# CALIFORNIA HIGH-SPEED TRAIN

**Project Environmental Impact Report / Environmental Impact Statement**


# DRAFT

# Air Quality Technical Report

## Merced to Fresno Section Project EIR/EIS

August 2011

CALIFORNIA High-Speed Rail Authority

U.S. Department of Transportation
Federal Railroad Administration

# DRAFT
# TECHNICAL REPORT

# Merced to Fresno Section
# Air Quality

*Prepared For:*

**California High Speed Rail Authority**

*and*

U.S. Department of Transportation
**Federal Railroad Administration**

*Prepared by:*

**AECOM**
**CH2M HILL**

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# Acronyms and Abbreviations

| | |
|---|---|
| µm | micrometer(s) |
| AB | Assembly Bill |
| AERMOD | American Meteorological Society/Environmental Protection Agency Regulatory Model |
| ATCM | airborne toxic control measure |
| AQMP | air quality management plan |
| BACT | best available control technology |
| BNSF | Burlington Northern Santa Fe |
| CAA | Clean Air Act |
| CAAQS | California Ambient Air Quality Standards |
| CAFE | Corporate Average Fuel Economy |
| Cal-EPA | California Environmental Protection Agency |
| Caltrans | California Department of Transportation |
| CARB | California Air Resources Board |
| CAS | Climate Adaptation Strategy |
| CCAA | California Clean Air Act |
| CCR | California Code of Regulations |
| CEQ | White House Council on Environmental Quality |
| CEQA | California Environmental Quality Act |
| CFCs | chlorofluorocarbons |
| CFR | Code of Federal Regulations |
| CO | carbon monoxide |
| $CO_2$ | carbon dioxide |
| $CO_2e$ | carbon dioxide equivalent |
| DE | diesel exhaust |
| DPM | diesel particulate matter |
| EAC | Early Action Compact |
| EIR | environmental impact report |
| EIS | environmental impact statement |
| endangerment finding | Final Endangerment and Cause or Contribute Findings for Greenhouse Gases |
| EO | Executive Order |

| | |
|---|---|
| EPA | U.S. Environmental Protection Agency |
| FHWA | Federal Highway Administration |
| FRA | Federal Railroad Administration |
| FTA | Federal Transit Administration |
| g/bhp-hr | grams per brake-horsepower hour |
| GC | General Conformity |
| GHG | greenhouse gas |
| GWP | Global Warming Potential |
| HC | hydrocarbon |
| HCFCs | hydrochlorofluorocarbons |
| HFC | hydrofluorocarbons |
| HFEs | hydrofluorinated ethers |
| hp | horsepower |
| HST | high-speed train |
| LOS | level of service |
| LST | Localized Significance Threshold |
| $\mu g/m^3$ | micrograms per cubic meter |
| MMT | million metric tons |
| mph | miles per hour |
| MPO | metropolitan planning organization |
| MSATs | Mobile source air toxics |
| $N_2O$ | nitrous oxide |
| NAAQS | National Ambient Air Quality Standards |
| NOA | naturally occurring asbestos |
| NO | nitric oxide |
| $NO_2$ | nitrogen dioxide |
| $NO_X$ | nitrogen oxides |
| $O_3$ | ozone |
| OEHHA | Office of Environmental Health Hazard Assessment |
| OPR | Office of Planning and Research |
| PAH | polycyclic aromatic hydrocarbon |
| Pb | lead |
| PFC | perfluorocarbon |

| | |
|---|---|
| PL | Public Law |
| PM | particulate matter |
| $PM_{2.5}$ | particulate matter smaller than or equal to 2.5 µm in diameter |
| $PM_{10}$ | particulate matter smaller than or equal to 10 µm in diameter |
| POM | Polycyclic Organic Matter |
| ppm | parts per million |
| RCEM | Roadway Construction Emission Model |
| ROG | reactive organic gas |
| RTIP | Regional Transportation Improvement Program |
| RTP | regional transportation plan |
| RTPA | regional transportation planning agency |
| SB | Senate Bill |
| SCAQMD | South Coast Air Quality Management District |
| SIP | State Implementation Plan |
| SJVAB | San Joaquin Valley Air Basin |
| SJVAPCD | San Joaquin Valley Air Pollution Control District |
| $SO_2$ | sulfur dioxide |
| $SO_X$ | sulfur oxide |
| TAC | toxic air contaminant |
| TIP | Transportation Improvement Program |
| TPA | transportation planning agency |
| tpy | tons per year |
| USC | United States Code |
| VMT | vehicle miles traveled |
| VOC | volatile organic compound |
| WWTF | wastewater treatment facility |

# 1.0 Introduction

The purpose of this report is to provide a detailed technical description of the analysis conducted for the Merced to Fresno Section of the proposed California High-Speed Train (HST) System. This technical report includes the following:

- A description of the project.
- A discussion of the regulatory framework that identifies the federal, state, and local agencies concerned with air quality and climate change; and the pertinent statutes and regulations.
- Identification of air pollutants of concern for this project, including criteria pollutants (i.e., pollutants for which National Ambient Air Quality Standards [NAAQS] have been established by the U.S. Environmental Protection Agency [EPA]), mobile source air toxics [MSATs], asbestos, and greenhouse gases (GHGs).
- A summary of the existing conditions, including regional climate and meteorology, air quality monitoring data, the area's attainment status with respect to criteria air pollutants, current regional air quality management and transportation improvement plans, the status of conformity with federal air quality regulations, and the most recent emission inventory information.
- A description of the analytical methodologies and assumptions used for this study and the results of these analyses, air quality impacts expected, and proposed mitigation measures.
- A discussion of the Merced to Fresno Section with respect to the EPA General Conformity (GR) Rule.

# 2.0 Project Description and Study Area

The purpose of the Merced to Fresno Section of the HST project is to implement the California HST System between Merced and Fresno, providing the public with electric-powered high-speed rail service that provides predictable and consistent travel times between major urban centers and connectivity to airports, mass transit systems, and the highway network in the south San Joaquin Valley, and to connect the northern and southern portions of the HST System. The approximately 65-mile-long corridor between Merced and Fresno is an essential part of the statewide HST System. The Merced to Fresno Section is the location where the HST would intersect and connect with the Bay Area and Sacramento branches of the HST System; it would provide a potential location for the heavy maintenance facility (HMF) where the HSTs would be assembled and maintained, as well as a test track for the trains; it would also provide Merced and Fresno access to a new transportation mode and would contribute to increased mobility throughout California.

## 2.1 No Project Alternative

The No Project Alternative refers to the projected growth planned for the region through the 2035 time horizon without the HST project and serves as a basis of comparison for environmental analysis of the HST build alternatives. The No Project Alternative includes planned improvements to the highway, aviation, conventional passenger rail, and freight rail systems in the Merced to Fresno project area. There are many environmental impacts that would result under the No Project Alternative.

## 2.2 High-Speed Train Alternatives

As shown in Figure 2-1, there are three HST alignment alternatives proposed for the Merced to Fresno Section of the HST System: the UPRR/SR 99 Alternative, which would primarily parallel the UPRR railway; the BNSF Alternative, which would parallel the BNSF railway for a portion of the distance between Merced and Fresno; and the Hybrid Alternative, which combines features of the UPRR/SR 99 and BNSF alternatives. In addition, there is an HST station proposed for both the City of Merced and the City of Fresno, there is a wye connection (see text box on page 2-3) west to the Bay Area, and there are five potential sites for a proposed HMF.

### 2.2.1 UPRR/SR 99 Alternative

This section describes the UPRR/SR 99 Alternative, including the Chowchilla design options, wyes, and HST stations.

#### 2.2.1.1 North-South Alignment

The north-south alignment of the UPRR/SR 99 Alternative would begin at the HST station in Downtown Merced, located on the west side of the UPRR right-of-way. South of the station and leaving Downtown Merced, the alternative would be at-grade and cross under SR 99. Approaching the City of Chowchilla, the UPRR/SR 99 Alternative has two design options: the East Chowchilla design option, which would pass Chowchilla on the east side of town, and the West Chowchilla design option, which would pass Chowchilla 3 to 4 miles west of the city before turning back to rejoin the UPRR/SR 99 transportation corridor. These design options would take the following routes:

- **East Chowchilla design option:** This design option would transition from the west side of the UPRR/SR 99 corridor to an elevated structure as it crosses the UPRR railway and N Chowchilla Boulevard just north of Avenue 27, continuing on an elevated structure away from the UPRR corridor along the west side of and parallel to SR 99 to cross Berenda Slough. Toward the south side of Chowchilla, this design option would cross over SR 99 north of the SR 99/SR 152 interchange near Avenue 23½ south of Chowchilla. Continuing south on the east side of SR 99 and the UPRR corridor, this design option would remain elevated for 7.1 miles through the communities of

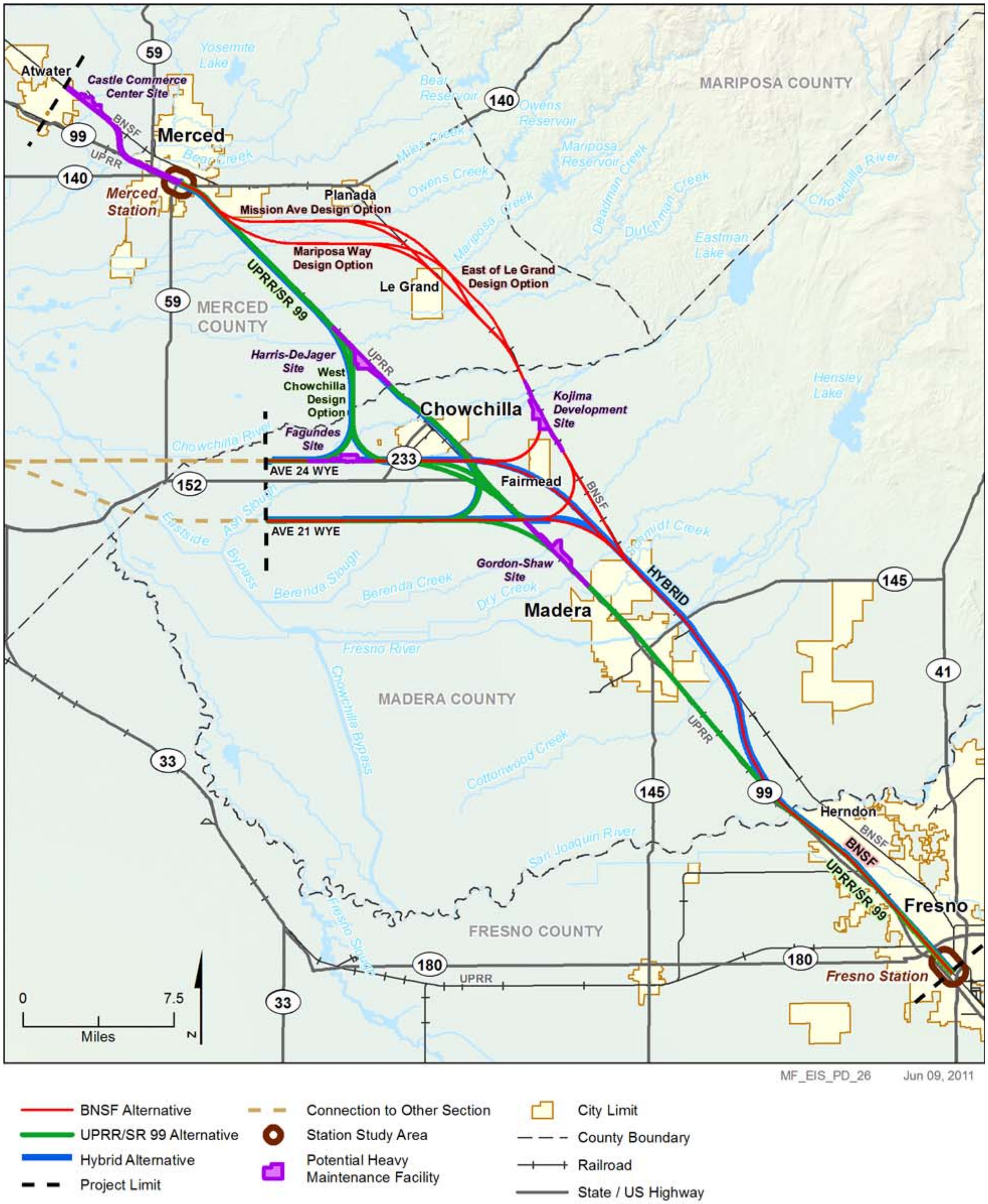



**Figure 2-1**
Merced to Fresno Section
HST Alternatives

- Fairmead and Berenda until reaching the Dry Creek Crossing. The East Chowchilla design option connects to the HST sections to the west via either the Ave 24 or Ave 21 wyes (described below).
- **West Chowchilla design option:** This design option would travel due south from Sandy Mush Road north of Chowchilla, following the west side of Road 11¾. The alignment would turn southeast toward the UPRR/SR 99 corridor south of Chowchilla. The West Chowchilla design option would cross over the UPRR and SR 99 east of the Fairmead city limits to again parallel the UPRR/SR 99 corridor. The West Chowchilla design option would result in a net decrease of approximately 13 miles of track for the HST System compared to the East Chowchilla design option and would remain outside the limits of the City of Chowchilla. The West Chowchilla design option connects to the HST sections to the west via the Ave 24 Wye, but not the Ave 21 Wye.

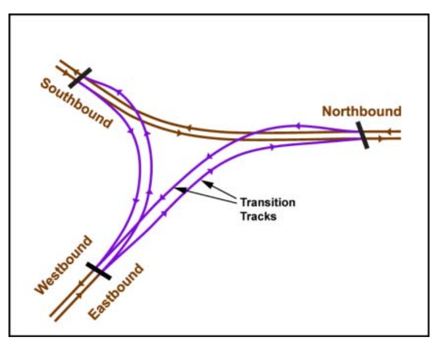
The UPRR/SR 99 Alternative would continue toward Madera along the east side of the UPRR south of Dry Creek and remain on an elevated profile for 8.9 miles through Madera. After crossing over Cottonwood Creek and Avenue 12, the HST alignment would transition to an at-grade profile and continue to be at-grade until north of the San Joaquin River. After the alternative crosses the San Joaquin River, it would rise over the UPRR railway on an elevated guideway, supported by straddle bents, before crossing over the existing Herndon Avenue and again descending into an at-grade profile and continuing west of and parallel to the UPRR right-of-way. After elevating to cross the UPRR railway on the southern bank of the San Joaquin River, south of Herndon Avenue, the alternative would transition from an elevated to an at-grade profile. Traveling south from Golden State Boulevard at-grade, the alternative would cross under the reconstructed Ashlan Avenue and Clinton Avenue overhead structures. Advancing south from Clinton Avenue between Clinton Avenue and Belmont Avenue, the HST guideway would run at-grade adjacent to the western boundary of the UPRR right-of-way and then enter the HST station in Downtown Fresno. The HST guideway would descend in a retained-cut to pass under the San Joaquin Valley Railroad spur line and SR 180, transition back to at-grade before Stanislaus Street, and continue to be at-grade into the station. As part of a station design option, Tulare Street would become either an overpass or undercrossing at the station.

#### 2.2.1.2 Wye Design Options

The following text describes the wye connection from the San Jose to Merced Section to the Merced to Fresno Section. There are two variations of the Ave 24 Wye for the UPRR/SR 99 Alternative because of the West Chowchilla design option. The Ave 21 Wye does not connect to the West Chowchilla design option and therefore does not have a variation.

**What is a "Wye"?**

The word "wye" refers to the "Y"-like formation that is created where train tracks branch off the mainline to continue in different directions. The transition to a wye requires splitting two tracks into four tracks that cross over one another before the wye "legs" can diverge in opposite directions to allow bidirectional travel. For the Merced to Fresno Section of the HST System, the two tracks traveling east-west from the San Jose to Merced Section must become four tracks—a set of two tracks branching to the north and a set of two tracks branching to the south.

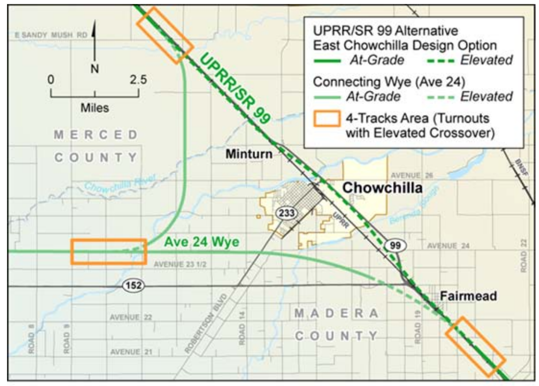



**<u>Ave 24 Wye</u>**

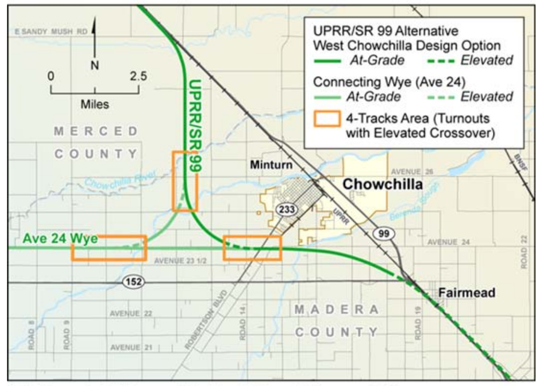
The Ave 24 Wye design option would travel along the south side of eastbound Avenue 24 toward the UPRR/SR 99 Alternative and would begin diverging onto two sets of tracks west of Road 11 and west of the City of Chowchilla. Under the East Chowchilla design option, the northbound set of tracks would travel northeast across Road 12, joining the UPRR/SR 99 north-south alignment on the west side of the UPRR right-of-way just north of Sandy Mush Road. Under the West Chowchilla design option, the northbound set of tracks would travel northeast across Road 12 and would join the UPRR/SR 99 north-south alignment just south of Avenue 26. The southbound HST guideway would continue east along Avenue 24, turning south near SR 233 southeast of Chowchilla, crossing SR 99 and the UPRR railway to connect to the UPRR/SR 99 Alternative north-south alignment on the east side of the UPRR near Avenue 21½. Under the West Chowchilla design option, the southbound tracks would turn south near Road

16 south of Chowchilla, crossing SR 99 and the UPRR to connect to the UPRR/SR 99 north-south alignment on the east side of the UPRR adjacent to the city limits of Fairmead.

Figure 2-2a shows the wye alignment for the East Chowchilla design option and Figure 2-2b shows the alignment for the West Chowchilla design option. Together, the figures illustrate the difference in the wye triangle formation for each design option connection. The north-south alignment of the West Chowchilla design option between Merced and Fresno diverges along Avenue 24 onto Road 12, on the north branch of the wye, allowing the HST alternative to avoid traveling through Chowchilla and to avoid constraining the city within the wye triangle.




**(a) Ave 24 Wye with the East Chowchilla Design Option**




**(b) Ave 24 Wye with the West Chowchilla Design Option**

**Figure 2-2a and b**
Ave 24 Wye and Chowchilla Design Options

**<u>Ave 21 Wye</u>**

The Ave 21 Wye would travel along the north side of Avenue 21. Just west of Road 16, the HST tracks would diverge north and south to connect to the UPRR/SR 99 Alternative, with the north leg of the wye joining the north-south alignment at Avenue 23½ and the south leg at Avenue 19½.

### 2.2.1.3 HST Stations

The Downtown Merced and Downtown Fresno station areas would each occupy several blocks, to include station plazas, drop-offs, a multimodal transit center, and parking structures. The areas would include the station platform and associated building and access structure, as well as lengths of platform tracks to accommodate local and express service at the stations. As currently proposed, both the Downtown Merced and Downtown Fresno stations would be at-grade, including all trackway and platforms, passenger services and concessions, and back-of-house functions.

**<u>Downtown Merced Station</u>**

The Downtown Merced Station would be between Martin Luther King Jr. Way to the northwest and G Street to the southeast. The station would be accessible from both sides of the UPRR, but the primary station house would front 16th Street. The major access points from SR 99 include V Street, R Street, Martin Luther King Jr. Way, and G Street. Primary access to the parking facility would be from West 15th Street and West 14th Street, just one block east of SR 99. The closest access to the parking facility from the SR 99 freeway would be R Street, which has a full interchange with the freeway. The site proposal includes a parking structure that would have the potential for up to 6 levels with a capacity of approximately 2,250 cars and an approximate height of 50 feet.

**<u>Downtown Fresno Station Alternatives</u>**

There are two station alternatives under consideration in Fresno: the Mariposa Street Station Alternative and the Kern Street Station Alternative.

#### *Mariposa Street Station Alternative*

The Mariposa Street Station Alternative is located in Downtown Fresno, less than 0.5 mile east of SR 99. The station would be centered on Mariposa Street and bordered by Fresno Street on the north, Tulare Street on the south, H Street on the east, and G Street on the west. The station building would be approximately 75,000 square feet, with a maximum height of approximately 60 feet. The two-level station would be at-grade, with passenger access provided both east and west of the HST guideway and the UPRR tracks, which would run parallel with one another adjacent to the station. Entrances would be located at both G and H Streets. The eastern entrance would be at the intersection of H Street and Mariposa Street, with platform access provided via the pedestrian overcrossing. The main western entrance would be located at G Street and Mariposa Street.

The majority of station facilities would be located east of the UPRR tracks. The station and associated facilities would occupy approximately 18.5 acres, including 13 acres dedicated to the station, bus transit center, surface parking lots, and kiss-and-ride accommodations. A new intermodal facility would be included in the station footprint on the parcel bordered by Fresno Street to the north, Mariposa Street to the south, Broadway Street to the east, and H Street to the west. The site proposal includes the potential for up to 3 parking structures occupying a total of 5.5 acres. Two of the three potential parking structures would each sit on 2 acres, and each would have a capacity of approximately 1,500 cars. The third parking structure would have a slightly smaller footprint (1.5 acres), with 5 levels and a capacity of approximately 1,100 cars. Surface parking lots would provide approximately 300 additional parking spaces.

#### *Kern Street Station Alternative*

The Kern Street Station Alternative for the HST station would also be in Downtown Fresno and would be centered on Kern Street between Tulare Street and Inyo Street. This station would include the same components and acreage as the Mariposa Street Station Alternative, but the station would not encroach on the historic Southern Pacific Railroad depot just north of Tulare Street and would not require relocation of existing Greyhound facilities. Two of the 3 potential parking structures would each sit on 2 acres and each would have a capacity of approximately 1,500 cars. The third structure would have a slightly smaller footprint (1.5 acres) and a capacity of approximately 1,100 cars. Like the Mariposa Street Station Alternative, the majority of station facilities under the Kern Street Station Alternative would be east of the HST tracks.

