainment for $PM_{2.5}$ and maintenance for $PM_{10,}$ the project is subject to localized PM_{10} and $PM_{2.5}$ hot-spot analysis. In December 2010, EPA released its *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (EPA 2010f). In accordance with this guidance, if a project meets one of the following criteria, it is considered a project of air quality concern and a quantitative PM_{10}/$PM_{2.5}$ analysis is required:

- *New or expanded highway projects that have a significant number of or significant increase in diesel vehicles.* The proposed project is not a new highway project, nor would it expand an existing highway beyond its current capacity. The HST vehicles would be electrically powered. While it would affect traffic conditions on roadways near the stations, it should not measurably affect truck volumes on the affected roadways. Most vehicle trips entering and leaving the stations would be passenger vehicles, which are typically not diesel-powered, with the exception of delivery truck trips to support station activities. Furthermore, the HST project would improve the regional traffic conditions by reducing traffic congestion, increasing vehicle speeds, and reducing regional VMT within the project vicinity.

- Projects affecting intersections that are at LOS D, E, or F with a significant number of diesel vehicles or those that will degrade to LOS D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project. Generally, the HST project would not change the existing traffic mix at signalized intersections. Although the maintenance facilities would use diesel vehicles, no signalized intersections were identified with LOS D, E, or F for these locations (Authority and FRA 2011b). In some cases, the LOS of intersections near the HST stations would change from LOS E under the No Project Alternative to LOS F under the HST alternatives. However, the traffic volume increases at the affected intersections would be primarily passenger cars and transit buses used for transporting people to or from the stations. Passenger cars would be gasoline powered. By 2016, transit buses in Fresno would be natural gas fueled (Shenson 2010). Buses in Merced would include a combination of natural-gas–fueled buses and diesel buses equipped with advanced control technologies (Ghearing 2010). Therefore, the HST alternatives would not measurably increase the number of diesel vehicles at affected intersections.

- New or expanded bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location. Although the proposed project would include passenger rail terminals, there would not be a significant number of diesel vehicles congregating at a single location. The HST vehicles would be electrically powered; most vehicle trips entering and leaving the station would be passenger vehicles, which are not typically diesel-powered; the transit buses used at the stations would be mostly natural gas fueled. The maintenance facilities may have diesel vehicles such as in-yard diesel locomotives to pull in or pull out the EMUs. However, the number of diesel locomotives and other diesel vehicles used at the maintenance facilities would be limited.

- 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 areas where the HST stations and maintenance facilities are located are not identified as sites of violation or possible violation in EPA-approved 2003 SIP, EPA-approved PM_{10} Maintenance Plan, or the adopted 2008 $PM_{2.5}$ Plan for San Joaquin Valley (SJVAPCD 2008; SJVAPCD 2007b).

For the reasons above, the proposed HST project would not be considered a project of air quality concern, as defined by 40 CFR 93.123(b)(1) and would not likely cause violations of PM_{10}/$PM_{2.5}$ NAAQS during its operation. Therefore, quantitative $PM_{2.5}$ and PM_{10} hot-spot evaluations are not required. CAA 40 CFR Part 93.116 requirements are, therefore, met without a quantitative hot-spot analysis. The HST project is unlikely to cause any localized adverse impact on air quality for PM_{10}/$PM_{2.5}$ standards. The PM_{10} hot-spot impact on air quality is negligible (NEPA) and less than significant (CEQA).

Localized Analysis of HMF Impacts

Because the exact location of the HMF has not been selected and the design has not been finalized, a detailed modeling analysis was conducted for a prototypical facility using a conceptual design and anticipated HMF activities. Details of the HMF operational impact analysis is presented in the *Merced to Fresno Section Air Quality Technical Report* (Authority and FRA 2011a).

Modeling Results: In general, emissions of criteria pollutants from HMF would not cause exceedances of NO_x NAAQS, CAAQS, or federal and state health guidelines at the facility boundary of the HMF. PM_{10} and $PM_{2.5}$ concentration increase due to the HMF operation would be minimal. However, ambient values currently monitored at the Merced, Madera, Drummond, and Fresno monitoring stations exceed the $PM_{2.5}$ and PM_{10} NAAQS and CAAQS; therefore, the project emissions of PM_{10} or $PM_{2.5}$ may continue to exceed these standards at the facility boundary where the worst-case ground-level concentration of pollutants from HMF would occur. CO analysis for the worst-case intersections near the HMF facility demonstrates that no CO NAAQS or CAAQS violations are expected from nearby traffic volume increase.