## 2.2.2 BNSF Alternative

This section describes the BNSF Alternative, including the Le Grand design options and wyes. It does not include a discussion of the HST stations, because the station descriptions are identical for each of the three HST alignment alternatives.

### 2.2.2.1 North-South Alignment

The north-south alignment of the BNSF Alternative would begin at the proposed Downtown Merced Station. This alternative would remain at-grade through Merced and would cross under SR 99 at the south end of the city. Just south of the interchange at SR 99 and E Childs Avenue, the BNSF Alternative would cross over SR 99 and UPRR as it begins to curve to the east, crossing over the E Mission Avenue interchange. It would then travel east to the vicinity of Le Grand, where it would turn south and travel adjacent to the BNSF tracks.

To minimize impacts on the natural environment and the community of Le Grand, the project design includes four design options:

- **Mission Ave design option:** This design option would turn east to travel along the north side of Mission Avenue at Le Grand and then would elevate through Le Grand adjacent to and along the west side of the BNSF corridor.

- **Mission Ave East of Le Grand design option:** This design option would vary from the Mission Ave design option by traveling approximately 1 mile farther east before turning southeast to cross Santa Fe Avenue and the BNSF tracks south of Mission Avenue. The HST alignment would parallel the BNSF for a half-mile to the east, avoiding the urban limits of Le Grand. This design option would cross Santa Fe Avenue and the BNSF railroad again approximately one-half mile north of Marguerite Road and would continue adjacent to the west side of the BNSF corridor.

- **Mariposa Way design option:** This design option would travel 1 mile farther than the Mission Ave design option before crossing SR 99 near Vassar Road and turning east toward Le Grand along the south side of Mariposa Way. East of Simonson Road, the HST alignment would turn to the southeast. Just prior to Savana Road in Le Grand, the HST alignment would transition from at-grade to elevated to pass through Le Grand on a 1.7-mile-long guideway adjacent to and along the west side of the BNSF corridor.

- **Mariposa Way East of Le Grand design option:** This design option would vary from the Mariposa Way design option by traveling approximately 1 mile farther east before turning southeast to cross Santa Fe Avenue and the BNSF tracks less than one-half mile south of Mariposa Way. The HST alignment would parallel the BNSF to the east of the railway for a half-mile, avoiding the urban limits of Le Grand. This design option would cross Santa Fe Avenue and the BNSF again approximately a half-mile north of Marguerite Road and would continue adjacent to the west side of the BNSF corridor.

Continuing southeast along the west side of BNSF, the BNSF Alternative would begin to curve just before Plainsburg Road through a predominantly rural and agricultural area. One mile south of Le Grand, the HST alignment would cross Deadman and Dutchman creeks. The alignment would deviate from the BNSF corridor just southeast of S White Rock Road, where it would remain at-grade for another 7 miles, except at the bridge crossings, and would continue on the west side of the BNSF corridor through the community of Sharon. The HST alignment would continue at-grade through the community of Kismet until crossing at Dry Creek. The BNSF Alternative would then continue at-grade through agricultural areas along the west side of the BNSF corridor through the community of Madera Acres north of the City of Madera. South of Avenue 15 east of Madera, the alignment would transition toward the UPRR corridor, following the east side of the UPRR corridor near Avenue 9 south of Madera, then continuing along nearly the same route as the UPRR/SR 99 Alternative over the San Joaquin River to enter the community of Herndon. After crossing the San Joaquin River, the alignment would be the same as for the UPRR/SR 99 Alternative

#### 2.2.2.2 Wye Design Options

The Ave 24 Wye and the Ave 21 Wye would be the same as described for the UPRR/SR 99 Alternative (East Chowchilla design option), except as noted below.

**Ave 24 Wye**

As with the UPRR/SR 99 Alternative, the Ave 24 Wye would follow along the south side of Avenue 24 and would begin diverging into two sets of tracks (i.e., four tracks) beginning west of Road 17. Two tracks would travel north near Road 20½, where they would join the north-south alignment of the BNSF Alternative on the west side of the BNSF corridor near Avenue 26½. The two southbound tracks would join the BNSF Alternative on the west side of the BNSF corridor south of Avenue 21.

**Ave 21 Wye**

As with the UPRR/SR 99 Alternative, the Ave 21 Wye would travel along the north side of Avenue 21. Two tracks would diverge, turning north and south to connect to the north-south alignment of the BNSF Alternative just west of Road 21. The north leg of the wye would join the north-south alignment just south of Avenue 24 and the south leg would join the north-south alignment just east of Frontage Road/Road 26 north of the community of Madera Acres.

## 2.2.3 Hybrid Alternative

This section describes the Hybrid Alternative, which generally follows the alignment of the UPRR/SR 99 Alternative in the north and the BNSF Alternative in the south. It does not include a discussion of the HST stations because the station descriptions are identical for each of the three HST alternatives.

### 2.2.3.1 North-South Alignment

From north to south, generally, the Hybrid Alternative would follow the UPRR/SR 99 alignment with either the West Chowchilla design option with the Ave 24 Wye or the East Chowchilla design option with the Ave 21 Wye. Approaching the Chowchilla city limits, the Hybrid Alternative would follow one of two options:

- In conjunction with the Ave 24 Wye, the HST alignment would veer due south from Sandy Mush Road along a curve and would continue at-grade for 4 miles parallel to and on the west side of Road 11¾. The Hybrid Alternative would then curve to a corridor on the south side of Avenue 24 and would travel parallel for the next 4.3 miles. Along this curve, the southbound HST track would become an elevated structure for approximately 9,000 feet to cross over the Ave 24 Wye connection tracks and Ash Slough, while the northbound HST track would remain at-grade. Continuing east on the south side of Avenue 24, the HST alignment would become identical to the Ave 24 Wye connection for the BNSF Alternative and would follow the alignment of the BNSF Alternative until Madera.
- In conjunction with the Ave 21 Wye connection, the HST alignment would transition from the west side of UPRR and SR 99 to an elevated structure as it crosses the UPRR and N Chowchilla Boulevard just north of Avenue 27, continuing on an elevated structure along the west side of and parallel to SR 99 away from the UPRR corridor while it crosses Berenda Slough. Toward the south side of Chowchilla, the alignment (with the Ave 21 Wye) would cross over SR 99 north of the SR 99/SR 152 interchange near Avenue 23½ south of Chowchilla. It would continue to follow along the east side of SR 99 until reaching Avenue 21, where it would curve east and run parallel to Avenue 21, briefly. The alignment would then follow a path similar to the Ave 21 Wye connection for the BNSF Alternative, but with a tighter 220 mph curve. The alternative would then follow the BNSF Alternative alignment until Madera.

Through Madera and until reaching the San Joaquin River, the Hybrid Alternative is the same as the BNSF Alternative. Once crossing the San Joaquin River, the alignment of the Hybrid Alternative becomes the same as for the UPRR/SR 99 Alternative.

### 2.2.3.2 Wye Design Options

The wye connections for the Hybrid Alternative follow Avenue 24 and Avenue 21, similar to those of the UPRR/SR 99 and BNSF alternatives.

#### Ave 24 Wye

The Ave 24 Wye is the same as the combination of the UPRR/SR 99 Alternative with the West Chowchilla design option, and the Ave 24 Wye for the BNSF Alternative.

#### Ave 21 Wye

The Ave 21 Wye is similar to the combination of the UPRR/SR 99 Alternative with the Ave 21 Wye on the northbound leg and the BNSF Alternative with the Ave 21 Wye on the southbound leg. However, the south leg under the Hybrid Alternative would follow a tighter, 220 mph curve than the BNSF Alternative, which follows a 250 mph curve.

### 2.2.4 Heavy Maintenance Facility Alternatives

The Authority is studying five HMF sites (see Figure 2-1) within the Merced to Fresno Section, one of which may be selected.

- **Castle Commerce Center HMF site** – A 370-acre site located 6 miles northwest of Merced, at the former Castle Air Force Base in northern unincorporated Merced County. It is adjacent to and on the east side of the BNSF mainline, 1.75 miles south of the UPRR mainline, off of Santa Fe Drive and Shuttle Road, 2.75 miles from the existing SR 99 interchange. The Castle Commerce Center HMF would be accessible by all HST alternatives.

- **Harris-DeJager HMF site** – A 401-acre site located north of Chowchilla adjacent to and on the west side of the UPRR corridor, along S Vista Road and near the SR 99 interchange under construction. The Harris-DeJager HMF would be accessible by the UPRR/SR 99 and Hybrid alternatives if coming from the Ave 21 Wye and the UPRR/SR 99 Alternative with the East Chowchilla design option and the Ave 24 Wye.

- **Fagundes HMF site** – A 231-acre site, located 3 miles southwest of Chowchilla on the north side of SR 152, between Road 11 and Road 12. This HMF would be accessible by all HST alternatives with the Ave 24 Wye.

- **Gordon-Shaw HMF site** – A 364-acre site adjacent to and on the east side of the UPRR corridor, extending from north of Berenda Boulevard to Avenue 19. The Gordon-Shaw HMF would be accessible from the UPRR/SR 99 Alternative.

- **Kojima Development HMF site** – A 392-acre site on the west side of the BNSF corridor east of Chowchilla, located along Santa Fe Drive and Robertson Boulevard (Avenue 26). The Kojima Development HMF would be accessible by the BNSF Alternative with the Ave 21 Wye.

## 2.3 Study Area

### 2.3.1 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 State Implementation Plan (SIP).

### 2.3.2 Regional

The regional study area for this analysis is the San Joaquin Valley Air Basin (SJVAB), in which the entire Merced to Fresno Section of the California HST System is located. Figure 2-3 shows the SJVAB, which includes all of Merced, Madera, and Fresno counties where this section of the HST Project is located.

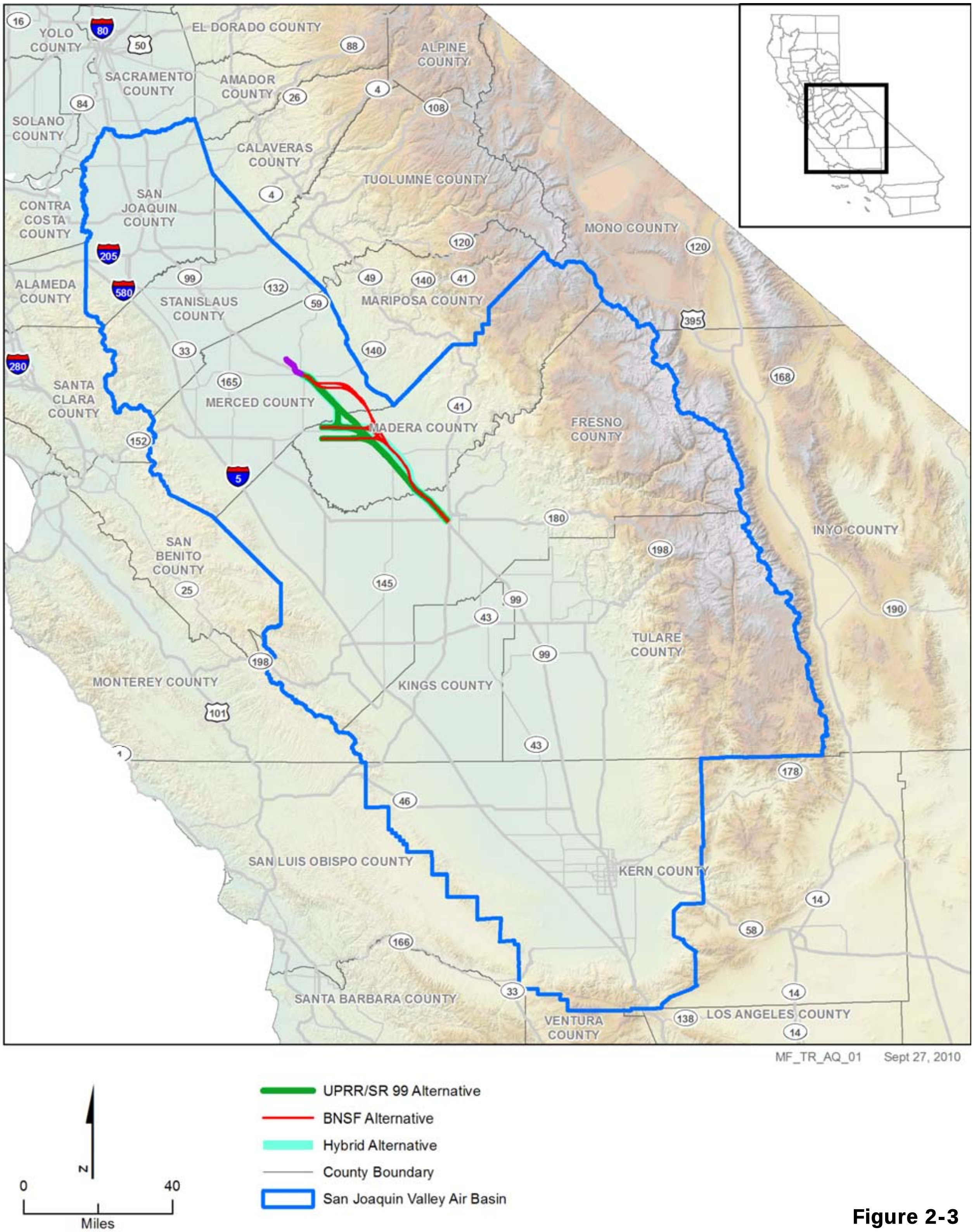



**Figure 2-3**
San Joaquin Valley Air Basin

The Merced to Fresno Section is approximately 65 miles long and would be serviced by one HST station in Merced and one in Fresno. The Merced to Fresno Section would pass through or near the cities of Merced, Chowchilla, Madera, and Fresno. Figure 2-1 shows the proposed route and HST station locations for this portion of the project. The Merced to Fresno Section of the HST alignment is shown in red in both figures.

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 to the east (8,000 to 14,000 feet in elevation), the Coast Range to the west (averaging 3,000 feet in elevation), and the Tehachapi Mountains to the south (6,000 to 8,000 feet in elevation). To the north, the San Joaquin Valley opens to the sea at Carquinez Strait, where the Sacramento–San Joaquin River Delta empties into San Francisco Bay.

### 2.3.3 Local Study Areas

Local study areas, in this context, are areas of potential major air emission activities along the HST alignment, including areas near 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 the HMF. Analyses performed by the California Air Resources Board (CARB) indicate that providing a separation of 1,000 feet from diesel sources and high traffic areas would substantially reduce diesel particulate matter (DPM) concentrations, public exposure, and asthma symptoms in children (CARB 2005). As a result, potential impacts to sensitive receptors within 1,000 feet of the project were evaluated, as well as the potential for local hot spots[1] associated with changes in concentrations of carbon monoxide (CO), particulate matter smaller than or equal to 2.5 micrometers (μm) in diameter ($PM_{2.5}$), and particulate matter smaller than or equal to 10 μm in diameter ($PM_{10}$) resulting from changes in traffic patterns for intersections operating at Level of Service (LOS) D or worse.

[1] 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).

# 3.0 Regulatory Framework

*Air pollution* is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. Air pollutants degrade the atmosphere by reducing visibility, damaging property, combining to form smog, reducing the productivity or vigor of crops or natural vegetation, and reducing human or animal health. *Air quality* describes the amount of air pollution to which the public is exposed.

Air quality in the United States is governed by the federal Clean Air Act (CAA), which is administered by EPA. Air quality in California is also governed by the California Clean Air Act (CCAA), which is administered by CARB.

The CCAA, as amended in 1992, delegates local enforcement of air quality regulations to air districts in the state, and requires them to endeavor to achieve and maintain state ambient air quality standards.

## 3.1 Regulatory Agencies

### 3.1.1 Federal

#### 3.1.1.1 U.S. Environmental Protection Agency

EPA is responsible for establishing the NAAQS, enforcing the CAA, and regulating transportation-related emission sources (e.g., aircraft, ships, and certain types of locomotives) under the exclusive authority of the federal government. EPA also has jurisdiction over emission sources outside of state waters (e.g., beyond the outer continental shelf) and establishes various emission standards, including standards for vehicles sold in states other than California. Automobiles sold in California must meet stricter emission standards established by CARB. For additional information about EPA, the reader can contact EPA's general internet address found at www.epa.gov. Additional information on the activities of EPA Region 9 (Pacific Southwest), which includes California, can be found at www.epa.gov/region9.

### 3.1.2 State

#### 3.1.2.1 California Environmental Protection Agency

The California Environmental Protection Agency (Cal-EPA) is a state agency that includes CARB, the State Water Resources Control Board (SWRCB), nine Regional Water Quality Control Boards (RWQCB), the Integrated Waste Management Board (IWMB), the Department of Toxic Substances Control (DTSC), the Office of Environmental Health Hazard Assessment (OEHHA), and the Department of Pesticide Regulation (DPR). The mission of Cal-EPA is to restore, protect, and enhance the environment and to ensure public health, environmental quality, and economic vitality. The internet address for Cal-EPA is www.calepa.ca.gov.

#### 3.1.2.2 California Air Resources Board

CARB is responsible for implementing the CCAA, meeting state requirements of the CAA, establishing California Ambient Air Quality Standards (CAAQS), and regulating mobile sources of air pollution. CARB is also responsible for setting emission standards for vehicles sold in California and for other emission sources, such as consumer products and certain off-road equipment. In addition, CARB establishes passenger vehicle fuel specifications and identifies toxic air contaminants (Health and Safety Code, Section 39650 et seq.).

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 stationary emission sources at the regional and county levels. The internet address for CARB is www.arb.ca.gov.

### 3.1.3 Local

#### 3.1.3.1 San Joaquin Air Quality Management District

The San Joaquin Valley Air Pollution Control District (SJVAPCD) is responsible for (1) implementing air quality regulations, including developing plans and control measures for stationary sources of air pollution to meet the NAAQS and CAAQS, (2) implementing permit programs for the construction, modification, and operation of sources of air pollution, and (3) enforcing air pollution statutes and regulations governing stationary sources. With CARB oversight, the SJVAPCD administers local regulations.

The SJVAPCD also coordinates transportation and air quality planning activities with the eight San Joaquin Valley transportation planning agencies. The SJVAPCD and the transportation planning agencies coordinate on mobile emissions inventory development, transportation control measure development and implementation, and transportation conformity issues.

#### 3.1.3.2 Association of Governments

There are 25 local planning agencies within California. The local planning agencies in the Merced to Fresno Section include the Merced County Association of Governments (MCAG), the Madera County Transportation Commission (MCTC), and the Council of Fresno County Governments (COG). MCAG comprises representatives from Merced County and the cities of Atwater, Dos Palos, Gustine, Livingston, Los Banos, and Merced. As a regional transportation planning agency (RTPA) and metropolitan planning organization (MPO), MCAG is the primary transportation facilitator in Merced County (MCAG 2010). Members of the COG include Fresno County and the cities of Clovis, Mendota, Coalinga, Orange Cove, Firebaugh, Parlier, Fowler, Reedley, Fresno, San Joaquin, Huron, Sanger, Kerman, Selma, and Kingsburg (COG 2010). The MCTC is the RTPA and the designated MPO for Madera County, which includes the City of Madera (MCTC 2010).

Each planning agency is the joint power of authority of member agencies and is responsible for establishing the long-range priorities for the regional transportation system through the development of the 20-year regional transportation plan (RTP) and transportation improvement program, as required by state law. These plans identify improvements across the entire system, including the road and highway network, bus and rail transit systems, freight transportation, the environment, and advanced technologies. The current plans of the responsible planning agencies in the Merced to Fresno Section are discussed in the following sections.

## 3.2 Applicable Regulations

### 3.2.1 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 that the action will occur in a nonattainment or maintenance area; one or more specific exemptions do not apply to the action; the action is not included in the federal agency's "presumed to conform" list; the emissions from the proposed action are not within the approved emissions budget for an applicable facility; 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 required to conform to the applicable SIP 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.

### 3.2.2 National and State Ambient Air Quality Standards

As required by the CAA, EPA has established NAAQS for six major air pollutants known as *criteria pollutants*. The criteria pollutants are: $O_3$, PM (i.e., $PM_{10}$ and $PM_{2.5}$), CO, $NO_2$, sulfur dioxide ($SO_2$), and lead (Pb). The CAAQS are generally more stringent than the corresponding federal standards and incorporate additional standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles.

State and federal standards are summarized in Table 3-1. The primary standards are intended to protect public health. The secondary standards are intended to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the general welfare.

**Table 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 …

For more information please call ARB-PIO at (916) 322-2990

California Air Resources Board (09/08/10)

**Table 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.

**For more information please call ARB-PIO at (916) 322-2990** **California Air Resources Board (09/08/10)**

Source: CARB (20010a).

### 3.2.3 Mobile Source Air Toxics

In addition to the NAAQS criteria pollutants, EPA regulates MSATs. In February 2007, EPA finalized a rule (Control of Hazardous Air Pollutants from Mobile Sources) to reduce hazardous air pollutant (HAP) emissions 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 of 2008. This revision added additional specific benzene control technologies that the previous rule did not include.

By 2010, EPA's existing programs will reduce MSATs by more than 1 million tons from 1999 levels (EPA 2011). In addition to controlling pollutants, such as hydrocarbons, PM, and nitrogen oxides ($NO_x$), recent EPA regulations controlling emissions from highway vehicles and nonroad equipment will result in large reductions in toxic emissions to the air. Furthermore, EPA has programs under development that would provide additional benefits (further controls) for small nonroad gasoline engines, diesel locomotives, and marine engines. A variety of EPA programs reduce risk in communities. These programs include Clean School Bus USA, the Voluntary Diesel Retrofit Program, Best Workplaces for Commuters, and the National Clean Diesel Campaign.

CARB has adopted regulations to reduce emissions from both on-road and off-road heavy duty diesel vehicles (e.g., equipment used in construction). These regulations, known as Airborne Toxic Control Measures, reduce the idling of school buses and other commercial vehicles, control DPM, and limit the emissions of ocean-going vessels in California waters (CARB 2009b). The regulations also include various measures to control emissions of air toxics from stationary sources. The California Toxics Inventory (CTI), developed by speciating CARB estimates of total organic gas (TOG) and PM, provides emissions estimates by stationary, area-wide, on-road mobile, off-road mobile, and natural sources (CARB 2011a).

No federal or California ambient standards exist for MSATs. Specifically, EPA has not established NAAQS or provided standards for hazardous air pollutants.

### 3.2.4 Federal Greenhouse Gas Regulations

Climate change and GHG emission reductions are a concern at the federal level. Laws and regulations, as well as plans and policies, address global climate change issues. This section summarizes key federal regulations relevant to the project.

In Massachusetts v. U.S. Environmental Protection Agency, et al., 549 U.S. 497 (2007), the United States Supreme Court ruled that GHG does fit within the CAA definition of a pollutant and that EPA has authority to regulate GHG.

On September 22, 2009, EPA published the final rule that requires mandatory reporting of GHG emissions from large sources in the United States. The rule amends CAA Regulations under 40 CFR Parts 86, 87, 89, 90, and 94 and provides a new section, Part 98. EPA uses the reports to collect accurate and comprehensive emissions data that can inform future policy decisions. Facilities that emit 25,000 metric tons or more per year of GHG emissions submit annual reports to EPA under Subpart C of the final rule. GHGs 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 (HFEs). This is not a transportation-related regulation. This will affect electrical generation sources that contribute to the California electrical grid, and it may affect the SIP and does not directly apply to the HST System.

On October 5, 2009, President Obama signed Executive Order (EO) 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*. EO 13514 requires federal agencies to set a 2020 GHG emission 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 (endangerment finding), under Section 202(a) of the CAA, went into effect. 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, which threatens public health and welfare (EPA 2010a).

Under the endangerment finding. EPA is developing vehicle emission standards under the CAA. EPA and the Department of Transportation, National Highway Traffic Safety Administration, have issued a joint proposal to establish a national program that includes new standards that will reduce GHG emissions and improve fuel economy for light-duty vehicles in model years 2012 through 2016. This proposal marks the first GHG standards proposed by EPA under the CAA as a result of the endangerment finding (EPA 2009a).

On February 18, 2010, the White House Council on Environmental Quality (CEQ) released draft guidance regarding 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; rather, it poses the question to the public (CEQ 2010).

## 3.2.5 California Environmental Quality Act

CEQA [Section 21000 et seq.] and CEQA Guidelines [Section 15000 et seq.] require state and local agencies to identify the significant environmental impacts of their actions, including potential significant air quality and climate change impacts, and to avoid or mitigate those impacts, when feasible. The CEQA amendments of December 30, 2009, specifically require lead agencies to address GHG emissions in determining the significance of environmental impacts caused by a project and to consider feasible means to mitigate the significant impacts of GHG emissions.

## 3.2.6 California Greenhouse Gas Regulations

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

### 3.2.6.1 Assembly Bill 1493

With the passage of Assembly Bill (AB) 1493 in 2002, California launched an innovative and proactive approach for 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 emission standards apply to automobiles and light trucks beginning with the 2009 model year. Although litigation was filed challenging these regulations and EPA initially denied California's related request for a waiver, a waiver has since been granted (CARB 2009c).

### 3.2.6.2 Executive Order S-3-05

On June 1, 2005, Governor Schwarzenegger signed EO S-3-05. The goal of EO S-3-05 is to reduce California's GHG emissions to (1) year 2000 levels by 2010, (2) 1990 levels by 2020, and (3) 80% below the 1990 levels by 2050. EO S-3-05 also calls for Cal-EPA to prepare biennial science reports regarding the potential impact of continued global warming on certain sectors of the state economy. As a result of the thorough scientific analysis collected in these biennial reports, the comprehensive Climate Adaptation Strategy (CAS) was released in December 2009 after extensive interagency coordination and stakeholder input. The latest of these reports, *Climate Action Team Biennial Report*, was published in December 2010 (Cal-EPA 2010).

#### 3.2.6.3 Assembly Bill 32

The goal of EO S-3-05 is further reinforced by AB 32, the Global Warming Solutions Act of 2006. AB 32 sets overall GHG emission reduction goals and mandates that CARB create a plan that includes market mechanisms and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases." EO S-20-06 further directs state agencies to begin implementing AB 32, including the recommendations made by the state's Climate Action Team (CARB 2009d).

The following are specific requirements of AB 32:

- CARB shall 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 an outline for future actions to reduce GHG emissions in California by implementing regulations, market mechanisms, and other measures. The scoping plan includes the implementation of an HST system 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 that will 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 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.

#### 3.2.6.4 Executive Order S-01-07

With EO S-01-07, Governor Schwarzenegger set forth the low carbon fuel standard for California. Under this EO, the carbon intensity of California's transportation fuels is to be reduced by at least 10% by 2020 (Office of the Governor 2007).

#### 3.2.6.5 California Environmental Quality Act

California Environmental Quality Act (CEQA) Section 21000 et seq. and the CEQA Guidelines [Section 15000 et seq.] require that state and local agencies identify the significant environmental impacts of their actions, including potential significant air quality and climate change impacts, and to avoid or mitigate those impacts, when feasible. The CEQA amendments of December 30, 2009, specifically require lead agencies to address GHG emissions in determining the significance of environmental effects caused by a project, and to consider feasible means to mitigate the significant effects of GHG emissions (California Natural Resources Agency 2010).

Provisions of the CEQA amendments include the following (Office of Planning and Research 2009):

- A lead agency may consider the following when assessing the significance of impacts from GHG emissions:
  - The extent to which the project may increase or reduce GHG emissions as compared to the existing environmental setting.

   - Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project.
   - The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions.
- When an agency makes a statement of overriding considerations, the agency may consider adverse environmental effects in the context of regionwide or statewide environmental benefits.
- Lead agencies shall consider feasible means of mitigating GHG emissions that may include, but not be limited to the following:
   - Measures in an existing plan or mitigation program for the reduction of emissions that are required as part of the lead agency's decision.
   - Reductions in emissions resulting from a project through implementation of project features, project design, or other measures.
   - Offsite measures, including offsets.
   - Measures that sequester GHGs.
   - In the case of the adoption of a plan (e.g., general plan, long-range development plan, or GHG reduction plan), mitigation may include specific measures that may be implemented on a project-by-project basis. Mitigation may also incorporate specific measures or policies in an adopted ordinance or regulation that reduces the cumulative effect of emissions.

#### 3.2.6.6 Senate Bill 375

SB 375, signed into law by Governor Schwarzenegger 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 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 MPOs. The MPOs have been tasked with creating Sustainable Community Strategies (SCS). The MPOs are required to develop the SCS through integrated land use and transportation planning and to 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 the CEQA.

Per 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, to include any relevant issues such as data needs, modeling techniques, growth forecasts, jobs-housing balance, interregional travel, various land use/transportation issues impacting GHG emissions, and overall issues relating to setting these targets. CARB proposed draft targets on June 30, 2010, and was required to adopt final targets by September 30, 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.

#### 3.2.6.7 Governor's Executive Order S-13-08

On November 14, 2008, the Governor signed an EO to address the risk of sea level rise resulting from global climate change. It requires that all state agencies that are planning construction projects in the areas vulnerable to sea level rise consider a range of sea level rise scenarios to assess project vulnerability and, to the extent feasible, reduce expected risks and increase resiliency to sea level rise.

### 3.2.7 California 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 (NESHAP) regulations for asbestos.

### 3.2.8 Local Air Quality Management District Regulations

SJVAPCD has specific air quality-related planning documents, rules, and regulations. This section summarizes the local planning documents and regulations that may be applicable to the project as administered by SJVAPCD with CARB oversight. There are also local city and county policies that pertain to air quality and climate change. The policies of the general plans focus on managing sources of air pollutants through mixed-use and transit- and pedestrian-friendly neighborhoods. Additional details regarding the applicable rules can be found at the SJVAPCD web site: http://www.valleyair.org/rules/1ruleslist.htm.

#### 3.2.8.1 SJVAPCD Rule 2201, New and Modified Stationary Source Review

Rule 2201 applies to new or modified stationary sources and requires that sources not increase emissions above the specified thresholds. If the post-project stationary source potential to emit equals or exceeds the offset threshold levels, offsets will be required (SJVAPCD 2008a). Stationary sources at the station (such as natural gas heaters) would need to be permitted by the SJVAPCD and would have to comply with best available control technology (BACT) requirements. Many stationary sources would be associated with heavy maintenance facility (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 BACT requirements.

#### 3.2.8.2 SJVAPCD Rule 2280, Portable Equipment Registration

Portable equipment used at project sites for less than 6 consecutive months must be registered with SJVAPCD. The district will issue the registrations 30 days after the receipt of the application (SJVAPCD 1996).

#### 3.2.8.3 SJVAPCD Rule 2303, Mobile Source Emission Reduction Credits

The project may qualify for SJVAPCD vehicle emission reduction credits if it meets the specific requirements of Rule 2303 for any of the following categories (SJVAPCD 1994):

- Low-Emission Transit Buses.
- Zero-Emission Vehicles.
- Retrofit Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles.
- Retrofit Heavy-Duty Vehicles.

#### 3.2.8.4 SJVAPCD Rule 4201 and Rule 4202, Particulate Matter Concentration and Emission Rates

Rule 4201 and Rule 4202 apply to operations that emit or may emit dust, fumes, or total suspended particulate matter. Particulate emissions from the project must be less than the specified emissions limit (SJVAPCD 1992a; 1992b).

#### 3.2.8.5 SJVAPCD Rule 4301, Fuel Burning Equipment

Rule 4301 limits the emissions from fuel-burning equipment whose primary purpose is to produce heat or power by indirect heat transfer. The project shall comply with the emission limits (SJVAPCD 1992c).

#### 3.2.8.6 SJVAPCD Rule 8011, General Requirements – Fugitive Dust Emission Sources

Fugitive dust regulations are applicable to outdoor fugitive dust sources. Operations, including construction operations, must control fugitive dust emissions in accordance with SJVAPCD Regulation VIII (SJVAPCD 2004a). According to Rule 8011, the SJVAPCD requires implementing 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.

#### 3.2.8.7 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 project will be subject to ISR and will 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 will pay the required offsite mitigation fees (SJVAPCD, 2005).

#### 3.2.8.8 SJVAPCD CEQA Guidelines

The SJVAPCD prepared the GAMAQI to assist lead agencies and project applicants in evaluating the potential air quality impacts of projects in the SJVAB. The GAMAQI provides SJVAPCD-recommended procedures for evaluating potential air quality impacts during the CEQA environmental review process. The GAMAQI provides guidance on evaluating short-term (construction) and long-term (operational) air emissions. The GAMAQI is currently being updated, but the most recent version (2002) was used in this evaluation and contains guidance on the following:

- Criteria and thresholds for determining whether a project may have a significant adverse air quality impact.
- Specific procedures and modeling protocols for quantifying and analyzing air quality impacts.
- Methods to mitigate air quality impacts.
- Information for use in air quality assessments and environmental documents that will be updated more frequently, such as air quality data, regulatory setting, climate, and topography.

# 4.0 Pollutants of Concern

## 4.1 Criteria Pollutants

Pollutants that have established national standards are referred to as “criteria pollutants.” For these pollutants, federal and state ambient air quality standards have been established to protect public health and welfare. The sources of these pollutants, their effects on human health and the nation's welfare, and their final deposition in the atmosphere vary considerably. A brief description of each pollutant is provided in the following sections.

### 4.1.1 Ozone

$O_3$ is a colorless toxic gas. As shown in Figure 4-1, $O_3$ is found in the Earth’s upper and lower atmosphere. In the upper atmosphere, $O_3$ is a naturally occurring gas that 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 certain hydrocarbons (HCs), referred to as VOCs, and $NO_x$, which are emitted from industrial sources and from automobiles. HCs are compounds composed primarily of atoms of hydrogen and carbon. TOGs and reactive organic gases (ROGs) are the two classes of HCs that are inventoried by CARB. ROGs have relatively high photochemical reactivity. The principal nonreactive HC is $CH_4$, which is also a GHG (refer to Section 4.3.). The major source of ROGs is the incomplete combustion of fossil fuel in internal combustion engines. Other sources of ROGs include the evaporative emissions associated with paint and solvents, the application of asphalt paving, and household consumer products. Adverse effects on human health are not caused directly by ROGs but rather by reactions of ROGs to form secondary pollutants. ROGs are also transformed into organic aerosols in the atmosphere, contributing to higher levels of fine PM and lower visibility. The term ROG is used by CARB for air quality analysis and is defined the same as the federal term “VOC.” In this report, ROG is assumed to be equivalent to VOC.


**Figure 4-1**
Ozone in the Atmosphere

Substantial $O_3$ formations generally require a stable atmosphere with strong sunlight; therefore, 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. The effects of changes in VOC and $NO_x$ emissions for the proposed project are examined on a regional and statewide level.

### 4.1.2 Particulate Matter

PM pollution is composed of solid particles or liquid droplets that are 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. However, PM pollution can include substances that are highly toxic. Of particular concern are those particles that are smaller than, or equal to, 10 micrometers (µm) ($PM_{10}$) or 2.5 µm ($PM_{2.5}$).

As noted above, $PM_{10}$ refers to particulate matter less than or equal to 10 µm in diameter, about 1/7th the thickness of a human hair (refer to Figure 4-2). PM pollution consists of very small liquid and solid particles floating in the air and can include smoke, soot, dust, salt, acid, and metals. PM can form when gases emitted from motor vehicles undergo chemical reactions in the atmosphere.

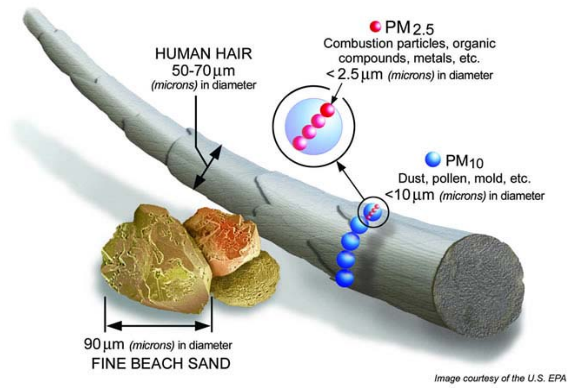



**Figure 4-2**
Relative Particulate Matter Size

Major sources of $PM_{10}$ include motor vehicles; wood-burning stoves and fireplaces; dust from construction, landfills, and agriculture; wildfires and brush/waste burning; industrial sources; windblown dust from open land; and atmospheric chemical and photochemical reactions. These suspended particulates produce haze and reduce visibility.

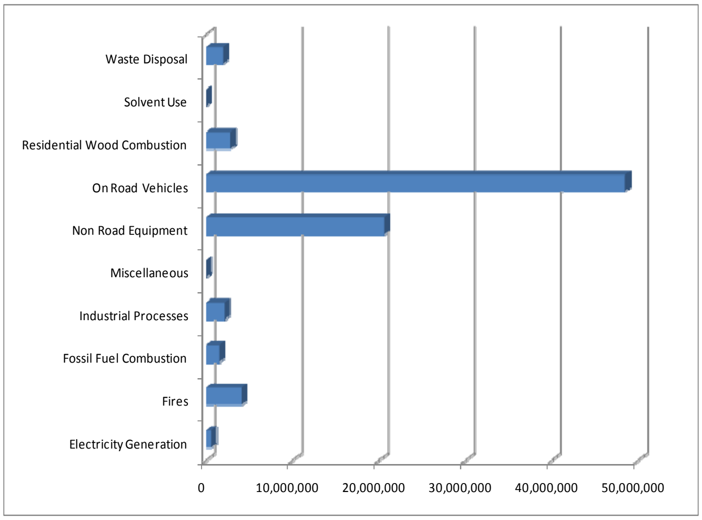
Data collected during nationwide studies indicate that most $PM_{10}$ comes from the following sources:

- Fugitive dust.
- Wind erosion.
- Agricultural and forestry sources.

A small portion of PM is the product of fuel combustion processes. However, the combustion of fossil fuels accounts for a significant portion of $PM_{2.5}$ pollution. The main health effect of airborne PM is on the respiratory system. $PM_{2.5}$ refers to particulates that are 2.5 µm or less in diameter, approximately 1/28th the diameter of a human hair. $PM_{2.5}$ results from fuel combustion (from motor vehicles, power generation, and industrial facilities), residential fireplaces, and wood stoves. In addition, $PM_{2.5}$ can be formed in the atmosphere from gases such as $SO_2$, $NO_x$, and VOCs. Like $PM_{10}$, $PM_{2.5}$ can penetrate the human respiratory system's natural defenses and damage the respiratory tract when inhaled. Whereas particles 2.5 to 10 µm in diameter tend to collect in the upper portion of the respiratory system, particles 2.5 µm or less can penetrate deeper into the lungs and damage lung tissue. The effects of $PM_{10}$ and $PM_{2.5}$ emissions for the project are examined on a localized (i.e., microscale) basis, on a regional basis, and on a statewide basis.

### 4.1.3 Carbon Monoxide

CO is a colorless gas that interferes with the transfer of oxygen to the brain. CO is emitted almost exclusively from the incomplete combustion of fossil fuels. As shown in Figure 4-3, on-road motor vehicle exhaust is the primary source of CO. In cities, 85% to 95% of all CO emissions may come from motor vehicle exhaust. Prolonged exposure to high levels of CO can cause headaches, drowsiness, loss of equilibrium, and heart disease. CO levels are generally highest in the colder months of the year when inversion conditions (i.e., 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 are typically found near congested intersections, along heavily




Source: EPA

**Figure 4-3**
Sources of CO

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.

### 4.1.4 Nitrogen Dioxide

$NO_2$ 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 gases 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 (NO) and atmospheric oxygen. $NO_x$ are major contributors to $O_3$ formation. $NO_2$ also contributes to the formation of $PM_{10}$. At atmospheric concentrations, $NO_2$ is only potentially irritating. At 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 (long-term) pulmonary fibrosis. An increase in bronchitis in children 2 to 3 years old has also been observed at concentrations below 0.3 parts per million (ppm).

### 4.1.5 Lead

Pb is a stable element that persists and accumulates in the environment and in animals. Its principal effects in humans are on the blood-forming, nervous, and renal systems. Lead levels from mobile sources in the urban environment have decreased significantly because of the federally mandated switch to lead-free gasoline, and they are expected to continually decrease. An analysis of the impacts of the lead emissions from transportation projects is, therefore, not warranted and is not conducted for this analysis.

### 4.1.6 Sulfur Dioxide

$SO_2$ is a product of high-sulfur fuel combustion. The main sources of $SO_2$ are coal and oil used in power stations, industry, and domestic heating. Industrial chemical manufacturing is another source of $SO_2$. $SO_2$ is an irritant gas that attacks the throat and lungs. It can cause acute respiratory symptoms and diminished ventilator function in children. $SO_2$ can also cause plant leaves to turn yellow and corrode iron and steel. Although heavy-duty diesel vehicles emit $SO_2$, transportation sources are not considered by EPA (or other regulatory agencies) to be significant sources of this pollutant. Therefore, an analysis of the impacts of $SO_2$ emissions from transportation projects is not warranted. However, an analysis of the impacts of $SO_2$ emissions was conducted for this project.

## 4.2 Toxic and Non-Criteria Pollutants

A toxic air contaminant (TAC) is defined by California law as an air pollutant that "may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health." EPA uses the term *hazardous air pollutant* (HAP) 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 HAPs. TACs can be emitted from stationary and mobile sources.

### 4.2.1 Asbestos

Asbestos deposits from brake wear may be present on surfaces and in the ambient air along the HST alignments. In addition, asbestos-containing materials may have been used in constructing buildings that would be demolished. Chronic inhalation exposure to asbestos in humans can lead to a lung disease called asbestosis, which is a diffuse fibrous scarring of the lungs. Symptoms of asbestosis include shortness of breath, difficulty in breathing, and coughing. Asbestosis is a progressive disease (i.e., the severity of symptoms tends to increase with time, even after the exposure has stopped). In severe cases, this disease can lead to death due to impairment of respiratory function. A large number of occupational studies have reported that exposure to asbestos by inhalation can cause lung cancer and mesothelioma, which is a rare cancer of the membranes lining the abdominal cavity and surrounding internal organs. EPA considers asbestos to be a human carcinogen (i.e., cancer-causing agent).

### 4.2.2 Air Toxics

Stationary sources of TACs from HST operations will 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 will not emit TACs, MSATs will be associated with the project, chiefly through motor vehicle traffic to and from the HST stations.

EPA has assessed the expansive list of air toxics in its latest rule on the Control of Hazardous Air Pollutants from Mobile Sources and identified a group of 93 compounds emitted from mobile sources that are listed in their 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 National Scale Air Toxics Assessment (EPA 2006b). These are acrolein, benzene, 1,3-butadiene, DPM plus diesel exhaust organic gases, formaldehyde, naphthalene, and polycyclic organic matter (POM). This list, however, is subject to change and may be adjusted in consideration of future EPA rules. Following is a brief description of these MSATs.

**Acrolein** is a water-white or yellow liquid that burns easily, is readily volatilized, and has a disagreeable odor. It is present as a product of incomplete combustion in the exhausts of stationary equipment (e.g., boilers and heaters) and mobile sources. It is also a secondary pollutant formed through the photochemical reaction of VOCs and $NO_x$ in the atmosphere. Acrolein is considered to have high acute toxicity, and it causes upper respiratory tract irritation and congestion in humans. The major effects from chronic (long-term) inhalation exposure to acrolein in humans consist of general respiratory congestion and eye, nose, and throat irritation. No information is available on the reproductive, developmental, or carcinogenic effects of acrolein in humans. EPA considers acrolein data to be inadequate for an assessment of human carcinogenic potential.

**Benzene** is a volatile, colorless, highly flammable liquid with a sweet odor. Most of the benzene in ambient air is from incomplete combustion of fossil fuels and evaporation from gasoline service stations. Acute inhalation exposure to benzene causes neurological symptoms, such as drowsiness, dizziness, headaches, and unconsciousness in humans. Chronic inhalation of certain levels of benzene causes disorders in the blood in humans. Benzene specifically affects bone marrow (the tissues that produce blood cells). Aplastic anemia, excessive bleeding, and damage to the immune system (by changes in blood levels of antibodies and loss of white blood cells) may develop. Available human data on the developmental effects of benzene are inconclusive because of concomitant exposure to other chemicals, inadequate sample size, and lack of quantitative exposure data. EPA has classified benzene as a known human carcinogen by inhalation.