Health risk analysis indicated that the receptors located within 1,300 feet of the HMF facility may be exposed to cancer risks greater than 10 in a million. Cancer risks at a distance more than 1,300 feet from the facility are estimated to be below 10 in a million. The worst-case acute and chronic hazard indexes are both estimated to be less than 1 at any locations outside the HMF boundary.

Conclusions

NEPA: Only one HMF site will be selected for implementation. Based on the prototypical HMF analysis, all of the HMF sites would have potentially substantial impacts for $PM_{2.5}$ under NEPA because the HMF would be in an area with $PM_{2.5}$ concentrations that already exceed the $PM_{2.5}$ NAAQS. All of the HMF sites would have negligible impacts for PM_{10} and NO_x under NEPA because the HMF emissions would not cause exceedances to the PM_{10} or NO_2 NAAQS.

Among the five HMF sites, the Castle Commerce Center, Gordon-Shaw, and Kojima Development sites may have sensitive receptors located in areas where the cancer risk exceeds 10 in a million; therefore, operation of HMF at these three sites can potentially cause moderate impacts under NEPA.

Harris-DeJager and Fagundes HMF sites do not have sensitive receptors located in areas with cancer risks over 10 in a million; therefore, health impacts from TACs are expected to be negligible under NEPA for Harris-DeJager and Fagundes HMF sites.

CEQA: All of the HMF sites would have potentially significant impacts for PM_{10} and $PM_{2.5}$ under CEQA because the HMF is in an area with PM_{10} and $PM_{2.5}$ concentrations that already exceed CAAQS. All of the HMF sites would have less-than-significant impacts for NO_2 under CEQA because the HMF would not cause an exceedance of the NO_2 CAAQS.

Health impacts from TACs are expected to be less than significant under CEQA for the Harris-DeJager and Fagundes sites, because no sensitive receptors near these two site would be exposed to cancer risks over 10 in a million or noncancer hazard indexes over 1.0 (SJVAPCD CEQA thresholds). Due to the closer distance between the sensitive receptors and the HMF at the Castle Commerce Center, Gordon-Shaw, and Kojima Development HMF sites, HMF operation at these three sites may have the potential to expose sensitive receptors to higher concentrations of TACs from both stationary sources and mobile sources compared to the other two HMF sites and this may result in higher health risks, especially cancer risks, which exceed CEQA health thresholds. Therefore, Castle Commerce Center, Gordon-Shaw, and Kojima Development HMF sites operation could potentially cause significant health impacts under CEQA.

The health risk analysis is conservative because all stationary sources at the HMF site would be required to go through the SJVAPCD permitting process to ensure that the risk due to project operation is below the SJVAPCD health risk significance thresholds.

Odors

General Operations

No potentially odorous emissions would be associated with the train operation because the high-speed trains would be powered using electricity from the regional power grid. However, there would be some “area source” emissions associated with station operation such as natural gas combustion for space and water heating, landscaping equipment emissions, and minor solvent and paint use. The solvent and paint use might be potential odorous sources to sensitive receptors in areas where the stations are located.

Nearby sensitive land uses would be exposed daily to potential odors when the stations are operational. The sensitive receptors would be exposed to some odors, but the exposure to odors is not as severe as it would be from other industrial activities that take place near stations under the No Project Alternative. Because the project would not likely create objectionable odors, there would be no impact under NEPA and a less-than-significant impact under CEQA.

HMF Operations

HMF operations would be a source of potentially odorous emissions from paints, solvents, and a small wastewater treatment plant. Except for the Castle Commerce Center HMF site, the four HMF sites are far from urbanized areas with residential and business land uses and are not expected to cause odor nuisance to the nearby public.

In addition, the HMF would be permitted through the SJVAPCD, with controls on operations generating odorous emissions to meet the public nuisance requirements. There would be operating conditions and controls on the potential sources of odors such as the spray booth and the wastewater treatment plant at the HMF. Therefore, the associated odor impacts from the HMFs would be negligible under NEPA and less than significant under CEQA.

Compliance with Air Quality Plans

During operation, the project would reduce the amount of vehicle miles traveled in the region, which would reduce regional O_3 precursor pollutant emissions. The project would also decrease emissions from other modes of travel (buses, diesel trains, and airplanes). This would be consistent with the SJVAB 8-hour Ozone Air Quality Plan (2007), the 2004 Extreme Ozone 1-hour Plan[5], the 2007 PM_{10} Maintenance Plan, the 2008 $PM_{2.5}$ Plan and the RTPs for Merced, Madera, and Fresno counties. Therefore, operation of the project would not conflict with or obstruct implementation of applicable air quality plans.

Compliance with Conformity Rules

Projects requiring approval of funding from federal agencies that are in areas designated as nonattainment or maintenance for the NAAQS are subject to EPA's Conformity Rule. The two types of federal conformity are general conformity, which applies to the HST project, and transportation conformity.

General Conformity

To determine whether projects are subject to the GC determination requirements, EPA has established GC threshold values (in tons per calendar year) for each of the criteria pollutants for each type of designated nonattainment and maintenance area. If the emissions generated by construction or operation of a project (on an area-wide basis) are less than these threshold values, the impacts of the project are not considered to be significant, no additional analyses are required. If the emissions are greater than these values, compliance with the GC Rule must be demonstrated.

The applicable project area is in an area designated as extreme nonattainment for the 8-hour O_3 standard, nonattainment for $PM_{2.5}$, and maintenance for PM_{10} and CO. The GC threshold values for this area, according to 40 CFR Part 93, are 10 tons per year for VOC, 10 tons per year for NO_x, and 100 tons per year for SO_2, $PM_{2.5}$, PM_{10}, and CO.

Because the regional emissions for the applicable pollutants are lower under the operational phase of the HST alternatives than for the No Project Alternative, only emissions generated during the construction phase need to be compared to these threshold values to determine whether the GC Rule is applicable.

As shown in Tables 3.3-7 through 3.3-9, construction-phase emissions in SJVAB are greater than the GC threshold(s) for:

- VOC for entire construction duration (March 2013 – July 2021, except 2020 when there would be no construction activities).
- NO_x for entire construction duration (March 2013 – July 2021, except 2020 when there would be no construction activities).
- CO for entire construction duration (March 2013 – July 2021, except 2020 when there would be no construction activities).
- PM_{10} for 3 years under the UPRR/SR 99 and BNSF alternatives (2013 – 2015) and for 2 years under the Hybrid Alternative (2013 and 2014).

[5] The 1-hour ozone standard was revoked by the EPA effective June 15, 2005, for areas including the SJVAB. However, the EPA still approved the 2004 Extreme Ozone Plan for 1-hour ozone on March 8, 2010 (SJVAPCD 2010b).

- $PM_{2.5}$ for 1 year under the UPRR/SR 99 Alternative (2013) and no years under the BNSF and Hybrid alternatives.

As such, the project must demonstrate compliance with the GC Rule before construction begins. Compliance with the GC Rule can be demonstrated in one or more of the following ways:

- By reducing construction-phase emissions to below the GC thresholds.
- By showing that the construction-phase emissions are included in the area's emission budget for the SIP.
- By demonstrating that the state agrees to include the emission increases in the SIP without exceeding emission budgets.
- By offsetting the project's construction-phase emissions in each year that the thresholds are exceeded.
- By an air quality modeling analyses demonstrating the project would not cause or exacerbate a NAAQS.

Compliance with the GC Rule for the preferred alternative would be demonstrated in the Final Project EIR/EIS through one or more of the methods listed above. Demonstration of compliance with the GC rule will not change the analysis in Section 3.3, except possibly allowing construction emissions impact(s) to change from significant to less than significant

Material-hauling emissions outside of the SJVAB would be below the GC thresholds for the entire construction period for all pollutants for any of the scenarios analyzed.

Transportation Conformity

Transportation conformity is an analytical process required for all federally funded highway and transit transportation projects. Under the 1990 CAA Amendments, the U.S. Department of Transportation cannot fund, authorize, or approve federal highway and transit actions that are not first found to conform to the SIP for achieving the goals of the CAA requirements. Conformity with the CAA takes place at both the regional level and the project level.