**1,3-Butadiene** is a colorless gas with a mild gasoline-like odor. Sources of 1,3-butadiene released into the air include motor vehicle exhaust, manufacturing and processing facilities, forest fires or other combustion, and cigarette smoke. Acute exposure to 1,3-butadiene by inhalation in humans results in irritation of the eyes, nasal passages, throat, and lungs. Neurological effects, such as blurred vision, fatigue, headache, and vertigo, have also been reported at very high exposure levels. One epidemiological study reported that chronic exposure to 1,3-butadiene by inhalation resulted in an increase in cardiovascular diseases, such as rheumatic and arteriosclerotic heart diseases. Other human studies have reported effects on blood. No information is available on reproductive or developmental effects of 1,3-butadiene in humans. EPA has classified 1,3-butadiene as a probable human carcinogen by inhalation.

**DPM/Diesel Exhaust Organic Gases** are complex mixtures of hundreds of constituents in either a gaseous or particle form. Gaseous components of diesel exhaust (DE) include $CO_2$, oxygen, nitrogen, water vapor, CO, nitrogen compounds, sulfur compounds, and numerous low-molecular-weight HCs. Among the gaseous HC components of DE that are individually known to be of toxicological relevance are several carbonyls (e.g., formaldehyde, acetaldehyde, and acrolein), benzene, 1,3-butadiene, and polycyclic aromatic hydrocarbons (PAHs) and nitro-PAHs. DPM is composed of a center core of elemental carbon and adsorbed organic compounds as well as small amounts of sulfate, nitrate, metals, and other trace elements. DPM consists primarily of $PM_{2.5}$, including a subgroup with a large number of particles having a diameter less than 0.1 µm. Collectively, these particles have a large surface area, which makes them an excellent medium for adsorbing organic compounds. Also, their small size makes them highly respirable and able to reach the deep lung. Several potentially toxicologically relevant organic compounds including PAHs, nitro-PAHs, and oxidized PAH derivatives are on the particles. DE is emitted from on-road mobile sources, such as automobiles and trucks, and from off-road mobile sources (e.g., diesel locomotives, marine vessels, and construction equipment). DPM is directly emitted from diesel-powered engines (primary PM) and can be formed from the gaseous compounds emitted by diesel engines (secondary PM).

Acute or short-term (e.g., episodic) exposure to DE can cause acute irritation (e.g., eye, throat, and bronchial), neurophysiological symptoms (e.g., lightheadedness and nausea), and respiratory symptoms (e.g., cough and phlegm). Evidence also exists for an exacerbation of allergenic responses to known allergens and asthma-like symptoms. Information from the available human studies is inadequate for a definitive evaluation of possible noncancer health effects from chronic exposure to DE. However, on the basis of extensive animal evidence, DE is judged to pose a chronic respiratory hazard to humans. EPA has determined that DE is “likely to be carcinogenic to humans by inhalation” and that this hazard applies to environmental exposures.

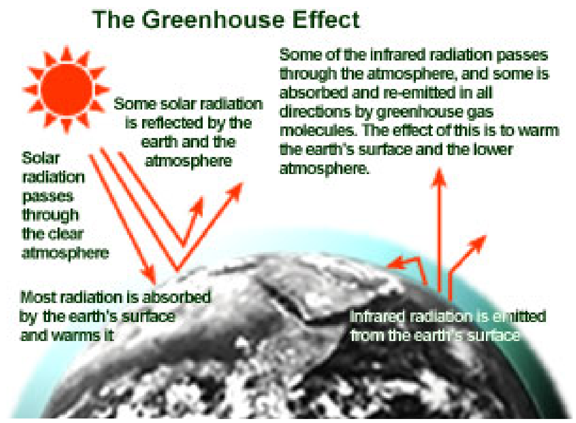
**Formaldehyde** is a colorless gas with a pungent, suffocating odor at room temperature. The major emission sources of formaldehyde appear to be power plants, manufacturing facilities, incinerators, and automobile exhaust. However, most of the formaldehyde in ambient air is a result of secondary formation through photochemical reaction of VOCs and $NO_x$. The major toxic effects caused by acute formaldehyde exposure by inhalation are eye, nose, and throat irritation, and effects on the nasal cavity. Other effects from exposure to high levels of formaldehyde in humans are coughing, wheezing, chest pains, and bronchitis. Chronic exposure to formaldehyde by inhalation in humans has been associated with respiratory symptoms and eye, nose, and throat irritation. EPA considers formaldehyde to be a probable human carcinogen.

**Naphthalene** is used in the production of phthalic anhydride; it is also used in mothballs. Acute (short-term) exposure of humans to naphthalene by inhalation, ingestion, and dermal contact is associated with hemolytic anemia, damage to the liver, and neurological damage. Cataracts have also been reported in workers acutely exposed to naphthalene by inhalation and ingestion. Chronic (long-term) exposure of workers and rodents to naphthalene reportedly causes cataracts and damage to the retina. Hemolytic anemia has been reported in infants born to mothers who sniffed and ingested naphthalene (as mothballs) during pregnancy. Available data are inadequate to establish a causal relationship between exposure to naphthalene and cancer in humans. EPA has classified naphthalene as a Group C, possible human carcinogen.

**Polycyclic Organic Matter** (POM) defines a broad class of compounds that includes PAHs, of which benzo[a]pyrene is a member. POM compounds are formed primarily by combustion and are present in the atmosphere in particulate form. Sources of air emissions are diverse and include cigarette smoke, vehicle exhaust, home heating, laying tar, and grilling meat. Cancer is the major concern from exposure to POM. Epidemiologic studies have reported an increase in lung cancer in humans exposed to coke oven emissions, roofing tar emissions, and cigarette smoke; all of these mixtures contain POM compounds. Animal studies have reported respiratory tract tumors from inhalation exposure to benzo[a]pyrene and forestomach tumors, leukemia, and lung tumors from oral exposure to benzo[a]pyrene. EPA has classified seven PAHs (benzo[a]pyrene, benz[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) as Group B2, probable human carcinogens.

## 4.3 Greenhouse Gases

Gases that trap heat in the atmosphere, which are often referred to as GHGs, are necessary to life because they keep the planet's surface warmer than it otherwise would be. This is referred to as the Greenhouse Effect (refer to Figure 4-4). As concentrations of GHGs increase, however, the Earth's temperature increases. According to National Oceanic and Atmospheric Administration (NOAA) and National Aeronautics and Space Administration (NASA) data, the Earth's average surface temperature has increased by 1.2ºF to 1.4ºF in 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 very 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.




Source: EPA

**Figure 4-4**
The Greenhouse Effect

Some GHGs, such as $CO_2$, occur naturally and are emitted to the atmosphere through 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 $CH_4$. To compare emissions of different GHGs, inventory compilers use a weighting factor called 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 $CO_2e$ but can also be expressed in terms of carbon equivalent; therefore, the GWP of $CO_2$ is 1. The GWP of $CH_4$ is 21, whereas the GWP of $N_2O$ is 310.

The principal GHGs that enter the atmosphere because of human activities are described below.

- $CO_2$ – Carbon dioxide enters the atmosphere via the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and also as a result of other chemical reactions (e.g., manufacture of cement). $CO_2$ is also removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle.
- $CH_4$ – Methane is emitted during the production and transport of coal, natural gas, and oil. $CH_4$ emissions also result from livestock and other agricultural practices and from the decay of organic waste in municipal solid waste landfills.
- $N_2O$ – Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.
- Fluorinated Gases – HFCs, PFCs, and $SF_6$ are synthetic, powerful GHGs that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances (e.g., chlorofluorocarbons [CFCs], hydrochlorofluorocarbons [HCFCs], and halons). These gases are typically emitted in smaller quantities, but because they are potent GHGs, they are sometimes referred to as High GWP gases.

Due to the global nature of GHG emissions and the nature of the electrical grid, GHGs are examined on a statewide level and regional level.

# 5.0 Existing Conditions

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. The principal TACs of concern for the proposed project are seven MSATs: acrolein; benzene; 1,3-butadiene; DPM/diesel exhaust organic gases; formaldehyde; naphthalene; and POM. The presence of GHGs limits the transmission of radiated heat from the Earth's surface to the atmosphere.

## 5.1 Meteorology and Climate

Air quality is affected by both the rate and location of pollutant emissions, and by meteorological conditions that influence movement and dispersal of pollutants in the atmosphere. 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.

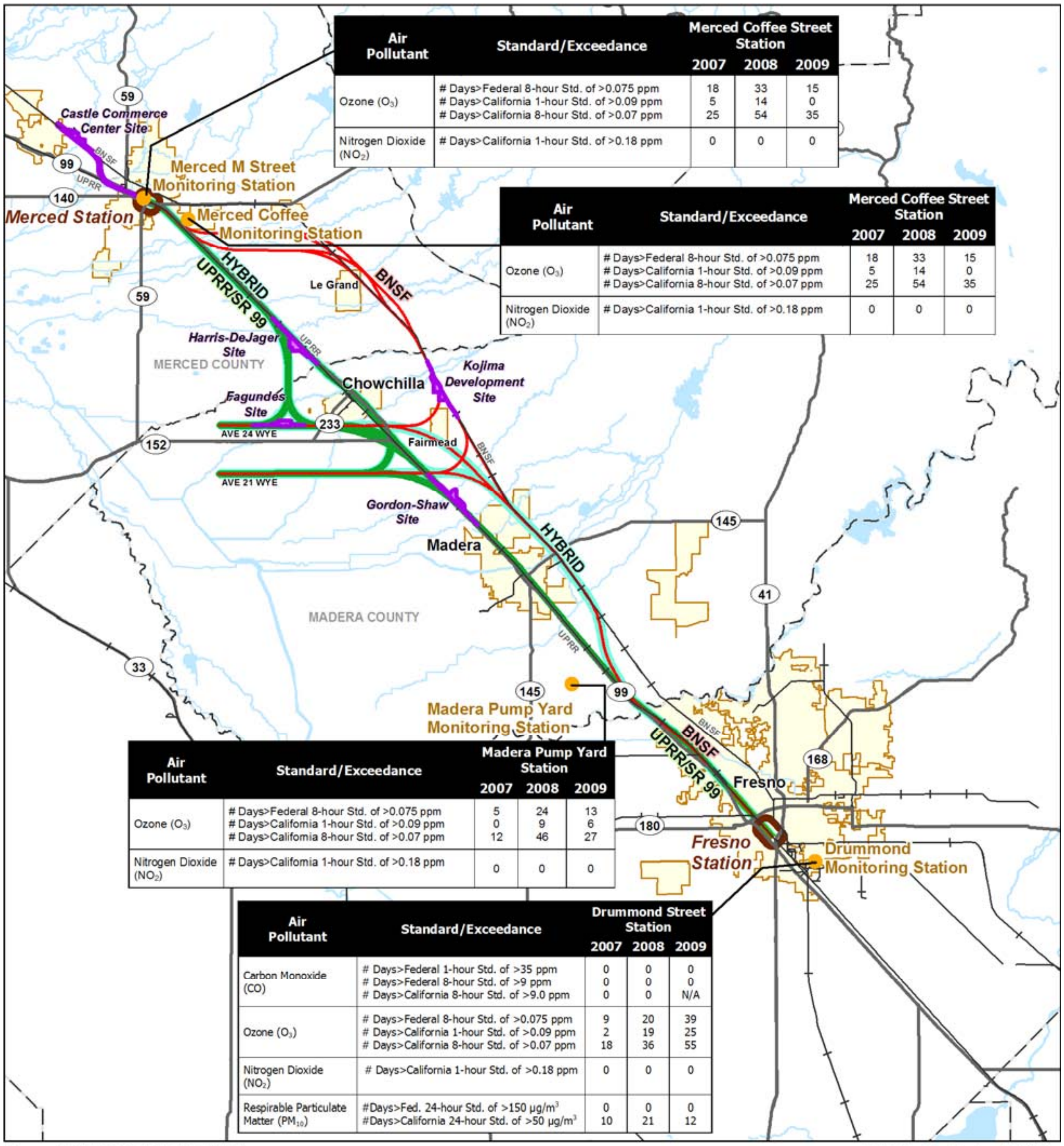
Elevation and topography can affect localized air quality. The project is located in the SJVAB, which encompasses the southern two-thirds of California's Central Valley. The SJVAB is approximately 250 miles long and is shaped like a narrow bowl. The sides and southern boundary of the bowl are bordered by mountain ranges. The valley's weather conditions include frequent temperature inversions; long, hot summers; and stagnant, foggy winters, all of which are conducive to the formation and retention of air pollutants (SJVAPCD 2009a).

The SJVAB is typically arid in the summer months 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 months is in the mid-90s and the average low 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).

## 5.2 Ambient Air Quality in the Study Area

CARB maintains ambient air monitoring stations for criteria pollutants throughout California. The stations closest to the HST alignment alternatives are the Merced Coffee, Madera Pump Yard, Fresno-Drummond, and Merced M Street monitoring stations. These stations monitor $NO_2$, $O_3$, $PM_{10}$, CO, and $PM_{2.5}$ but do not monitor $SO_2$. The land uses in the region range from urban and residential to rural and agricultural and these stations represent these land use types. Air quality standards, primarily for $O_3$ and PM, have been exceeded in the SJVAB because of existing industrial and agricultural sources. Monitoring station locations are shown in Figure 5-1. Table 5-1 summarizes the results of ambient monitoring at the three stations from 2007 through 2009. A brief summary of the monitoring data includes the following:

- Monitored data from 2007 through 2009 do not exceed either the state or federal standards for CO or $NO_2$.
- $O_3$ values for the region exceed the state and the national 8-hour $O_3$ standards for all $O_3$ stations for years 2007 through 2009. $O_3$ values for the region also exceed the state 1-hour $O_3$ standard for all stations for every year in the past 3 years (EPA 2009b).
- The $PM_{10}$ monitor is located in Fresno. The annual and the 24-hour state standards were exceeded multiple times for years 2007 through 2009. There were no exceedances of the federal 24-hour standard.




| Air Pollutant | Standard/Exceedance | Merced Coffee Street Station 2007 | 2008 | 2009 |
|---|---|---|---|---|
| Ozone ($O_3$) | # Days>Federal 8-hour Std. of >0.075 ppm<br># Days>California 1-hour Std. of >0.09 ppm<br># Days>California 8-hour Std. of >0.07 ppm | 18<br>5<br>25 | 33<br>14<br>54 | 15<br>0<br>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<br># Days>California 1-hour Std. of >0.09 ppm<br># Days>California 8-hour Std. of >0.07 ppm | 18<br>5<br>25 | 33<br>14<br>54 | 15<br>0<br>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<br># Days>California 1-hour Std. of >0.09 ppm<br># Days>California 8-hour Std. of >0.07 ppm | 5<br>0<br>12 | 24<br>9<br>46 | 13<br>6<br>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<br># Days>Federal 8-hour Std. of >9 ppm<br># Days>California 8-hour Std. of >9.0 ppm | 0<br>0<br>0 | 0<br>0<br>0 | 0<br>0<br>N/A |
| Ozone ($O_3$) | # Days>Federal 8-hour Std. of >0.075 ppm<br># Days>California 1-hour Std. of >0.09 ppm<br># Days>California 8-hour Std. of >0.07 ppm | 9<br>2<br>18 | 20<br>19<br>36 | 39<br>25<br>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<br>#Days>California 24-hour Std. of >50 µg/m³ | 0<br>10 | 0<br>21 | 0<br>12 |

Source: CARB (2010); U.S. EPA (2010).

MF_TR_AQ_02 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 5-1**
Air Quality Monitoring Stations Closest to the Project

**Table 5-1**
Ambient Criteria Pollutant Concentration Data 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 | 2008 | 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 |
| 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 |

| 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 | 2008 | 2009 |
| Respirable Particulate Matter ($PM_{10}$) | Year coverage | NM | NM | NM | NM | NM | NM | 97 | 100 | 100 | 95 | 92 | 94 |
| | Max. 24-hour concentration (µg/m$^3$) | 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/m$^3$ | NM | NM | NM | NM | NM | NM | 0 | 0 | 0 | 0 | 0 | 0 |
| | #Days>California 24-hour std. of >50 µg/m$^3$ | NM | NM | NM | NM | NM | NM | 10 | 21 | 12 | 6 | 14 | 5 |
| | Annual average (µg/m$^3$) | 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/m$^3$) | NM | NM | NM | NM | NM | NM | NM | NM | NM | 81.6 | 54.0 | 53.3 |
| | State annual average (µg/m$^3$) | NM | NM | NM | NM | NM | NM | NM | NM | NM | 15.2 | N/A | 13.6 |
| | #Days>fed. 24-hour std. of >35 µg/m$^3$ | NM | NM | NM | NM | NM | NM | NM | NM | NM | 17 | 9 | 8 |
| | Annual average (µg/m$^3$) | NM | NM | NM | NM | NM | NM | NM | NM | NM | 15.2 | N/A | 13.5 |

[a]Coverage is for an 8-hour standard.
µg/m$^3$ = micrograms per cubic meter
NM = not monitored
N/A = not available
> = greater than
Sources: CARB (2010b); EPA (2010b).

## 5.3 Attainment Status of the Study Area

EPA and CARB designate each county (or portions of counties) within California as attainment, maintenance, or nonattainment based on the area's ability to meet ambient air quality standards. Regions are designated as attainment for a criteria pollutant when the concentration of that pollutant is below the ambient air standard. If a criteria pollutant concentration is above the ambient air standard, the area is in nonattainment for that pollutant. Areas previously designated as nonattainment that subsequently demonstrated compliance with the ambient air quality standards are designated as maintenance areas. Table 5-2 summarizes the federal (under NAAQS) and state (under CAAQS) attainment status for the project vicinity.

**Table 5-2**
Federal and State Attainment Status for SJVAB

| Pollutant | Federal Classification | State Classification |
|---|---|---|
| $O_3$ | Nonattainment | Nonattainment |
| $PM_{10}$ | Maintenance | Nonattainment |
| $PM_{2.5}$ | Nonattainment | Nonattainment |
| CO | Urban portion of Fresno County: Maintenance<br>Remaining Basin: Attainment | Attainment |
| $NO_2$ | Attainment | Attainment |
| $SO_2$ | Attainment | Attainment |
| Sources: CARB (2010e), EPA (2010e). | | |

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 µg/m$^3$ and 24-hour standard of 65 µg/m$^3$), and the 2006 24-hour $PM_{2.5}$ standard (35 µg/m$^3$). The SJVAB is a maintenance area for $PM_{10}$, and the Fresno urbanized area is designated a maintenance area for CO. The SJVAB is in attainment for the $NO_2$ and $SO_2$ NAAQS. The SJVAB is unclassified for the Pb NAAQS.

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 $SO_2$, $NO_2$, and Pb standards. The SJVAB is an unclassified area for the state hydrogen sulfide standard and the visibility-reducing particle standard, and is classified as an attainment area for sulfates and vinyl chloride.

## 5.4 Air Quality Plans

### 5.4.1 State Implementation Plan

Planning documents for pollutants for which the study area is classified as a federal nonattainment or maintenance area are developed by SJVAPCD and CARB and approved by EPA. The SJVAB is presently guided by the California SIP (CARB 2011b) and other planning documents. The following lists the relevant SIP documents for the SJVAB:

- 2007 8-Hour Ozone Plan (SJVAPCD 2007a).
- 2004 1-Hour Ozone Plan (SJVAPCD 2004b).
- 2008 $PM_{2.5}$ Plan (SJVAPCD 2008b).
- 2004 Carbon Monoxide SIP (CARB 2004).
- 2007 PM10 Maintenance Plan (SJVAPCD 2007b).

#### 5.4.1.1 2007 Ozone Attainment Plan

On May 5, 2010, EPA reclassified the 8-hour $O_3$ nonattainment of the San Joaquin Valley from "serious" to "extreme." The reclassification requires the State of California to incorporate more stringent requirements, such as lower permitting thresholds and implementing reasonably available control technologies at more sources (EPA 2010b).

The 2007 8-hour Ozone Air Quality Plan contained a comprehensive list of regulatory and incentive-based measures to reduce emissions of $O_3$ and PM precursors throughout the San Joaquin Valley. On December 18, 2007, the SJVAPCD Governing Board adopted the plan with an amendment to extend the rule adoption schedule for organic waste operations. On January 8, 2009, 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 (SJVAPCD 2007).

#### 5.4.1.2 2004 Extreme Ozone attainment Plan

Although EPA subsequently revoked the 1-hour $O_3$ standard effective on June 15, 2005, the requirement for SJVAPCD to submit a plan for that standard remains in effect for the San Joaquin Valley (EPA 2008). On March 8, 2010, EPA approved San Joaquin Valley's 2004 Extreme Ozone Attainment Plan for 1-hour $O_3$. However, effective June 15, 2005, EPA revoked the federal 1-hour $O_3$ standard for certain areas, including the SJVAB (SJVAPCD 2004b).

#### 5.4.1.3 2008 $PM_{2.5}$ Plan

The SJVAPCD Governing Board adopted the 2008 $PM_{2.5}$ Attainment Plan following a public hearing on April 30, 2008. On May 22, 2008, CARB adopted the plan and subsequently submitted the plan to EPA as a revision to California's SIP (CARB 2008a). This far-reaching plan provides measures designed to reduce emissions such that the valley will attain all the $PM_{2.5}$ standards, the 1997 federal standards, the 2006 federal standards, and the state standard, as soon as possible. EPA designated the SJVAB nonattainment under the new $PM_{2.5}$ national standard on October 8, 2009, and SIPs for the 2006 $PM_{2.5}$ standards will be due to EPA within 3 years of final designation (SJVAPCD, 2008b).

#### 5.4.1.4 2004 Revision to california State Implementation Plan for Carbon Monoxide

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; revises emission estimates; and establishes new on-road motor vehicle emission budgets for transportation conformity purposes (CARB 2004). On November 30, 2005, EPA approved and promulgated the Implementation Plans and Designation of Areas for Air Quality Purposes (EPA 2005a). This revision provides a 10-year update to the CO maintenance plan and establishes new CO motor-vehicle emissions budgets for the purposes of determining transportation conformity. The on-road motor-vehicle CO emissions budget in the approved CO SIP for the project region is included in Table 5-3.