Regional-level conformity in California is concerned with how well the region is meeting the standards set for CO, NO_2, O_3, and PM. A project could demonstrate compliance with regional conformity requirements by inclusion in a conforming RTP/RTIP. Project-level conformity determination is also required in CO, PM_{10}, and $PM_{2.5}$ nonattainment and maintenance areas. The following criteria are required to demonstrate project-level conformity:

- The project is listed in a conforming RTP and RTIP.
- The design concept and scope that were in place at the time of the conformity finding are maintained through implementation.
- The project design concept and scope must be defined sufficiently to determine emissions at the time of the conformity determination.
- The project must not cause a new local violation of the federal standards for CO, PM_{10}, or $PM_{2.5}$ or exacerbate an existing violation of the federal standards for CO, PM_{10}, or $PM_{2.5}$.

As discussed in previous sections, the HST project in its entirety is not subject to transportation conformity; however individual roadway projects, such as the minor expansion and re-alignment of SR 99, that are a part of the HST project are subject to transportation conformity. These individual projects are not currently listed in the FCOG 2011 RTP but are being added in the next version of the RTP.

Based on the microscale CO analysis and PM hot-spot discussion performed for the roadway projects in area along SR 99, the SR 99 projects would not cause or contribute to a violation of the CO, PM_{10}, or $PM_{2.5}$ federal standards. The project components subject to transportation conformity will demonstrate project-level conformity once they are included in the conforming RTP because the project level hot-spot analyses shows the project would not cause or contribute to a violation of the CO, PM_{10}, or $PM_{2.5}$ federal standards.

3.3.6 Mitigation Measures

Construction of the HST project would increase regional emissions and cause or exacerbate an exceedance of an air quality standard. As such, mitigation measures designed to minimize potential air quality impacts would focus on the construction phase of the project. These measures would go beyond the control measures listed in the Statewide Program EIR/EIS and controls required by the SJVAPCD for compliance.

The HST project would, in general, improve air quality because of the reduction in regional emissions. These mitigation measures are the same regardless of whether the project is compared to the existing conditions as baseline or no project as baseline. Temporary, short-term, emission increases associated with construction activities would be substantially reduced with mitigation strategies and design practices. Typical mitigation measures that may be applied to the project include the following:

AQ-MM#1: Reduce Fugitive Dust by Watering. This mitigation measure would apply to construction of the alternatives, including north-south alignments, HST stations, HMFs, and power substations. During construction activities, exposed surfaces would be watered three times daily, achieving a 61% reduction in PM emissions instead of the 55% reduction achieved under the programmatic measures. This measure would have the secondary impact of requiring an increased demand for water. Water demand is evaluated in the Section 3.6 Public Utilities and Energy

AQ-MM#2: Reduce VOC Emissions from Paint. This mitigation measure would apply to the painting of buildings. A low-VOC architectural coating, achieving a 10% reduction in VOC emissions, would be used for painting buildings during construction. This measure would not fully address the exceedance of emissions thresholds during construction.

AQ-MM#3: Reduce Fugitive Dust from Material Hauling. This mitigation measure would apply to the hauling of cut and fill material. Trucks would be covered to reduce significant fugitive dust emissions while hauling soil and other similar material.

AQ-MM#4: Reduce Criteria Exhaust Emissions from Construction Equipment. This mitigation measure would apply to heavy-duty construction equipment used during the construction phase. All off-road construction diesel equipment greater than 50 horsepower (hp) would have to meet at least Tier 4 California Emission Standards unless such engines are not available for a particular piece of equipment. In the event that Tier 4 engines are not available for any off-road engine larger than 50 hp that the engine shall have tailpipe retrofit controls that reduce exhaust emissions of NO_x and PM to Tier 4 emission levels. Tier 3 engines will be allowed on a case-by-case basis only when the contractor has documented that no Tier 4 equipment or emissions equivalent retrofit equipment is available for a particular equipment type. Documentation will be provided in such instances by the contractors and at least two construction equipment rental companies.