#### 5.4.1.5 2007 $PM_{10}$ maintenance Plan and Request for redesignations

CARB approved SJVAPCD's 2007 $PM_{10}$ Maintenance Plan and Request for Redesignation with modifications to the transportation conformity budgets. On September 25, 2008, EPA redesignated the San Joaquin Valley as in attainment for the $PM_{10}$ NAAQS and approved the $PM_{10}$ Maintenance Plan (SJVAPCD 2007b).

**Table 5-3**
On-Road Motor-Vehicle CO Emissions Budget

| CO Maintenance Area | Area Included in Inventory | 2010 CO Winter Seasonal Emissions (tons per day) | 2018 CO Winter Seasonal Emissions (tons per day) |
|---|---|---|---|
| Bakersfield | Western Kern County | 180 | 180 |
| Fresno | Fresno County | 240 | 240 |
| Modesto | Stanislaus County | 130 | 130 |
| Stockton | San Joaquin County | 170 | 170 |
| Source: EPA (2009c). | | | |

### 5.4.2 Transportation Plans and Programs

Regional Transportation Planning Agencies (RTPAs and MPOs) within the SJVAB and the study area (i.e., MCAG, MCTC, and Fresno COG) are responsible for preparing RTPs. The RTP addresses 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 for which funding has been committed. 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 (COG 2010). The relocation and minor expansion of part of SR 99, which would be part of the HST project, are included as an unconstrained project in the Final RTP; however, the HST project is not included in the unconstrained project list in Appendix D of the Fresno COG 2011 RTP or the 2011 FTIP and is therefore not included in the conformity determination (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.

## 5.5 Emission Inventory

### 5.5.1 Criteria Pollutants

CARB maintains an annual emission inventory for each county and air basin in the state. The inventory for the SJVAB consists of data submitted to CARB by SJVAPCD plus estimates for certain source categories, which are provided by CARB staff. The most recent published inventory data for the SJVAB is summarized in Table 5-4.

In the SJVAPCD, mobile source emissions account for over 60% of the basin's CO and $NO_x$ emission inventory. Area sources account for over 80% and over 50% of the basin's particulate and total VOC emissions, respectively, and stationary sources account for over 70% of the basin's sulfur oxides ($SO_X$) emissions.

**Table 5-4**
2010 Estimated Annual Average Emissions for SJVAB (tons per day)

| Source Category | TOG | ROG | CO | $NO_x$ | $SO_x$ | PM | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|---|---|---|---|
| **Stationary Sources** | | | | | | | | |
| Fuel Combustion | 27.4 | 6.0 | 35.6 | 45.0 | 6.7 | 5.9 | 5.7 | 5.7 |
| Waste Disposal | 72.7 | 9.2 | 1.1 | 2.0 | 0.5 | 1.2 | 0.7 | 0.3 |
| Cleaning and Surface Coatings | 48.3 | 39.2 | 0.1 | 0.1 | 0.0 | 0.5 | 0.5 | 0.5 |
| Petroleum Production and Marketing | 38.1 | 33.1 | 8.9 | 4.3 | 6.2 | 4.0 | 2.6 | 2.2 |
| Industrial Processes | 21.4 | 19.5 | 2.4 | 4.6 | 2.7 | 24.0 | 14.4 | 6.7 |
| Total Stationary Sources | 208.0 | 107.0 | 48.1 | 56.0 | 16.1 | 35.6 | 24.0 | 15.4 |
| Stationary Sources Percentage of Total | 22.1 | 15.3 | 1.4 | 6.8 | 40.8 | 6.8 | 8.0 | 13.3 |
| **Area-wide Sources** | | | | | | | | |
| Solvent Evaporation | 145.6 | 127.1 | - | - | - | - | - | - |
| Miscellaneous Processes | 88.7 | 15.5 | 111.3 | 25.8 | 0.9 | 424.4 | 214.9 | 52.1 |
| Total Area-wide Sources | 234.3 | 142.6 | 111.3 | 25.8 | 0.9 | 424.5 | 214.9 | 52.1 |
| Area-wide Sources Percentage of Total | 24.9 | 20.4 | 3.3 | 3.1 | 2.3 | 81.4 | 71.9 | 44.9 |
| **Mobile Sources** | | | | | | | | |
| On-road Motor Vehicles | 231.8 | 210.8 | 2,115.8 | 450.3 | 2.1 | 25.2 | 24.9 | 17.9 |
| Other Mobile Sources | 165.5 | 150.8 | 974.2 | 287.8 | 18.9 | 19.1 | 18.5 | 16.4 |
| Total Mobile Sources | 397.3 | 361.6 | 3,090.0 | 738.2 | 21.0 | 44.3 | 43.4 | 34.4 |
| Mobile Sources Percentage of Total | 42.3 | 51.8 | 90.5 | 89.5 | 53.2 | 8.5 | 14.5 | 29.7 |
| **Natural (Nonanthropogenic) Sources** | | | | | | | | |
| Natural Sources | 100.6 | 86.5 | 164.2 | 5.0 | 1.5 | 17.3 | 16.6 | 14.1 |
| Total Natural (Nonanthropogenic Sources) | 100.6 | 86.5 | 164.2 | 5.0 | 1.5 | 17.3 | 16.6 | 14.1 |
| Natural Sources Percentage of Total | 10.7 | 12.4 | 4.8 | 0.6 | 3.8 | 3.3 | 5.5 | 12.2 |
| **Grand Total** | **940.1** | **697.7** | **3,413.5** | **825.0** | **39.5** | **521.7** | **298.9** | **115.9** |

Source: CARB (2009g).

## 5.5.2 Statewide Greenhouse Gas

As a part of AB 32, CARB established an emissions inventory for 1990 and a projected limit for 2020. Because climate change is a global and not a regional issue, specific inventories have not been prepared for the individual air basins. The statewide 2020 limit was approved on December 6, 2007, and is not sector-specific. The statewide 2020 limit is based on the total 1990 GHG emissions inventory and is 427

MMT $CO_2e$ (CARB 2009e). The largest source of emissions in the state is the energy sector, which includes energy and manufacturing industries, the agricultural and forestry sector, emissions from fuels, and the transportation sector. The transportation sector accounts for about 37% of the statewide GHG emissions inventory. The electric power sector accounts for about 24% of the total statewide GHG emissions inventory (CARB 2010d). A summary of the 2008 statewide emissions inventory is included in Table 5-5.

**Table 5-5**
2008 California Statewide Greenhouse Gas Emissions Inventory

| Emission Category | 2008 (MMT $CO_2e$) |
|---|---|
| Transportation | 174.99 |
| Electric power | 116.35 |
| Commercial and residential | 43.13 |
| Industrial | 92.66 |
| Recycling and waste | 6.71 |
| High GWP | 15.65 |
| Agriculture | 28.06 |
| Forestry | 0.19 |
| Total California Emissions | 477.74 |
| Source: CARB (2010d). | |

## 5.6 Sensitive Receptors

Some locations are considered more susceptible to adverse impacts from air pollution than others. These locations are commonly referred to as *sensitive receptors,* and include schools, daycare facilities, elderly care establishments, medical facilities, and other areas that are populated with people considered more vulnerable to the effects of poor air quality. Analyses performed by CARB indicate that providing a separation of 1,000 feet from diesel sources and high-traffic areas would substantially reduce the exposure to air contaminants and decrease asthma symptoms in children (CARB 2005). Sensitive receptors located within 1,000 feet of the project footprint are shown in Figures 5-2 through 5-5.

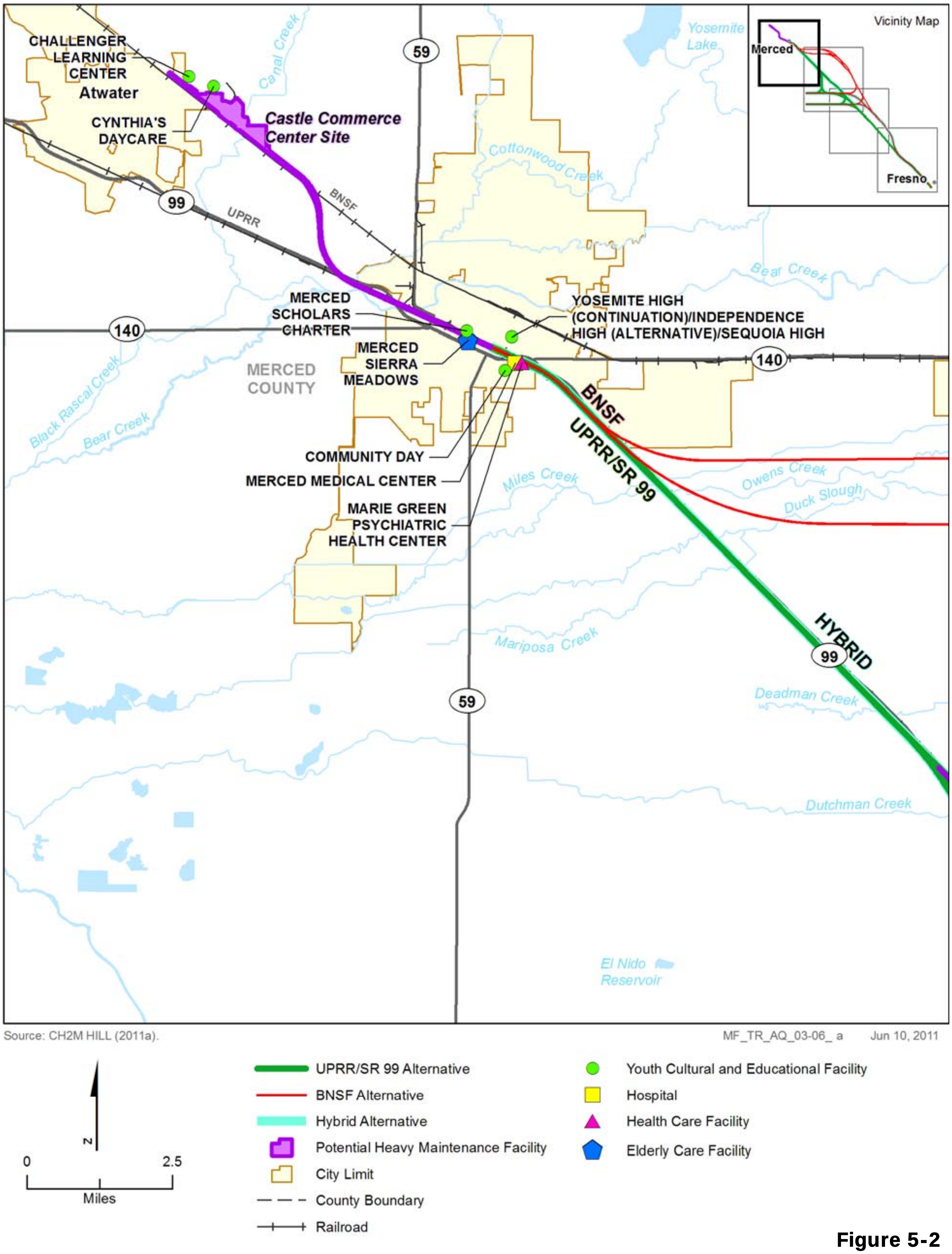



**Figure 5-2**
Sensitive Receptors in the Merced Project Vicinity

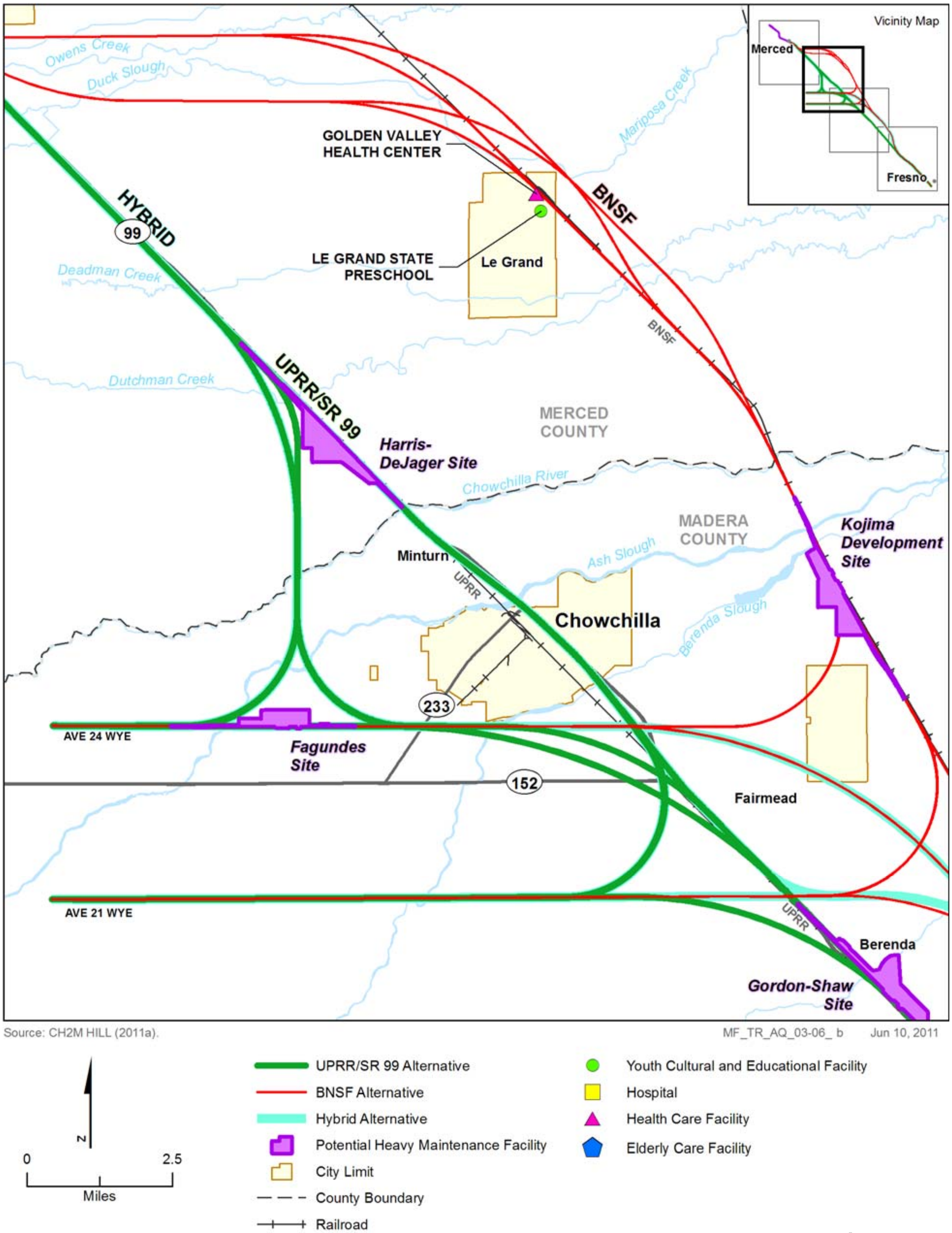



**Figure 5-3**
Sensitive Receptors in the Chowchilla Project Vicinity

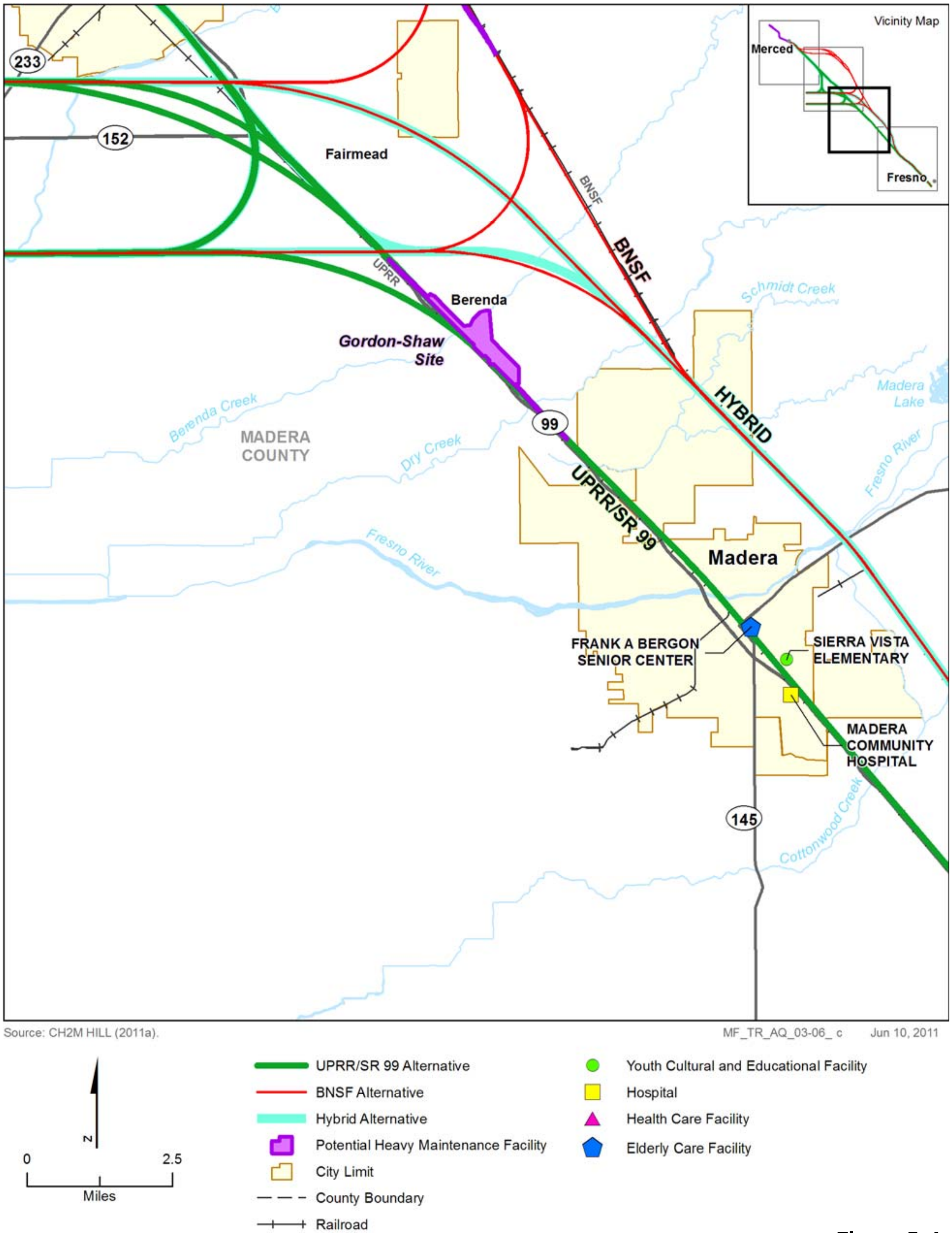



**Figure 5-4**
Sensitive Receptors in the Madera Project Vicinity

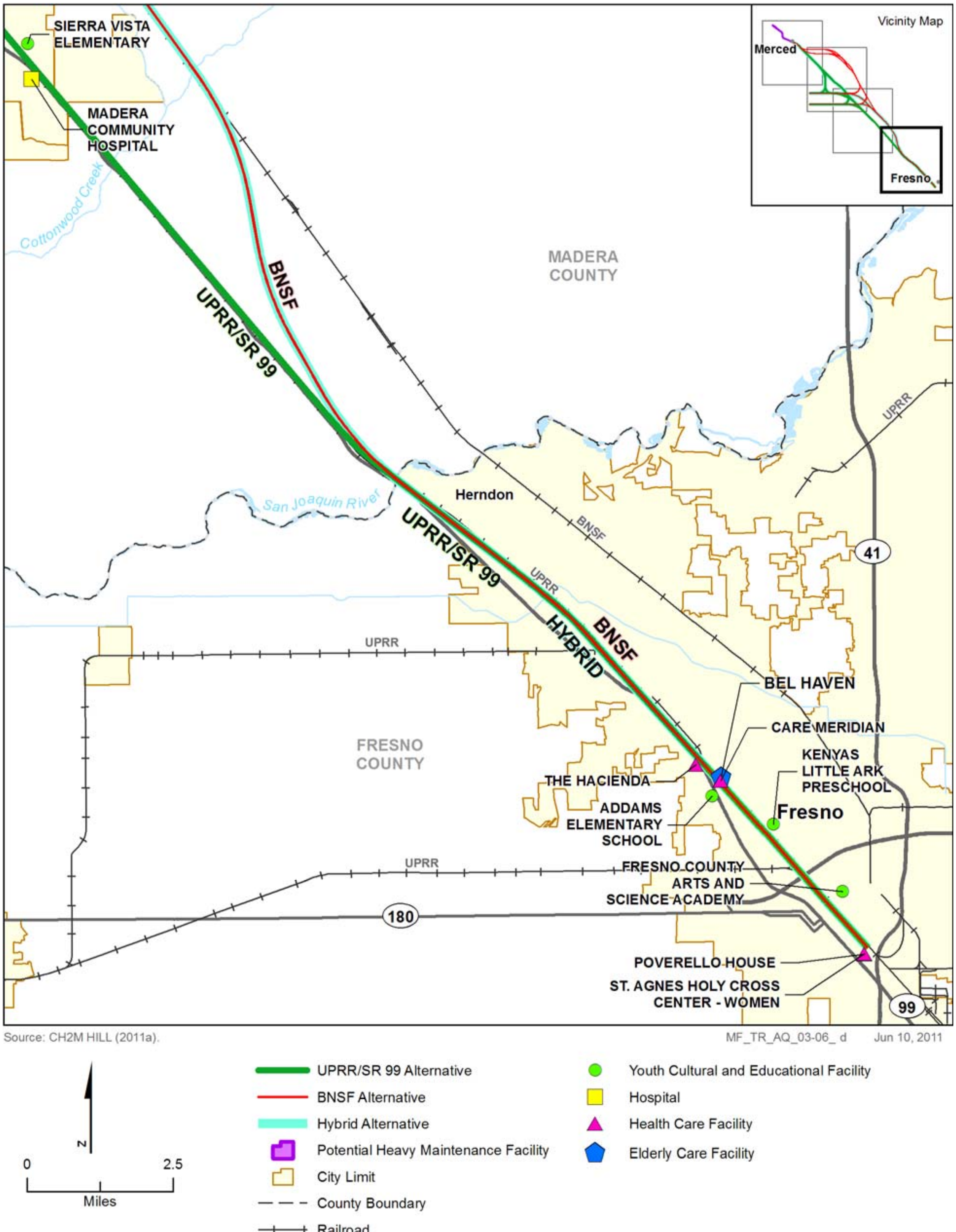



**Figure 5-5**
Sensitive Receptors in the Fresno Project Vicinity

Tables 5-6 and 5-7 summarize the distance between each sensitive receptor and each project component, broken down by alternative. Overnight layover and servicing facilities are co-located with the HMF. The sensitive receptors associated with these facilities are already included in the tables below.

**Table 5-6**
Sensitive Receptors within 1,000 Feet of the Merced and Fresno HST Stations and the HMF

| Sensitive Receptors[a] | Distance (feet) | | |
|---|---|---|---|
| | Downtown Merced Station | Downtown Fresno Station | Castle Commerce HMF [e, f] |
| Yosemite High (continuation)/ Independence High (alternative)/Sequoia High[a] | 6 | - | - |
| Merced Sierra Meadows[b] | 127 | - | 258 |
| Community Day[a] | 136 | - | - |
| Merced Medical Center[d] | 273 | - | - |
| St. Agnes Holy Cross Center – Women[c] | - | 393 | - |
| Poverello House[c] | - | 408 | - |
| Cynthia's Daycare[a] | - | - | 610 |
| Merced Scholars Charter School[a] | 659 | - | 327 |
| Marie Green Psychiatric Health Center[c] | 810 | - | - |
| Challenger Learning Center[c] | - | - | 820 |
| Fresno County Arts and Science Academy[a] | - | 975 | - |

[a] Receptor type: Youth cultural and educational facility
[b] Receptor type: Elderly care facility
[c] Receptor type: Health care facility
[d] Receptor type: Hospital
[e] Sensitive receptors are not located within 1,000 feet of the HMF at Harris-DeJager, Fagundes, Gordon-Shaw, and Kojima Development sites.
[f] Overnight layover/servicing facilities are co-located with HMF

**Table 5-7**
Sensitive Receptors within 1,000 Feet of the HST Alternatives

| Sensitive Receptors[a] | Distance (feet) | | |
|---|---|---|---|
| | UPRR/SR 99 | BNSF | Hybrid |
| The Hacienda[b] | 0 | 0 | 0 |
| Marie Green Psychiatric Health Center[b] | 88 | 88 | 88 |
| Addams Elementary School[c] | 99 | 99 | 99 |
| Golden Valley Health Center[b] | - | 126 | - |
| Care Meridian[b] | 136 | 136 | 136 |
| Merced Sierra Meadows[d] | 258 | 258 | 258 |
| Merced Scholars Charter School[c] | 327 | 327 | 327 |
| Frank A Bergon Senior Center[d] | 336 | - | - |
| Kenya's Little Ark Preschool[c] | 382 | 382 | 382 |
| Merced Medical Center[e] | 395 | 395 | 395 |
| Bel Haven[d] | 434 | 434 | 434 |
| St. Agnes Holy Cross Center – Women[b] | 482 | 482 | 482 |
| Poverello House[b] | 490 | 490 | 490 |
| Cynthia's Daycare[c] | 610 | 610 | 610 |
| Madera Community Hospital[e] | 790 | - | - |
| Challenger Learning Center[c] | 791 | 791 | 791 |
| Yosemite High (continuation)/ Independence High (alternative)/Sequoia High[c] | 795 | 795 | 795 |
| Sierra Vista Elementary School[c] | 920 | - | - |
| Fresno County Arts and Science Academy[c] | 948 | 948 | 948 |
| Community Day[c] | 964 | 964 | 964 |
| Le Grand State Preschool[c] | - | 973 | - |

[a] Sensitive receptors are not located within 1,000 feet of the Ave 24 Wye and Ave 21 Wye.
[b] Receptor type: Health care facility
[c] Receptor type: Youth cultural and educational facility
[e] Receptor type: Hospital
[d] Receptor type: Elderly care facility

# 6.0 Analysis Methodology

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 reach their 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. The results comparing the project with the future expected baseline are presented in detail in the main text of this section. The results comparing the project with existing conditions are summarized in the main text of this section; details (including mitigation) are presented in Appendix E.

## 6.1 Statewide and Regional Emission Calculations

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

### 6.1.1 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 using the CARB emission factor program, EMFAC2007. Parameters were set in the program for each individual county to reflect conditions within each county, and statewide parameters were used to reflect travel through each county. The analysis was conducted for the following modeling years:

- Existing (Year 2009).
- Existing plus Project (Year 2009).
- Future No Project (Year 2035).
- Future Dedicated HST (Year 2035).

To determine the overall pollutant burdens generated by on-road vehicles, the estimated VMT were multiplied by the specific pollutant's emission factors, which are based on speed, vehicle mix, and analysis year. It should be noted that, according to the current version of EMFAC2007, future fuel economy factors are forecast to improve only slightly between the year 2009 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 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.

### 6.1.2 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 the emissions generated from a specified number of landing and take-off (LTO) cycles. Along with the emissions from the planes themselves, emissions generated from associated ground maintenance requirements are included. Average plane emissions are calculated based on the profile of aircraft currently servicing the San Francisco to Los Angeles corridor. The number of air trips that would be removed due to the HST was estimated through the travel demand modeling analyses conducted for the project.

### 6.1.3 Power Plant Emissions

The electrical demands due to propulsion of the trains and the trains at terminal stations and in storage depots and maintenance facilities were calculated as part of the project design. Average emission factors for each kilowatt-hour required were derived from CARB statewide emission inventories of electrical and cogeneration facilities data along with EPA eGRID electrical generation data.

The HST System would be powered by the state's electrical grid. Because no dedicated generating facilities are proposed for this project, no source facilities can be identified. Emission changes from power generation can therefore be predicted on a statewide level only. In addition, because of the state requirement that an increasing fraction (33% by 2020) of electricity generated for the state's power portfolio 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.

## 6.2 Analysis of Local Operational Emission Sources

Operation of the Merced to Fresno Section HST stations and the HMF would affect emissions of criteria pollutants and GHGs. The operation of the traction power, switching, and paralleling stations would not result in appreciable air pollutants as site visits would be infrequent and power usage would be limited. Therefore, emissions from these stations were not quantified. Section 6.2.1 discusses the methodology used to estimate operational air emissions from the train stations, the HMF, and local mobile sources. Project information used for the operation emission estimates are presented in Appendix A. Detailed emission calculations are shown in Appendix C.

### 6.2.1 HST Stations

Emissions associated with the operation of the Downtown Merced and Downtown Fresno HST stations would primarily result from space heating and facility landscaping, energy consumption for facility lighting, CO emissions from the parking structures, and employee and passenger traffic. Deliveries to the HST stations are considered negligible.

Emissions of criteria pollutants and GHGs were estimated for operation of the Downtown Merced and Downtown Fresno stations for the design year of 2035. The activities and emissions associated with the operation of the Downtown Merced and Downtown Fresno stations are expected to be similar. The options for the Downtown Fresno Station are within 10% of the size of the Downtown Merced Station. Operational emissions for the Downtown Fresno Station were taken from *Fresno to Bakersfield Section Air Quality Technical Report* (Authority and FRA 2011b).

#### 6.2.1.1 Area and Stationary Sources

Emissions from area and stationary sources, including natural gas consumption for space heating and landscaping equipment, were calculated using URBEMIS2007 (URBEMIS, 2007). Emissions were based on the land use data, entered as the size of the station buildings (square feet). The parking structures were excluded from the land use as they would not require heating and would require minimal landscaping. The URBEMIS2007 output files, the emissions estimated for each operational activity, and the activity data details used to perform the estimations are summarized in Appendix C.

#### 6.2.1.2 Indirect Electricity

The Downtown Merced and Downtown Fresno stations would generate indirect emissions from purchased electricity consumed for facility lighting. It is expected that the power used by the HST stations would be much less than the power used by train operations; however, the indirect emissions from power consumption have been included in overall emission estimates.

Indirect emissions from purchased electricity consumed by the HST stations were calculated based on the building square footage, electricity consumption rates provided by the South Coast Air Quality Management District (SCAQMD) (SCAQMD 1993), and emission factors from eGRID (EPA 2010c). The retail consumption rate of 13.55 kilowatt-hours/square foot/year was assumed to be representative for the HST stations. The emission factors used were for the California region (CAMX-WECC California) and are for 2007, the most recent year for which data were available.

### 6.2.2 Heavy Maintenance Facilities

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[2]
- Diesel trucks

#### 6.2.2.1 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.

#### 6.2.2.2 Pollutants of Concern

Both criteria and noncriteria 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

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

The TACs considered are contaminants identified according to the California's 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, DPM 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. DPM 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 DPM 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, $SO_{2,}$ 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, $SO_{2,}$ and GHG emissions from HMF operations are only included in the regional air quality impact discussion.

#### 6.2.2.3 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 DPM 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.
- DPM ($PM_{10}$), $PM_{2.5}$, $NO_2$, 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 ultra-low sulfur diesel (ULSD) fuel. This is a reasonable assumption since the HMF will 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.
- It was conservatively assumed that all of the $NO_x$ released from the diesel engines (which are generally composed of only a small percent of $NO_2$) would be converted in the atmosphere to $NO_2$ by the time they 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 fuel (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 DPM ($PM_{10}$), $PM_{2.5}$, $NO_2$, 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 "Technical Information and References," Table 2, Santa Barbara County Air Pollution Control District "Construction Equipment Controlled Emission Factors" (SBCAPCD 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 miles per hour for the year 2017, which is a conservative assumption since the HMF will 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 even though equipment with higher-control efficiencies is available.

- Speciation of TAC emissions from paint booth operations were estimated using CARB's *Organic Speciation Profile for Surface Coating Operations* (CARB 2011c.

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

- Emissions of organic compounds from diesel combustion were estimated using CARB's Organic Speciation Profile for Diesel Light & 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 period.

Details of the estimated emission factors and emission rates for the pollutants evaluated are provided in Appendix F.

#### 6.2.2.4 Detailed Analysis for HMF

A detailed dispersion modeling analysis was conducted to estimate the potential impacts of HMF emissions on nearby sensitive land uses. 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 of approximately 500, 1,000, 1,300, 3,000, and 5,000 feet from the site boundary. Receptors were located around the property boundary in increments of 25 meters, as specified in SJVAPCD modeling guidance. 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 SJVAPCD, 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 DPM and applicable TAC concentrations were used to estimate cumulative cancer risks and the overall noncancer chronic and acute hazard index associated with HMF operations using procedures developed by OEHHA (Cal-EPA 2003). The cancer risk calculation procedure developed by the California OEHHA was used to estimate increased cancer risks resulting from the HMF's DPM and TAC emissions. Details of the risk analysis are in Appendix F.

#### 6.2.2.5 Health Risk Methodology

Maximum estimated dispersion modeling concentrations of DPM and other TACs were used to calculate cancer risks, chronic noncancer risk, and acute noncancer risk associated with HMF operations. Pollutant concentrations and dispersion model parameters are presented in Appendix F.

Cancer Risk: Cancer potency factors (or unit risk factors) were developed for six pollutants (which are considered to be carcinogens by OEHHA) emitted from diesel vehicular exhaust, and spray booth operations: DPM, benzene, 1, 3-butadiene, acetaldehyde, formaldehyde, and methylene chloride. The maximum individual cancer risk for each pollutant and total incremental cancer risks associated with these pollutants releases were calculated using procedures developed by OEHHA, together with OEHHA/CARB-approved health values for health risk assessments. The 5-years average AERMOD-estimated concentrations were used for these calculations, as recommended by the SJVAPCD. Metal elements bounded to PM from vehicular exhaust, such as arsenic, cadmium, nickel, and others, were considered as part of the DPM.

Chronic Noncancer Risk: Calculations for estimating the chronic noncancer hazard index (HIC) are based on the EPA's Human Health Risk Assessment Protocol (HHRAP [EPA 2005b]) methodology and equations.

Acute Hazard Risk: Acute hazard index (HIA) analyses are based on HHRAP methodology and equations (EPA 2005b).

#### 6.2.2.6 CO Hot-Spot Analysis

A CO hot-spot analysis was conducted to evaluate the potential impacts of traffic volume change near the HMF stations. Only the Castle Commerce Center HMF site is near a large population and sensitive receptors; therefore, this site was evaluated in the CO hot-spot analysis. A 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.

### 6.2.3 Local Operational Mobile Sources

Local emissions associated with mobile sources would occur from passenger travel, HMF and station employee commutes, and HMF truck deliveries. Vehicular exhaust emissions were estimated using EMFAC2007 with an SJVAB fleet mix. Employee commute and passenger emission factors were estimated using EMCAC2007 for light duty automobiles and light duty trucks; and truck deliveries were estimated assuming heavy duty diesel trucks.

The average local speed of the vehicles was assumed to be 35 mph, which is the average of the speed vehicles travel on the freeway (55 mph) and the speed vehicles travel on city roads (15 mph). The temperature and relative humidity used in EMFAC2007 modeling were taken as the annual averages of the San Joaquin Valley (67°F and 55%) (University of California, Davis [UCD] 2007).

#### 6.2.3.1 Employee Traffic

Emissions from employee traffic were calculated using a passenger vehicle emission factor, assuming that 50% of the employees would use light duty automobiles (LDA-All) and 50% would use light duty trucks (assumed an average of LDT1-All and LDT2-All). As a conservative estimate, employee and passenger traffic was expected to occur 7 days per week, 24 hours per day. In the absence of more specific data, a round trip distance of 40 miles was assumed for all employee commute trips. It was assumed that each employee would make one round trip per day and that 20% of all employees would carpool (Authority 2009). The projected employee counts for each facility are listed in Table 6-1.

**Table 6-1**
Employee Counts

| Facility | 2035 Employee Count |
|---|---|
| Downtown Merced Station | 40 |
| Downtown Fresno Station[a] | 40 |
| HMF | 1,500 |
| Overnight/Layover Facility | 40 |

[a] The Downtown Fresno Station employee counts were not available. As a result, employee counts for the Downtown Merced Station were used for the Fresno station.

#### 6.2.3.2 Truck Deliveries

Truck deliveries for the HST stations would be minimal. For the HMF deliveries, it was assumed that there would be an average of 20 deliveries to the site per day and the trucks would travel 120 miles round trip. Truck deliveries would include supplies of materials and chemicals, as well as the removal of refuse from the site.

#### 6.2.3.3 Passenger Traffic

There would be no passenger traffic at the maintenance facilities. Passengers would be expected to arrive at the Downtown Merced and Downtown Fresno stations by car, by shuttle/bus, or by biking or walking. It was assumed that each passenger would make one round trip per day. The numbers of passengers visiting the Downtown Merced Station daily are listed in Table 6-2 by their mode of transportation.

**Table 6-2**
Daily Passenger Counts

| Mode of Transportation | 2035 Merced Station | 2035 Fresno Station |
|---|---|---|
| By Shuttle/Bus | 600 | 700 |
| By Car | 6,700 | 4,300 |
| By Biking/Walking | 300 | 400 |
| Total | 7,600 | 5,400 |

For travel by shuttle/bus, emissions were calculated using the urban buses (UBUS-All) emission factors. It was assumed that each bus would hold 30 people traveling to the train stations. As a result, the bus trips per day were the total number of passengers traveling by shuttle/bus divided by 30. For 2035 operations, the emission factors were determined using only 2023 through 2035 model years based on a 12-year usable lifespan for city buses (Federal Transit Administration 2007).

No emissions are anticipated from travel by biking or walking.

## 6.3 Microscale CO Analysis

CO hot spot analyses were conducted to evaluate the potential air quality impacts of HST-related changes in traffic conditions along heavily traveled roadways, congested intersections, and areas near train station parking structures. CO modeling was performed using the CALINE4 air quality dispersion model to estimate existing (2009), existing plus Project (2009), future (2035) No Project Alternative, and future Project (2035) CO concentrations at selected locations. CO modeling results for 2035 and 2009 are presented in Appendices D and E, respectively.

### 6.3.1 Intersection Microscale Analysis

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

Receptors for the intersection 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 so they were not within the mixing zone of the travel lanes and were spaced at 0, 25, and 50 meters from the intersection for both the 1-hour and 8-hour analyses (Caltrans 1997). Although sidewalks do not exist around all the intersections, it was assumed that the public could access these locations.

#### 6.3.1.2 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. EMFAC2007 output files are included in Appendix D.

#### 6.3.1.3 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.

CALINE4 is a Gaussian model recommended in the Caltrans CO Protocol. Gaussian models assume that the dispersion of pollutants downwind of a pollution source follows a normal distribution around the center of the pollution source. The model is described in *CALINE4 – A Dispersion Model for Predicting Air Pollutant Concentration near Roadways, FHWA/CA/TL-84/15*. The analysis of roadway CO impacts followed the CO Protocol (Caltrans 1997). It is also consistent with procedures identified in the SJVAPCD CEQA guidance (SJVAPCD 2002).

#### 6.3.1.4 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).

- **Wind Direction**. Maximum CO concentrations are normally found when the wind is assumed to blow approximately parallel to a single roadway adjacent to the receptor location. However, at complex intersections, it is difficult to predict which wind angle will result in maximum concentrations. Therefore, at each receptor location, the approximate wind angle that would result in maximum pollutant concentrations was used in the analysis. All wind angles from 0° to 360° were considered.
- **Wind Speed**. CO concentrations are greatest at low wind speeds. A conservative wind speed of 1.1 mph (0.5 meter per second) was used to predict CO concentrations during peak traffic periods.
- **Temperature and Profile of the Atmosphere**. An ambient temperature of 41°F for the Fresno area and 41°F for the Merced area, a "mixing" height (the height in the atmosphere to which pollutants rise) of 1,000 meters, and the most stable atmospheric stability (stability class G) conditions were used in estimating microscale CO concentrations. The ambient temperatures were determined to be 5°F above the lowest January average minimum temperature over a representative 3-year period (based on Table B.7 of the CO Protocol [Caltrans 1997]). The stability class G~~E~~ was chosen, as recommended in Table B.11 of the CO Protocol.

The selection of these meteorological parameters was based on recommendations from the CEQA Air Quality Handbook, Caltrans' CO Protocol, and EPA's Guidelines. These data were found to be the most representative of the conditions existing in the study area.

#### 6.3.1.5 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 following:

- Over an 8-hour period (as distinct from a single hour), vehicle volumes will fluctuate downward from the peak hour.

- Vehicle speeds may vary.
- Meteorological conditions, including wind speed and wind direction, will vary compared to the conservative assumptions used for the single hour.

The analysis used a persistence factor of 0.7, which is recommended in the CO Protocol (Caltrans 1997).

#### 6.3.1.6 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 ppm, and the second-highest 8-hour average was 2.14 ppm for the Fresno-Drummond monitoring station.

#### 6.3.1.7 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.

#### 6.3.1.8 Analysis Years

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

### 6.3.2 Parking Structure Microscale CO Analysis

The Downtown Merced and Fresno station parking structure locations were also modeled for potential CO hot spots because of the potential increase in the number of idling cars in one location. The microscale CO analysis for the Merced station parking structures used the same methodology as used in the intersections CO modeling. Receptors were located 3 meters from the parking structure at each corner and the entrance of the structure. To estimate CO emissions, Merced station parking structures were evaluated based on the total number of parking spaces. The emission factors were based on the assumed travel speed of 5 mph. As a conservative estimate, one level of each parking structure was modeled and the resulting emissions were multiplied by the number of levels in the structure. This is a conservative estimate because the upper levels are less likely to be filled to maximum capacity. To determine an overall worst-case impact, the resulting emissions from each Merced station parking structure were summed together.

CO modeling results for the Downtown Fresno Station parking structures were taken from *Fresno to Bakersfield Section High-Speed Train Environmental Impact Report and Environmental Impact Statement (EIR/EIS)* (Authority and FRA 2011a).

## 6.4 Particulate Matter ($PM_{10}$/$PM_{2.5}$) Hot-Spot Analysis

While the HST portion of the project is subject to the general and not transportation conformity guidelines, because the study area 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 Qualitative Hot-spot Analyses in $PM_{2.5}$ and $PM_{10}$ Nonattainment and Maintenance Areas* (EPA 2010d) was conducted, as recommended in EPA's Final Rule regarding the localized or hot-spot analysis of $PM_{2.5}$ and $PM_{10}$ (40 CFR Part 93, issued March 10, 2006).

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 identified by the $PM_{2.5}$ SIP as a localized air quality concern. Projects of air quality concern, as defined by 40 CFR 93.123(b)(1), are the following:

- 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 $PM_{2.5}$- or $PM_{10}$-applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation.

## 6.5 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 HAPs. 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, DPM plus diesel exhaust organic gases (DPM), formaldehyde, naphthalene, and POM.

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 VOCs 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 6-1.

On February 3, 2006, FHWA released *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 Air Toxic Analysis in NEPA Documents (FHWA 2009).* FHWA's guidance advises 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, FHWA will update the guidance.

A qualitative analysis provides a basis for identifying and comparing the potential differences in MSAT emissions, if any, among the HST alternatives. FHWA's Interim Guidance groups projects into the following categories:

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

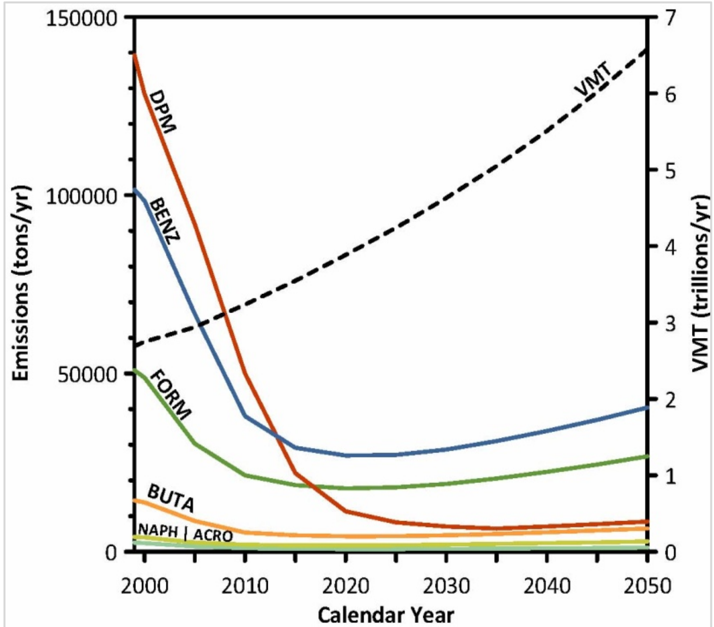



**Figure 6-1**
National MSAT Emission Trends (1999-2050) for Vehicles Operating on Roadways Using EPA'S Mobile 6.2 Model

Source: EPA Mobile6.2 Model run 20 August 2009
Notes:
(1) Annual emissions of POM are projected to be 561 tons/yr for 1999, decreasing to 373 tons/yr for 2050.
(2) Trends for specific locations may be different, depending on locally derived information representing VMT, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.