AQ-MM#5: Reduce Criteria Exhaust Emissions from On-Road Construction Equipment. This mitigation measure would apply to on-road trucks used to haul construction materials, including fill, ballast, rail ties, and steel. Material hauling trucks would consist of an average fleet mix of equipment model year 2010 or newer. This measure would not fully address the exceedance of emissions thresholds during construction. This measure may have a co-benefit of reducing GHG pollutant emissions.

AQ-MM#6: Reduce the Potential Impact of Toxics. This mitigation measure would apply to the layout of the HMF (Applies to Castle Commerce Center, Gordon-Shaw, and Kojima Development HMF sites). A minimum buffer distance of 1,300 feet from sensitive receptors would be provided for the diesel vehicle and idling of diesel vehicles would be limited at the facility, or a detailed health risk assessment that shows cancer risk is less than 10 in a million would be prepared when the site design is refined.

AQ-MM#7: Reduce the Potential Impact of Stationary Sources. This mitigation measure would apply to criteria pollutant sources at the HMF (Castle Commerce Center only). Large stationary equipment (combustion equipment, paint booths, wastewater treatment, etc.) would be implemented with best industry practices, or alternative equipment to the extent possible to reduce emissions of criteria pollutants.

AQ-MM#8: Reduce the Potential Impact of Concrete Batch Plants. This mitigation measure would apply to the location of concrete batch plants. Concrete batch plants would be at least 1,000 feet (300 meters) from sensitive receptors, such as schools and hospitals.

AQ-MM#9: Purchase Offsets for Emissions Associated with Hauling Ballast Material in Certain Air Districts. This mitigation measure would apply to scenarios where the ballast and sub-ballast material is hauled from quarries located outside the SJVAB. NO_x offsets would be purchased from the South Coast AQMD and the Mojave Desert AQMD if offsets are available.

3.3.6.1 CEQA and NEPA Level of Impact After Mitigation

<u>Construction Period</u>

NEPA Impacts: With implementation of mitigation measures defined above, VOC, CO, and NO_x impacts would be reduced but would remain substantial under NEPA because emissions would still exceed GC thresholds for all construction years. PM_{10} impacts would be reduced to moderate under NEPA, lowering emissions below the GC threshold with the application of mitigation measures and control measures for all years except 2013. SO_2 impacts would remain negligible and $PM_{2.5}$ impacts would be reduced to negligible under NEPA.

Material hauling outside the SJVAB would have substantial impacts in the South Coast Air Basin and the Mojave Air Basin. Mitigation measures AQ-MM#5 and AQ-MM#9 would be implemented to reduce NO_x impacts in these air basins to negligible under NEPA. Other pollutants in these air basins would have negligible impacts. Material hauling in other air basins for all pollutants would be negligible under NEPA.

CEQA Impacts: With implementation of mitigation measures defined above, construction of the HST alternatives would still exceed the SJVAPCD CEQA significance thresholds for VOC and NO_x for all construction years and exceed the PM_{10} and $PM_{2.5}$ for some of the construction years. Therefore, the project would violate an air quality standard and/or contribute substantially to an existing or projected air quality violation for VOC, NO_x, PM_{10}, and $PM_{2.5}$ and has the potential to result in a significant impact under CEQA. However, this impact would only last through the HST construction period, and the project would result in emission reduction of VOC, NO_x, $PM_{10,}$ and $PM_{2.5}$ throughout the project lifetime once operation starts.

There is no SO_2 threshold from SJVAPCD CEQA guidance. However, SO_2 impacts would be expected to be less than significant due to the ultra-low sulfur content of diesel fuel. Impacts on climate change would be less than significant.

Tables 3.3-29 through 3.3-31 list whether the mitigated construction emissions for the HST alternatives exceed either the SJVAPCD CEQA thresholds or the CG thresholds. A comparison for the year 2020 has not been included as no construction activities occur during that time.

Table 3.3-29
UPRR/SR 99 Alternative Mitigated Construction Emissions for Years 2013–2021[a] (tons/year)

Activities	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
SJVAPCD annual CEQA significance thresholds[b]	10	NA	10	NA	15	15
SJVAB annual GC thresholds[c]	10	100	10	100	100	100
Year 2013						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	Yes	No
Year 2014						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2015						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2016						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	No	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2017						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2018						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	No	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2019						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	No	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2021						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	No	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No

NA = not applicable

[a] The wye option with generally the higher emissions is presented for the alternative.