- 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 in MSAT emissions, if any, among 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).

## 6.6 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 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 down NOA to microscopic fibers, 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, which inhibit lung function. EPA is addressing concerns about potential effects of NOA in a number of areas in California.

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

## 6.7 Greenhouse Gas Analysis

As discussed in Section 6-1, 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 takeoffs and landings. The project would also affect electricity demand throughout the state. These elements would affect GHG emissions on both a statewide and regional study area level. The methodology for estimating GHG emissions associated with operation of the HST project is discussed below.

The methodology for estimating GHG emissions associated with construction is included in Section 6.8.

### 6.7.1 On-Road Vehicles

The on-road vehicle GHG emission analysis was conducted using average daily VMT estimates and associated average daily speed estimates, 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 to reflect travel through each county. The analysis was conducted for the following modeling years:

- Existing (Year 2009).
- Existing plus Project (Year 2009).
- Future No Project (2035).
- Future Dedicated HST (2035).

To determine overall GHG burdens generated by on-road vehicles, estimated VMTs are multiplied by appropriate GHG emission factors, which are based on speed, vehicle mix, and analysis year. According to EMFAC2007, fuel economy factors are forecast to improve only slightly between 2009 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:

- The State of California has enacted legislation requiring dramatic improvements in vehicle fuel economy for all vehicles sold in California.

- 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 years 2012 through 2016.

### 6.7.2 Airport Emissions

FAA's EDMS Version 5.1.2 model was used to estimate airplane GHG emissions. EDMS estimates the emissions generated from a specified number of LTO cycles. Along with the emissions from the planes themselves, GHG emissions generated from associated ground maintenance requirements are included. Average plane GHG emissions are calculated based on the profile of aircraft servicing the San Francisco to Los Angeles corridor. The number of air trips removed due to the HST was estimated through the travel demand modeling analysis conducted for the project.

### 6.7.3 Power Plant Emissions

The electrical demands due to propulsion of the trains, the trains at terminal stations and in storage depots, and in maintenance facilities are calculated as part of the project design. Average GHG emission factors for each kilowatt-hour required are derived from CARB statewide GHG emission inventories of electrical and cogeneration facilities data along with EPA eGRID electrical generation data.

The HST System would be powered by the state's electrical grid. Because no dedicated generating facilities are proposed for this project, no source facilities can be identified. GHG emission changes from power generation were therefore 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 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.

## 6.8 Construction Phase

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

- At-grade rail segments.
- Elevated rail segments.
- Retained fill rail segments.
- Electrical substations.
- Train stations.
- HMF.
- Roadways and roadway overpasses.

These major construction activities would account for the vast 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 vast majority of construction emissions that would be generated by construction of the proposed project. The estimated construction emissions from these major activities were used to evaluate the regional and localized air quality impacts during the construction phase. Project-specific information was analyzed when available. Default emission rates for activities such as station and parking structure construction, asphalt paving, and architectural coating were used if -information specific to the project was not available. Project information used for the construction emission estimates is presented in Appendix A. Details of the construction emission calculations are shown in Appendix B.

### 6.8.1 Models Used for Construction Emissions

Criteria pollutant and GHG emissions from regional building demolition and construction of the at-grade rail segments, elevated rail segments, retained fill rail segments, traction power substations, industrial buildings at the HMF, and HST stations (including parking garages and platform facilities) were calculated using URBEMIS2007. URBEMIS2007 uses emission factor data for off-road equipment from OFFROAD2007 and on-road equipment from EMFAC2007. The URBEMIS2007 model was chosen over the Sacramento Roadway Construction Model (RCM) because the URBEMIS2007 model uses statewide off-road emission factors, 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 URBEMIS2007 for linear construction projects such as the construction of the HST, when a project specific construction phasing and equipment is known. Detailed analysis of the RCM and URBEMIS model features can be found in *Appendix G.*

URBEMIS2007 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 twice daily, and promptly replacing ground cover over disturbed areas, as well as SJVAPCD regulatory control measures. These measures are collectively referred to in the analysis and results as "programmatic" emissions reductions measures.

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 non-linear construction associated with the stations and HMF buildings and therefore the URBEMIS 2007 default settings were used in these instances only. Calculations were performed for each year of construction.

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

### 6.8.2 General Assumptions and Methodologies

#### 6.8.2.1 Assumptions and Methodologies

This section discusses the model assumptions and methodologies used to estimate construction emissions from demolition activities and construction of the Downtown Fresno and Downtown Merced stations, the overnight layover/servicing facility (co-located with the HMF), the HMF, the traction power supply stations, switching stations and paralleling stations, rail alignment, roadways, and roadway overpasses. Activities associated with these sources may include site grading, asphalt paving, operation of construction equipment, architectural coating, laying rail, operation of a concrete plant, worker and vendor trips, and material hauling. The assumptions used for the construction emission calculations are based on the following and discussed throughout this document:

- 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 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 information required for URBEMIS2007 to calculate construction emissions from the stations and other facilities includes areas (in square feet) and land use type (i.e., light industrial for HST stations and power substations and heavy industrial for maintenance facilities). Project-specific data, including construction equipment lists and the construction schedule, were used when available. Project-specific equipment lists were used in URBEMIS2007 to estimate emissions from land grubbing (part of site preparation), the remaining earth moving activities (mass site grading, trenching, and cutting and filling), project mobilization, project demobilization, and alignment construction. Two staging areas and negligible dust disturbance from off-road travel were assumed for the project mobilization and demobilization.

The following default assumptions from URBEMIS2007 were used unless otherwise specified:

- The work schedule is 5 days per week.
- The number and type of construction equipment are based on the size of the construction area and land use type.
- Worker trip emissions assume the number of workers equals 125% of the number of pieces of construction equipment used and a trip distance of approximately 10.6 miles each way.
- A vendor trip is approximately 5.8 miles each way.
- Haul trucks would be required during building demolition to remove materials from the construction site to the nearest landfill. The number of haul trips per day and VMT per day assume a truck capacity of 20 cubic yards and a trip distance of 30 miles per round trip.

- For building construction, the total number of acres required to be graded is twice the size of the building area. The maximum number of acres graded daily is equal to 25% of the total acres to be graded.
- 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. Ballast materials would be potentially transported from locations outside the 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 from the EPA document *Emission Factors for Locomotives* (EPA 2009d) were used to estimate the locomotive emissions. Other construction materials would likely be delivered from supply facilities within the SJVAB.

#### 6.8.2.2 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 mph (PM, 45%)
- Ensuring that trucks hauling loose materials would be covered (PM, 69%) (This percent reduction was selected based on the equipment loading and unloading procedures detailed in the SCAQMD guidance [SCAQMD 2007].)

#### 6.8.2.3 Regulatory Control Measures

Many of the control measures required by the SJVAPCD Regulation VIII are the same or similar to the control measures listed in the Statewide Program EIR/EIS. The emission reductions associated with SJVAPCD Regulation VIII are the same as the emission reductions associated with the Statewide Program EIR/EIS (Authority and FRA 2005) listed above.

### 6.8.3 Construction Activities

#### 6.8.3.1 Mobilization

Mobilization would take approximately 8 months, beginning in March 2013. Emissions associated with mobilization were calculated using URBEMIS2007 for a site-specific land use category with properties similar to those of an industrial park. The size of the construction area entered into URBEMIS2007 was conservatively based on the longest alignment footprint (53,121,779 square feet based on the BNSF Alternative with Ave 24 Wye). While the construction emissions were estimated using a mass site grading phase, fugitive dust emissions from mobilization were presumed negligible because of the minimal disturbance to the construction site.

Two mobilization staging areas were assumed for the Merced to Fresno portion of the HST alignment. Construction equipment is assumed to be built or rebuilt in the year 2005 and operating at a load factor of 0.65.

#### 6.8.3.2 Site Preparation

**Demolition**

Demolition of existing structures along the HST alignment and HST stations would take approximately 5 months in 2013. Demolition emissions were calculated using URBEMIS2007. In addition to the fugitive dust emissions resulting from the destruction of existing buildings, emissions were estimated for worker trips, construction equipment exhaust, and truck hauling exhaust. Activity data for the demolition of buildings were based on site surveys. For the HST alternatives with multiple options, only the option with the maximum demolition-related emissions was included in the total emissions estimate.

The General Heavy-Industry land use category in URBEMIS2007 was used to model the demolition activities. The length and width of the buildings to be demolished were derived from the total area to be demolished. In the absence of project-specific data, the height of all buildings was assumed to be 40 feet. This is a conservative estimate based on the average heights of city buildings as presented in *Building Height Characteristics in Three U.S. Cities* (Brown et al. 2002). All other demolition data parameters were based on the URBEMIS2007 default options. The maximum daily volume of buildings to be demolished was estimated using the total area provided and the approximate duration of construction activities. Table 6-3 summarizes the land use sizes of the demolition activities.

**Table 6-3**
Area of Demolition Activities

| Alternative | Total Area (square feet) | Length and Width Dimensions (feet) | Maximum Daily Length and Width Dimensions (feet) |
|---|---|---|---|
| BNSF | 17,902,900 | 4,231.2 | 403.4 |
| UPRR/SR 99 | 25,072,400 | 5,007.2 | 477.4 |
| Hybrid | 20,245,900 | 4,499.5 | 429.0 |
| HMF | 3,775.000 | 1,942.9 | 185.3 |

**Land Grubbing**

Land grubbing refers to the site preparation activities for the HST alignment construction and would coincide with demolition activities. Emissions from land grubbing were estimated using the URBEMIS2007 default parameters for the Light-Industry land use category and the mass site grading option as well as a site-specific equipment list.

The construction area used in URBEMIS2007 was the total area to be cleared based on the length of the alignment. Although the track widths vary along the alignment, it was conservatively assumed that a width of 120 feet would be graded along the entire length of the alignment. This width accounts for the widest portion of the alignment (four tracks wide) plus a buffer area on each side. It was assumed that the maximum graded area would be 0.5 acre per day (Valsecchi 2010). The URBEMIS2007 default fugitive dust emission factor for grading (20 pounds per acre per day) was used to estimate fugitive dust emissions from land grubbing activities.

The methodology used for calculating the site preparation emissions from the HST guideway associated with the HMF is included in the discussion of construction of the HMF building.

#### 6.8.3.3 Earth Moving

The earth moving activities include grading, trenching, and cut/fill activities for the alignment construction. Earth moving would occur between 2013 and 2015. The emissions associated with the earth moving activities were estimated using URMBEMIS2007 default parameters for the Light-Industry land use category as well as a site-specific equipment list.

The construction area used in URBEMIS2007 was the total area to be cleared based on the length of the alignment. Although the track widths vary along the alignment, it was conservatively assumed that a width of 120 feet would be graded along the entire length of the alignment. This width accounts for the widest portion of the alignment (four tracks wide) plus a buffer on each side. It was assumed that the maximum graded area would be 0.5 acre per day (Valsecchi 2010).

The default fugitive dust emissions from cut/fill activities were estimated based on the total quantity of cut and fill material of the onsite excavation and offsite hauling.

The methodology for calculating the site preparation emissions from the HMF alignment section is included in the discussion of construction of the HMF building.

#### 6.8.3.4 HST Alignment Construction

The HST alignment construction is expected to occur from 2013 to 2017, and includes the following construction phases and operation of a concrete batch plant:

- Constructing structures for the elevated rail, which would begin 6 months prior to alignment construction
- Laying elevated rail, laying at-grade rail
- Constructing the retaining wall for the retained fill rail
- Laying retained fill rail

**Rail Type and Alignment Alternatives**

Three rail types (elevated, at-grade, and retained fill), three HST alignment alternatives (BNSF, UPRR/SR 99, and Hybrid), and the HMF track were considered in this analysis. The HST alignment alternatives differ in their total length, location, width, and percent at-grade/elevated/retained fill. The BNSF, UPRR/SR 99, and Hybrid Alternatives have two options based on the construction of a wye. The Ave 21 Wye and Ave 24 Wye options were included in the alignment construction calculations by incorporating the length of each wye into the total length of the alignment. Emissions associated with the HMF track were estimated using the same approach as for the alignment alternatives.

Table 6-4 summarizes the total lengths of at-grade rail, elevated rail, and retained fill rail for each alignment alternative and options, regardless of track width. The emissions of each alternative/option were taken as the sum of the at-grade, elevated, and retained-fill emissions.

**Track Construction**

Emissions from the track construction included exhaust emissions from construction equipment, hauling trucks, and workers commute. Paving activities were not included because the alignment would be concrete and steel. Architectural coatings were also excluded.

**Table 6-4**
HST Alternative Alignment Lengths

| Alternative | Total Length (miles) | At-Grade Length (miles) | Elevated Length (miles) | Retained Fill Length (miles) |
|---|---|---|---|---|
| BNSF with Ave 21 Wye | 82 | 67 | 13 | 2 |
| BNSF with Ave 24 Wye | 84 | 68 | 14 | 2 |
| UPRR/SR 99 with Ave 21 Wye | 72 | 36 | 35 | 1 |
| UPRR/SR 99 with Ave 24 Wye | 74 | 43 | 30 | 1 |
| Hybrid with Ave 24 Wye | 64 | 58 | 5 | 1 |
| Hybrid with Ave 21 Wye | 72 | 52 | 19 | 1 |
| HMF Access Guideway | 7 | 4 | 2 | 1 |

Emissions from construction of the track were modeled using URBEMIS2007. The elevated rail, retained fill, and at-grade rail construction were modeled separately using a unit construction activity of building 1,000 linear feet of rail per year. The resulting emissions were scaled to the actual length of the elevated, retained fill, and at-grade rail of each alignment alternative.

The construction area was estimated to be 120,000 square feet (1,000 linear feet x 120 feet). Project-specific equipment lists for at-grade and elevated rail construction were used in URBEMIS2007. The elevated rail construction list includes equipment for constructing elevated structures and laying rail. The retained fill rail construction was assumed to utilize the same equipment as the elevated rail construction.

Since the track construction will last for several years, the equipment fleet mix of 2013, the first year of construction, was used to be conservative. The default URBEMIS2007 load factors were used for all equipment. Daily hours of equipment operation were adjusted from an assumed 8-hour workday to reflect the project-specific usage estimates. Rail-specific equipment not included in the default URBEMIS2007 equipment list was accounted for as “Other General Industrial Equipment.”

The equipment counts, horsepower, hours of operation, and load factors used in URBEMIS modeling are included in Appendix B.

**Concrete Batch Plants**

Concrete would 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, three batch plants would be needed during construction of the elevated structures and retaining wall. Concrete batch plant operation would begin approximately 7 months prior to laying the elevated rail and cease approximately 4 months after the rail has been completed.

Because the locations of the concrete batch plants are unknown, fugitive dust emissions associated with the plants were estimated based on the total amount of concrete required (independent of the number of concrete batch plants) and emission factors from Chapter 11.12 of AP-42 (EPA 2006a). The material composition of cement was based on the Bay Area Air Quality Management District’s guidance (BAAQMD 2006).

Emissions from on-road truck trips associated with transporting material to and from the concrete batch plants were included in the analysis and are discussed below.

**Material Hauling Within SJVAB**

Materials for construction of the alignment, such as sand, gravel, and cement needed to make concrete; reinforcing steel; excavation and fill materials would be delivered from supply facilities within the SJVAB. The rail would be delivered by train car through railroads near the project site within the existing railroad operation capacity. Therefore, the associated emissions of rail delivery were not included in the analysis. Ballast and subballast materials could potentially be delivered from outside of SJVAB by rail, and then transported to project site by a combination of rail and trucks. Amount of material needed for alignment construction is provided in Table 6-7.

The emissions for material hauling were estimated for each construction phase and summed on an annual basis; the details of the emissions estimates are included in Appendix B. The amount of

Haul truck emission factors were estimated using EMFAC2007. Exhaust emissions from material hauling trucks were calculated using the heavy-duty truck emission factors, the anticipated distance to material suppliers, and an estimated number of truck trips.

To estimate the miles traveled by each haul truck, distances were assumed based on likely locations of material suppliers.

- The reinforcing steel, excavation, and fill materials would likely be from suppliers located approximately 60 miles from the construction site.
- The concrete rail ties would be precast at a shop located up to 120 miles from the construction site.
- The concrete would be from the onsite concrete batch plant; however, it was assumed that it could be transported up to 10 miles from one site location to another along the alignment.
- The sand, gravel, and cement used to make the concrete would likely be from suppliers located approximately 63 miles from the construction site.
- Emissions from ballast and subballast material hauling within SJVAB were calculated using the distance traveled within the San Joaquin Valley, extending up to 145 miles from the construction site for the regional emission analysis. (Emissions associated with hauling this material from outside the air basin is discussed below.)

The number of trucks required to haul the material was determined using an estimated truck capacity and the quantity of materials required for the alignment construction. The truck capacities assumed were 20 cubic yards for soil, ballast, and subballast; 30 tons for cement, sand, and gravel; 14 cubic yards for concrete; and 35,000 pounds for reinforcing steel and concrete railway ties. The total material quantities were determined based on the alignment profile (i.e., rail length, rail width, and at-grade, elevated, or retained fill rail type).

Ballast and subballast materials could potentially be hauled by a combination of rail and trucks within the air basin. Rail emission factors from the EPA document *Emission Factors for Locomotives* (EPA 2009d) and the travel distance by rail within the SJVAB were used to estimate rail emissions. 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 SJVAB.

**Material Hauling From Outside of SJVAB:**

Ballast and subballast materials would be potentially transported from locations outside of the SJVAB. For the regional emission analysis, emissions from ballast and subballast material-hauling were calculated using the distance traveled within the SJVAB. Emissions from ballast and subballast 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 2009d) were used to estimate the locomotive emissions.

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:

- All ballast and subballast were transported by rail from Kaiser Eagle Mountain Quarry.
- Ballast and subballast 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.
- Ballast and subballast 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.
- Ballast and subballast 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.
- Ballast and subballast 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.

Details of the emission estimates for material hauling outside the SJVAB are summarized in Appendix G.

#### 6.8.3.5 Train Station Construction

Emissions from HST station construction would be a result of mass site grading, building construction, and architectural coatings. Where applicable, emissions resulting from worker trips, vendor trips, and construction equipment exhaust were also analyzed as part of each construction phase. Paving activities were not considered because surface parking lots are not expected as part of the construction; only parking structures with emissions captured during the building construction phase were included.

Construction of the HST stations would begin in 2014 and be completed by the end of 2019. URBEMIS2007 was used to estimate emissions from construction phases of the HST stations. The Light-Industry land use category in URBEMIS was used for construction of the station buildings, parking structure, platforms, bridges, and columns. Modeling parameters and results for the Downtown Fresno

Station were taken from *Fresno to Bakersfield Section Air Quality Technical Report* (Authority and FRA 2011b).

For the building construction, the default assumptions of 0.38 vendor trip per 1,000 square feet of building and 0.42 worker trip per 1,000 square feet of building were used to estimate worker and vendor trip emissions. For the architectural coating, the URBEMIS2007 default assumption used in the analysis was: there are no vendor trips and worker trips are equal to 20% of the worker trips required for the building construction.

#### 6.8.3.6 Heavy Maintenance Facility Construction

Emissions associated with construction of the HMF are expected as a result of mass site grading, asphalt paving, building construction, and architectural coatings. Emissions would also result from construction of the HMF Access Guideway rail. The General Heavy-Industry land use category was assumed in URBEMIS2007 modeling to estimate the emissions from HMF construction.

HMF construction activities were divided into three construction phases (Phases 1, 2, and 3), as described below. Unless noted below, the URBEMIS2007 defaults were applied to the HMF construction.

**Phase 1**

Phase 1 includes grading of the entire HMF footprint and is expected to last approximately 4 months, beginning in August 2017. The mass site grading default settings of URBEMIS2007 were used to model this phase. The total area graded would be 154 acres.

**Phase 2**

Phase 2 includes paving and building construction of the overnight layover/servicing facility as well as construction of the track related to overnight layover/servicing facility operation. Phase 2 is expected to last approximately 7 months, beginning in June 2018. The overnight layover/servicing facility is co-located with the HMF such that the buildings will be constructed separately but are contained within the footprint of the 154 acres graded during Phase 1.

As a conservative estimate, the total area to be paved was assumed equal to the total area to be cleared minus the size of buildings to be constructed. The land use area used in URBEMIS2007 was the total building construction area (7,277 square feet).

Track construction would include elevated, at-grade, and retained fill rail, elevated structures, and a retaining wall. Emissions from track construction were estimated using the same approach described for the HST alignment construction. The length of track related to overnight layover/servicing facility operation was determined by multiplying the total HMF track length (presented in Table 6-4) by the ratio of area cleared for the overnight layover/servicing facility to the area cleared for the total HMF (154 acres).

**Phase 3**

Phase 3 includes paving, building construction, and architectural coating of the HMF, as well as construction of the track related to HMF operation. Phase 3 is expected to last approximately 7 months, beginning in January 2021.

As a conservative estimate, the total area to be paved was assumed equal to the total area to be cleared minus the size of HMF buildings to be constructed minus the total area cleared for the overnight layover/servicing facility. The area used in URBEMIS2007 was the total building construction area (720,399 square feet).

Track construction would include laying elevated, at-grade, and retained fill rail and constructing elevated structures and a retaining wall. As with Phase 2, Phase 3 emissions from track construction were estimated using the same approach described for the HST alignment construction. The length of track related to HMF operation was determined by subtracting the length of overnight layover/servicing facility track from the total HMF track length (presented in Table 6-4).

#### 6.8.3.7 Power Distribution Station Construction

Emissions associated with construction of the traction power substations, switching stations, and paralleling stations would be from mass site grading, building construction, and architectural coatings. Paving activities were not considered because these stations would not have paved areas and access roads would be covered with gravel.

The emissions from power distribution station construction were calculated using default parameters in URBEMIS2007 with the Light-Industry land use category. Two traction power substations, three switching stations, and four paralleling stations would be included in each HST alternative. For simplicity, only one of each station type was modeled in URBEMIS2007; the resulting emissions were multiplied by the number of stations to be constructed. Construction of all power distribution stations is expected to occur concurrently, beginning in 2016 and ending in 2018.