[b] The SJVAPCD has significance thresholds for NO_x, PM_{10}, $PM_{2.5}$ and ROG/VOC. The district currently does not have thresholds for CO. Section 3.1.8 summarizes the CEQA significance for these pollutants.

[c] The GC thresholds for criteria pollutants are based on the SJVAB federal attainment status. The SJVAB is considered in extreme nonattainment for the O_3 NAAQS, is a nonattainment area for $PM_{2.5}$, and is a maintenance area for the CO and PM_{10} NAAQS.

Table 3.3-30
BNSF Alternative Mitigated Construction Emissions for Years 2013–2021[a] (tons/year)

Activities	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
SJVAPCD annual CEQA significance thresholds[b]	10	NA	10	NA	15	15
SJVAB annual GC thresholds[c]	10	100	10	100	100	100
Year 2013						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	Yes	No
Year 2014						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2015						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2016						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	No	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2017						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2018						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	No	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2019						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	No	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2021						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	No	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No

NA = not applicable

[a] The wye option with generally the higher emissions is presented for the alternative.

[b] The SJVAPCD has significance thresholds for NO_x, PM_{10}, $PM_{2.5}$ and ROG/VOC. The district currently does not have thresholds for CO. Section 3.1.8 summarizes the CEQA significance for these pollutants.

[c] The GC thresholds for criteria pollutants are based on the SJVAB federal attainment status. The SJVAB is considered in extreme nonattainment for the O_3 NAAQS, is a nonattainment area for $PM_{2.5}$, and is a maintenance area for the CO and PM_{10} NAAQS.

Table 3.3-31
Hybrid Alternative Mitigated Construction Emissions for Years 2013–2021[a] (tons/year)

Activities	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
SJVAPCD annual CEQA significance thresholds[b]	10	NA	10	NA	15	15
SJVAB annual GC thresholds[c]	10	100	10	100	100	100
Year 2013						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	Yes
Exceeds GC threshold?	Yes	Yes	Yes	No	Yes	No
Year 2014						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2015						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2016						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	No	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2017						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	Yes	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2018						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	No	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2019						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	No	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No
Year 2021						
Exceeds SJVAPCD CEQA thresholds?	Yes	NA	Yes	NA	No	No
Exceeds GC threshold?	Yes	Yes	Yes	No	No	No

NA = not applicable

[a] The wye option with generally the higher emissions is presented for the alternative.

[b] The SJVAPCD has significance thresholds for NO_x, PM_{10}, $PM_{2.5}$ and ROG/VOC. The district currently does not have thresholds for CO. Section 3.1.8 summarizes the CEQA significance for these pollutants.

[c] The GC thresholds for criteria pollutants are based on the SJVAB federal attainment status. The SJVAB is considered in extreme nonattainment for the O_3 NAAQS, is a nonattainment area for $PM_{2.5}$, and is a maintenance area for the CO and PM_{10} NAAQS.

Material Hauling Outside SJVAB

Material hauling in multiple AQMDs and APCDs would have significant impacts for NO_x. Mitigation measures AQ-MM#5 and AQ-MM#9 would be implemented to reduce NO_x emissions in these regions (as described above in Section 3.3.6, Mitigation Measures). The CEQA impacts after reducing on-road truck exhaust and purchasing NO_x offset would make the material hauling emissions in certain AQMDs/APCDs less than significant.

The Bay Area AQMD and the East Kern APCD do not have offset programs for mobile sources, whereas the South Coast AQMD and the Mojave Desert AQMD currently have offset programs. Therefore, no feasible mitigation measure is available to reduce the NO_x impacts in the Bay Area AQMD and the East Kern APCD. NO_x impacts due to material hauling in Bay Area AQMD and the East Kern APCD would remain significant. In addition, the NOx emissions for all scenarios where material is hauled by truck only would be reduced to less than significant for all affected AQMDs/APCDs..

Project/Operational Phase

The HST alternatives would result in a net benefit on regional air quality because the HST project would result in lower MSATs, GHG, VOC, NO_x, CO, SO_2, PM_{10}, and $PM_{2.5}$ emissions than the No Project Alternative. Although PM_{10} would have a slight increase compared to existing conditions, the amount would be below the SJVAPCD CEQA threshold. The localized impacts resulting from changes in traffic patterns would be negligible as demonstrated by the results of the CO and PM hot-spot analyses. Therefore, the project would not have significant regional impacts under CEQA or substantial impacts under NEQA. Mitigation is not required for regional emissions from HST operation.

Sensitive receptors located near the Castle Commerce Center, Gordon-Shaw, and Kojima Development HMF sites may have the potential to be exposed to significant toxic emissions and cancer risks. The adverse localized health impact would be reduced to less than significant under CEQA and negligible under NEPA by implementing the mitigation measures.

Localized PM_{10} and $PM_{2.5}$ emissions from the HMF would be reduced by implementation of mitigation measures. Due to the current exceedances of $PM_{2.5}$ to the CAAQS and NAAQS, and exceedances of PM_{10} to CAAQS, the PM_{10} and $PM_{2.5}$ from the HMF would remain significant under CEQA. PM_{10} impacts from the HMF would remain substantial under NEPA.

3.3.7 NEPA Impacts Summary

3.3.7.1 Construction Period Impacts

Project construction would cause substantial impacts on air quality for VOC, CO, NO_x, PM_{10}, and $PM_{2.5}$ before mitigation. With implementation of mitigation measures defined in Section 3.3.6, impacts on air quality for VOC, NO_x, and CO emissions would be reduced but would still exceed GC thresholds for all construction years; therefore, VOC, NO_x, and CO impacts would remain substantial for all HST alternatives. Impacts on air quality for PM_{10} emissions would be reduced to moderate. $PM_{2.5}$ impacts would be reduced to negligible. Impacts on air quality for SO_2 emissions would remain negligible. Additionally, the impacts from construction emissions would only last through the HST construction period, and the project would result in emission reduction of VOC, CO, NO_x, SO_2, PM_{10}, and $PM_{2.5}$ throughout the project lifetime once operation starts.

For material hauling of ballast and sub-ballast outside the SJVAB, the emissions through various air basins would be less than the GC thresholds for all pollutants.

3.3.7.2 Project/Operational-Phase Impacts

The statewide and regional impact on air quality from operation of the HST would be beneficial. The HST alternatives would result in a net benefit to air quality because the HST project would result in lower MSATs, GHG, VOC, NO_x, SO_2, CO, PM_{10}, and $PM_{2.5}$ emissions than the No Project Alternative. Localized impacts resulting from changes in traffic patterns would be negligible as demonstrated by the CO and PM hot-spot analyses.

As a result of HMF operations near urbanized areas, impacts on sensitive receptors near the Castle Commerce Center, Gordon-Shaw, and Kojima Development HMF sites from localized increases in TAC emissions at and near the facility have the potential to be substantial. However, implementing the mitigation measures would reduce potential adverse localized health impact to negligible.

Localized PM_{10} and $PM_{2.5}$ emissions from the HMF would be reduced by implementation of mitigation measures. Due to the current exceedances of $PM_{2.5}$ to NAAQS, the $PM_{2.5}$ emissions from the HMF would remain substantial under NEPA.

3.3.8 CEQA Significance Conclusions

Table 3.3-32 presents the level of significance for the CEQA criteria thresholds prior to mitigation and after implementation of mitigation measures for the HST alternatives.

Table 3.3-32
Summary of Significant Air Quality and Global Climate Change Impacts and Mitigation Measures

Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Construction Period Impacts			
Regional Impacts **AQ#1:** Construction of the HST alternatives would exceed the CEQA emissions thresholds for VOC and NO_x. Therefore, it could potentially cause violations of NO_2 and O_3 air quality standards or contribute substantially to NO_2 and O_3 existing or projected air quality violations.	Significant for VOC and NO_x	**AQ-MM#2:** Reduce VOC Emissions from Paint; **AQ-MM#4:** Reduce Criteria Exhaust Emissions from Construction Equipment; **AQ-MM#5:** Reduce Criteria Exhaust Emissions from On-Road Construction Equipment.	Significant for VOC and NO_x
Regional Impacts **AQ#2:** Construction of the HST alternatives would exceed the CEQA emissions thresholds for PM_{10} and $PM_{2.5}$. Therefore, it could potentially cause violations of PM_{10} air quality standards or contribute substantially to existing or projected PM_{10} violations	Significant for PM_{10} and $PM_{2.5}$	**AQ-MM#1:** Reduce Fugitive Dust by Watering; **AQ-MM#3:** Reduce Fugitive Dust from Material Hauling; **AQ-MM#4:** Reduce Criteria Exhaust Emissions from Construction Equipment; **AQ-MM#5:** Reduce Criteria Exhaust Emissions from On-Road Construction Equipment.	Significant for PM_{10} Significant for $PM_{2.5}$ (only in 2013)

Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Regional Impacts **AQ#3:** Material hauling outside the SJVAB would exceed CEQA emission thresholds for NO_x in the BAAQMD, East Kern APCD, Mojave Desert AQMD, and the SCAQMD for certain hauling scenarios. Therefore, it could potentially cause violations of NO_2 and O_3 air quality standards or contribute substantially to NO_2 and O_3 existing or projected air quality violations in those air districts.	Significant for NO_x in the Bay Area AQMD, East Kern APCD, Mojave Desert AQMD and the South Coast AQMD	**AQ-MM#5:** Reduce Criteria Exhaust Emissions from On-Road Construction Equipment **AQ-MM#9:** Purchase offsets for emissions associated with hauling ballast material in Mojave Desert AQMD and SCAQMD.	Significant and unavoidable for NO_x in the East Kern APCD and BAAQMD. Less than significant for NO_x in the Mojave Desert AQMD and SCAQMD
Compliance with Air Quality Plans **AQ#4:** Construction of the HST alternatives would exceed the CEQA emissions thresholds for VOC and NO_x. Therefore, it would conflict with the 1-hour Ozone Attainment Plan and the 8-hour Ozone Attainment Plan.	Significant for O_3 precursors (VOC and NO_x)	**AQ-MM#2:** Reduce VOC Emissions from Paint; **AQ-MM#4:** Reduce Criteria Exhaust Emissions from Construction Equipment; **AQ-MM#5:** Reduce Criteria Exhaust Emissions from On-Road Construction Equipment.	Significant for VOC and NO_x
Compliance with Air Quality Plans **AQ#5:** Construction of the HST alternatives would exceed the CEQA emissions thresholds for PM_{10} and $PM_{2.5}$. Therefore, it would conflict with the PM_{10} Maintenance Plan and the $PM_{2.5}$ Attainment Plan.	Significant for PM_{10} and $PM_{2.5}$	**AQ-MM#1:** Reduce Fugitive Dust by Watering; **AQ-MM#3:** Reduce Fugitive Dust from Material Hauling; **AQ-MM#4:** Reduce Criteria Exhaust Emissions from Construction Equipment; **AQ-MM#5:** Reduce Criteria Exhaust Emissions from On-Road Construction Equipment.	Significant for PM_{10} and $PM_{2.5}$
Localized Impacts **AQ# 6**: Construction of the alignment may expose sensitive receptors to temporary substantial pollutant concentrations from concrete batch plants.	Significant	**AQ-MM#8:** Reduce the Potential Impact of Concrete Batch Plants.	Less than significant

Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Project Impacts			
Localized Impacts Local Impacts: Localized Hot-Spot Analysis of HMF **AQ#7:** Operation of the HMF (Castle Commerce Center, Gordon-Shaw, and Kojima Development HMF sites) may expose sensitive receptors to substantial TAC pollutant concentrations. Significant for TAC.	Significant	**AQ-MM#6:** Reduce the Potential Impact of Toxics; **AQ-MM#7:** Reduce the Potential Impact of Stationary Sources.	Less than significant
Localized Impacts Local Impacts: Localized Hot-Spot Analysis of HMF **AQ#8:** Operation of the HMF may cause the total PM_{10} and $PM_{2.5}$ ambient concentrations to exceed CAAQS due to the existing exceedances in the area. Significant for PM_{10} and $PM_{2.5}$.	Significant	**AQ-MM#7:** Reduce the Potential Impact of Stationary Sources.	Significant