The URBEMIS2007 default number of construction equipment items was based on the total acres of building construction. The URBEMIS2007 default equipment list was used for the traction power substations; however, for the switching and paralleling stations, the default list was overwritten with the default equipment list for 1 acre of building construction, taken from Appendix H of the URBEMIS User's Guide, because otherwise, given their small size, the default number of equipment items used would be zero.

#### 6.8.3.8 Roadway Construction

The HST alternatives would include the relocation and expansion of freeway segments, local roads, and overpasses, and reconstruction of several intersections. Fugitive dust and exhaust emissions from these construction activities were estimated using default equipment lists and construction schedules from the Sacramento Roadway Construction Emissions Model (SMAQMD 2009) and input into the URBEMIS2007 model for calculation. In the absence of project-specific data, the SMAQCD default equipment settings were used. These defaults were input into URBEMIS2007 to provide consistency with the calculation methods used for other construction activities.

Roadway project construction would begin in 2013 and last for a total of 55 months. Each type of roadway project would be constructed independently at staggered intervals during this 55-month period. The total construction area was estimated using the project length and conservatively using a width of four lanes for all projects. Each lane was assumed to be 12 feet wide. It was also assumed that the maximum area disturbed would be 0.5 acre per day. Construction activities were assumed to occur 280 days per year.

Based on project-specific data, a simplified construction schedule was used to estimate construction emissions from four roadway project scenarios, and URBEMIS2007 modeling was used to estimate the emissions from each scenario. The representative project roadway length for each scenario was estimated by averaging all anticipated project roadway lengths within that designated scenario. Table 6-5 lists the roadway project scenarios and the anticipated construction duration.

To estimate construction emissions, the roadway projects were grouped by county, by size, and by inclusion in the RTPs (i.e., projects included in the RTPs were lumped, and projects not included in the RTPs were lumped). Projects listed in the RTPs may be subject to transportation conformity determinations, while projects not listed in the RTPs and occurring only as a result of the HST were included in the annual construction emissions for the project. Table 6-6 lists the number of roadway projects in each scenario for each alternative.

**Table 6-5**
Roadway Projects Scenarios

| Scenario | Project Size | Representative URBEMIS 2007 Modeling Conditions | |
|---|---|---|---|
| | | Project Roadway Length | Construction Duration |
| Small Projects | 1 mile or less | 0.4 mile | 1 year |
| Medium Project | More than 1 mile and less than or equal to 2.5 miles | 1.9 miles | 2 years |
| Large Projects | More than 2.5 miles | 6.0 miles | 2.5 years |
| Structures | All | 0.1 mile | 1 year |

**Table 6-6**
Number of Roadway Projects for Each Scenario

| County | Small Projects | Medium Projects | Large Projects | Structures |
|---|---|---|---|---|
| **Projects not Included in the RTPs** | | | | |
| **UPRR/SR 99 Alternative** | | | | |
| Merced[a] | 0 | 1 | 1 | 3 |
| Madera[a] | 18 | 6 | 3 | 14 |
| Fresno | 22 | 0 | 1 | 11 |
| **BNSF Alternative** | | | | |
| Merced | 3 | 0 | 1 | 6 |
| Madera[a] | 8 | 3 | 0 | 26 |
| Fresno | 22 | 0 | 1 | 11 |
| **Hybrid Alternative** | | | | |
| Merced | 2 | 1 | 1 | 3 |
| Madera[a] | 11 | 1 | 0 | 27 |
| Fresno[a] | 28 | 0 | 1 | 12 |
| **Projects Included in the RTPs** | | | | |
| **UPRR/SR 99 Alternative** | | | | |
| Merced | 2 | 0 | 0 | 2 |
| Madera | 0 | 0 | 0 | 0 |
| Fresno | 4 | 1 | 0 | 2 |
| **BNSF Alternative** | | | | |
| Merced | 0 | 0 | 0 | 0 |
| Madera | 0 | 0 | 0 | 0 |
| Fresno | 4 | 1 | 0 | 2 |

| County | Small Projects | Medium Projects | Large Projects | Structures |
|---|---|---|---|---|
| **Hybrid Alternative** | | | | |
| Merced | 1 | 0 | 0 | 2 |
| Madera | 0 | 0 | 0 | 0 |
| Fresno | 4 | 1 | 0 | 2 |
| [a]The maximum number of projects within each county, regardless of alternative option, is presented. | | | | |

#### 6.8.3.9 Demobilization

Demobilization would take approximately 29 months, beginning in August 2017. Emissions associated with demobilization were calculated using URBEMIS2007, using a site-specific land use category with properties similar to an industrial park. The land use area entered into URBEMIS2007 was conservatively estimated based on the longest alignment footprint (53,121,779 square feet based on the BNSF Alternative with Ave 24). While the construction activities were represented using a mass site grading phase, fugitive dust emissions during demobilization were presumed negligible because of minimal surface disturbance associated with this activity.

Two demobilization staging areas were assumed for the Merced to Fresno Section. Construction equipment is assumed to be built or rebuilt in the year 2005, and operating at a load factor of 0.65.

### 6.8.4 Construction Quantities and Schedule

Construction quantities and schedules for the HST Project were estimated by consultation with project engineers. For purposes of calculating emissions, the overall construction project was categorized into the “unit operations” listed in Table 6-7. Construction quantities (e.g., cubic yards of exported soil, cubic yards of concrete, and square feet of buildings) were estimated for each unit operation. Estimates of the type and number of off-road construction equipment required for each unit operation were then derived.

**Table 6-7**
Construction Unit Operations for Construction Emission Calculations

| Unit No. | Construction Unit Operation | Unit Quantity[a] | | | |
|---|---|---|---|---|---|
| | | BNSF Alternative | UPRR/SR 99 Alternative | Hybrid Alternative | Units |
| Building Demolition | | 21,677,900 | 28,847,400 | 24,020,900 | sq ft |
| **At-Grade Rail Segments** | | | | | |
| A-1 | Mainline Clear and Grub | 987 | 633 | 843 | acres |
| A-2 | Mainline Select Fill [b] | 1,360,546 | 894,875 | 1,198,054 | cy |
| A-3 | Mainline Cut | 1,700,683 | 1,118,594 | 1,497,568 | cy |
| A-4 | Mainline Ballast | 718,066 | 472,295 | 632,306 | cy |
| A-5 | Railway Ties (Concrete) | 188,965 | 124,288 | 166,396 | ties |
| A-6 | Rail | 99,773,394 | 65,624,172 | 87,857,311 | lb |
| A-7 | Mainline Track Laying | 377,930 | 248,576 | 332,793 | ft |
| **Elevated Rail Segments** | | | | | |
| E-1 | Mainline Clear and Grub | 203 | 509 | 283 | acres |
| E-2 | Mainline Select Fill [b] | 148,454 | 325,627 | 161,172 | cy |
| E-3 | Mainline Cut | 306,806 | 672,963 | 333,089 | cy |

| Unit No. | Construction Unit Operation | Unit Quantity[a] | | | |
|---|---|---|---|---|---|
| | | BNSF Alternative | UPRR/SR 99 Alternative | Hybrid Alternative | Units |
| E-4 | Mainline Ballast | 188,042 | 412,461 | 204,151 | cy |
| E-5 | Railway Ties (Concrete) | 49,485 | 108,542 | 53,724 | ties |
| E-6 | Rail | 26,127,992 | 57,310,361 | 28,366,722 | lb |
| E-7 | Reinforced Steel | 237,527,199 | 521,003,286 | 257,875,200 | lb |
| E-8 | Concrete | 989,697 | 2,170,847 | 1,074,480 | cy |
| E-9 | Mainline Track Laying | 98,970 | 217,085 | 107,448 | ft |
| **Retained-Fill Rail Segments** | | | | | |
| R-1 | Mainline Clear and Grub | 29 | 20 | 20 | acres |
| R-2 | Mainline Select Fill [b] | 231,219 | 175,122 | 171,316 | cy |
| R-3 | Mainline Cut | 4,868 | 3,687 | 3,607 | cy |
| R-4 | Mainline Ballast | 23,122 | 17,512 | 17,132 | cy |
| R-5 | Railway Ties (Concrete) | 6,085 | 4,608 | 4,508 | ties |
| R-6 | Rail | 3,212,722 | 2,433,278 | 2,380,393 | lb |
| R-7 | Reinforced Steel | 3,772,515 | 2,857,259 | 2,795,158 | lb |
| R-8 | Concrete | 973,552 | 737,357 | 721,331 | cy |
| R-9 | Mainline Track Laying | 12,169 | 9,217 | 9,017 | ft |
| **Maintenance Yard** | | | | | |
| MY-1 | Maintenance Yard Track (At-Grade) | 37,275 | 37,275 | 37,275 | ft |
| MY-2 | Maintenance Yard Track (Elevated) | 15,970 | 15,970 | 15,970 | ft |
| MY-3 | Maintenance Yard Track (Retained Fill) | 7,000 | 7,000 | 7,000 | ft |
| MY-4 | Maintenance Buildings | 727,676 | 727,676 | 727,676 | sq ft |
| **HST Stations** | | | | | |
| S-1 | Downtown Merced Station Buildings [c] | 465,600 | 465,600 | 465,600 | sq ft |
| S-2 | Downtown Fresno Station Buildings [d] | 465,600 | 465,600 | 465,600 | sq ft |
| **Power Substations** | | | | | |
| PS-1 | Traction Power Supply Stations | 3,250 | 3,250 | 3,250 | sq ft |
| PS-2 | Switching Stations | 450 | 450 | 450 | sq ft |
| PS-3 | Paralleling Stations | 450 | 450 | 450 | sq ft |

[a] The values presented represent the scenario with the highest source of emissions.
[b] Select fill includes the material used for fill and subballast.
[c] Includes three parking structures.
[d] The Downtown Fresno Station buildings were assumed equal in size to the Downtown Merced Station Buildings.

The currently available draft construction schedule was used for this analysis. Regional building demolition and/or site preparation is expected to begin in 2013, and the major construction activity for the other project elements is expected to be done from 2013 through 2021. There is no construction activity expected in 2020. The specific breakdown of individual construction activities and the construction schedule used to estimate emissions are provided in Appendix A.

### 6.8.5 Construction Impact Analysis

Air quality impacts of HST project construction would be evaluated under NEPA and CEQA contexts. Although the following criteria are discussed for construction impact analysis, the same criteria also apply to operational impact analysis.

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.

Per NEPA regulations, the regional project emissions are compared to the general conformity *de minimis* thresholds (GC thresholds) on a calendar-year basis. If the GC thresholds are exceeded for any calendar year in which emissions occur, a GC determination is required. In addition, the project emissions may not cause new violations or exacerbate an existing violation of NAAQS. Table 6-8 presents the *de minimis* thresholds for the project.

**Table 6-8**
General Conformity *De Minimis* Thresholds

| Pollutant | Federal Attainment Status | Threshold Values (tpy)[a] |
|---|---|---|
| $NO_2$ | Attainment | N/A |
| Ozone precursor ($NO_x$)[b] | Nonattainment: Extreme | 10 |
| Ozone precursor (VOCs)[b] | Nonattainment: Extreme | 10 |
| CO[c] | Maintenance | 100 |
| $SO_x$ | Attainment | N/A |
| $PM_{2.5}$ | Nonattainment | 100 |
| $PM_{2.5}$ precursor ($SO_2$) [d] | Nonattainment | 100 |
| $PM_{10}$ | Maintenance | 100 |
| Pb | No Designation | N/A |

N/A = not applicable
[a]Thresholds from 40 CFR Parts 51 and 93.
[b]$O_3$ 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 tpy. 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 or evaluation is included for $SO_2$ in this report.
[e] Source of attainment status: SJVAPCD (2010), EPA (2010d)

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.

Pursuant to CEQA Guidelines, impacts on air quality would be considered 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.
- 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 $O_3$ 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 reducing the emissions of GHG.

The SJVAPCD GAMAQI (SJVAPCD 2002) contains the emissions thresholds used to evaluate the significance of a project's emissions with regard to air quality standards. If a project's emissions are below the significance thresholds as listed in Table 6-9, the impact would be considered less than significant and would not lead to a violation of an ambient air quality standard or conflict with an air quality plan. If either the construction- or operational-phase emissions are greater than these values, impacts for that phase would be considered potentially significant. Additionally, as per the SJVAPCD GAMAQI, if a project is individually significant, it is also considered cumulatively significant; therefore, the thresholds listed in Table 6-9 are also the cumulative significance thresholds for the project.

**Table 6-9**
SJVAPCD CEQA Construction and Operational Thresholds of Significance

| Pollutant | Thresholds (tpy) |
|---|---|
| $NO_x$ | 10 |
| ROG | 10 |
| $PM_{10}$ | 15 |
| $PM_{2.5}$ | 15 |

Notes:
$NO_x$ = nitrogen oxides
$PM_{10}$ = particulate matter smaller than or equal to 10 µm in diameter
$PM_{2.5}$ = particulate matter smaller than or equal to 2.5 µm in diameter
ROG = reactive organic gases
Source: 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.

The 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.

# 7.0 Impact Analysis

Using the methodologies described in Section 6, the impacts of the proposed project were evaluated and are discussed in the following sections.

## 7.1 Statewide and Regional Operational Emission Analysis

Table 7-1 summarizes estimated statewide emission burden changes due to the project in 2035. As shown, the project is predicted to have a beneficial effect on (i.e., reduce) statewide emissions of applicable pollutants. The analysis estimated the emission changes due to projected reductions of on-road VMT and intrastate air travel, and increases in electrical demand (required to power the HST). In the existing conditions vs. existing plus project analysis, the project is also predicted to have a beneficial effect (i.e., reduce) statewide emissions of all applicable pollutants, as compared to the existing conditions.

**Table 7-1**
2035 Estimated Statewide Emission Burden Changes Due to the HST

| Project Element | HC (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 |
| Planes | -237 | -2,154 | -2,884 | -201 | -22 | -22 |
| Energy (Power Plants) | 37 | 380 | 256 | 33 | 55 | 47 |
| Total | **-725** | **-12,346** | **-5,407** | **-223** | **-502** | **-298** |
| Note: Totals may not add up exactly due to rounding. | | | | | | |

### 7.1.1 On-Road Vehicles

As shown in Table 7-2, the HST is predicted to reduce daily roadway VMT by more than 30 million due to travelers using the HST rather than driving. The on-road vehicle emission analysis is based on VMT changes and associated average daily speed estimates, calculated for each affected county. Emission factors were obtained from EMFAC2007, using parameters set within the program for each individual county to reflect travel within each county and statewide parameters to reflect travel through each county. As shown in Table 7-2, the proposed project is predicted to have either no measurable effect or slightly reduce regional emissions, as compared to the No Project Alternative. This is demonstrated on both a county and statewide level.

In the existing conditions vs. existing plus project analysis, it is estimated that the project will reduce daily VMT in every county and by over 17 million miles a day statewide. As such, it is predicted to reduce roadway emissions by approximately 2% as compared to the existing scenario, due to travelers choosing to use the HST rather than drive.

**Table 7-2**
2035 On-Road Vehicle Emission Changes Due to the HST

| County | No Project VMT Total Traffic | Project VMT Total Traffic | Change in Emissions with HST (tons/year) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | VOC | CO | $NO_x$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ |
| Alameda | 44,195,495 | 43,551,929 | -12.94 | -244.34 | -64.16 | -1.29 | -12.17 | -7.51 |
| Alpine | 1,403,945 | 1,401,217 | -0.04 | -0.88 | -0.24 | 0.00 | -0.05 | -0.03 |
| Amador | 4,661,019 | 4,646,828 | -0.23 | -4.59 | -1.23 | -0.02 | -0.23 | -0.14 |
| Calaveras | 1,414,871 | 1,383,696 | -0.50 | -10.34 | -2.75 | -0.05 | -0.51 | -0.30 |
| Contra Costa | 27,867,886 | 27,667,001 | -4.04 | -76.30 | -20.04 | -0.40 | -3.80 | -2.34 |
| El Dorado | 9,405,356 | 9,379,731 | -0.44 | -8.86 | -2.34 | -0.04 | -0.43 | -0.27 |
| Fresno | 27,367,949 | 24,364,285 | -47.13 | -965.60 | -259.83 | -4.83 | -49.55 | -29.00 |
| Imperial | 12,187,692 | 12,170,172 | -0.54 | -8.88 | -3.70 | -0.04 | -0.38 | -0.24 |
| Inyo | 5,178,956 | 5,158,901 | -0.33 | -6.32 | -1.73 | -0.03 | -0.33 | -0.20 |
| Kern | 39,240,101 | 35,149,202 | -65.88 | -1,333.46 | -357.57 | -6.59 | -67.51 | -39.52 |
| Kings | 3,136,720 | 2,663,113 | -7.81 | -149.39 | -41.16 | -0.76 | -7.81 | -4.76 |
| Los Angeles | 265,560,319 | 259,698,490 | -97.91 | -2,058.08 | -503.08 | -10.88 | -102.86 | -63.68 |
| Madera | 8,532,552 | 8,256,392 | -4.56 | -87.00 | -23.89 | -0.44 | -4.56 | -2.78 |
| Marin | 7,961,630 | 7,866,736 | -1.99 | -36.58 | -9.62 | -0.19 | -1.79 | -1.15 |
| Mariposa | 873,461 | 846,009 | -0.44 | -8.95 | -2.40 | -0.04 | -0.45 | -0.27 |
| Merced | 13,534,370 | 12,018,453 | -24.47 | -479.41 | -131.50 | -2.45 | -25.07 | -14.68 |
| Mono | 1,378,612 | 1,365,352 | -0.25 | -4.34 | -1.22 | -0.02 | -0.23 | -0.14 |
| Monterey | 13,864,584 | 13,123,028 | -11.64 | -236.00 | -63.85 | -1.19 | -12.23 | -7.16 |
| Napa | 4,838,702 | 4,792,647 | -1.02 | -18.34 | -4.82 | -0.09 | -0.91 | -0.59 |
| Nevada | 7,648,230 | 7,575,684 | -1.14 | -23.32 | -6.28 | -0.12 | -1.20 | -0.70 |
| Orange | 94,555,953 | 92,699,029 | -30.14 | -643.40 | -154.39 | -3.54 | -31.74 | -19.03 |
| Placer | 12,357,969 | 12,212,333 | -2.46 | -49.75 | -13.18 | -0.23 | -2.46 | -1.46 |
| Riverside | 101,286,914 | 99,801,479 | -27.04 | -530.88 | -149.04 | -2.99 | -26.94 | -16.53 |
| Sacramento | 33,432,730 | 32,754,592 | -10.83 | -224.06 | -58.77 | -1.09 | -11.14 | -6.51 |
| San Benito | 3,361,404 | 2,968,595 | -6.34 | -124.21 | -33.92 | -0.63 | -6.49 | -3.80 |
| San Bernardino | 96,726,005 | 95,709,159 | -18.83 | -350.19 | -112.76 | -1.86 | -18.55 | -11.14 |
| San Diego | 158,273,980 | 156,278,290 | -36.15 | -716.62 | -188.64 | -4.01 | -35.33 | -21.68 |
| San Francisco | 10,557,241 | 10,413,805 | -3.23 | -55.60 | -13.53 | -0.31 | -2.79 | -1.79 |
| San Joaquin | 22,717,713 | 21,198,249 | -24.51 | -478.97 | -131.36 | -2.45 | -25.09 | -15.28 |

| County | No Project VMT Total Traffic | Project VMT Total Traffic | Change in Emissions with HST (tons/year) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | VOC | CO | $NO_x$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ |
| San Luis Obispo | 8,411,244 | 7,940,789 | -7.76 | -148.21 | -40.69 | -0.76 | -7.76 | -4.73 |
| San Mateo | 24,218,646 | 23,804,290 | -6.55 | -142.28 | -26.88 | -0.73 | -6.84 | -4.10 |
| Santa Barbara | 8,094,082 | 7,592,558 | -7.87 | -159.61 | -43.18 | -0.81 | -8.27 | -4.84 |
| Santa Clara | 50,863,603 | 49,956,147 | -17.27 | -334.90 | -83.25 | -1.78 | -16.46 | -10.30 |
| Santa Cruz | 2,600,612 | 2,564,302 | -0.60 | -12.29 | -3.23 | -0.06 | -0.61 | -0.36 |
| Solano | 16,101,043 | 15,928,916 | -3.32 | -63.44 | -16.69 | -0.35 | -3.12 | -1.94 |
| Sonoma | 12,738,505 | 12,651,479 | -1.82 | -33.54 | -8.82 | -0.18 | -1.65 | -1.05 |
| Stanislaus | 11,477,980 | 10,480,727 | -16.06 | -324.98 | -87.16 | -1.61 | -16.45 | -9.63 |
| Sutter | 3,878,420 | 3,828,474 | -0.80 | -16.28 | -4.36 | -0.08 | -0.82 | -0.48 |
| Tulare | 10,112,011 | 9,648,380 | -7.46 | -146.06 | -39.92 | -0.75 | -7.65 | -4.66 |
| Tuolumne | 1,766,709 | 1,734,529 | -0.58 | -11.55 | -3.04 | -0.06 | -0.57 | -0.35 |
| Ventura | 26,635,805 | 26,352,804 | -4.82 | -101.70 | -22.34 | -0.57 | -4.80 | -2.95 |
| Yolo | 7,858,254 | 7,661,590 | -3.17 | -62.13 | -16.90 | -0.32 | -3.24 | -1.90 |
| Yuba | 2,207,207 | 2,185,401 | -0.35 | -7.23 | -1.92 | -0.04 | -0.36 | -0.21 |
| Rest of CA (North of Bay Area/ Sacramento) | 34,117,813 | 33,886,195 | -3.83 | -73.02 | -20.02 | -0.37 | -3.82 | -2.33 |
| Statewide Total | 1,254,604,293 | 1,223,330,976 | -525 | -10,572 | -2,775 | -55 | -535 | -323 |
| Regional | 49,434,871 | 44,639,130 | -76 | -1,532 | -415 | -7.7 | -79 | -46 |

Based on the traffic analysis, all the HST alternatives evaluated would have the same regional VMT and the same regional emissions. Under the HST alternatives design year, the regional VMT would decrease by about 10% compared to the No Project Alternative for Merced and Madera counties and about 2% compared to existing conditions. These reductions would result in lower pollutant emissions. The benefits presented depend on ridership. Therefore, lower ridership than those assumed in the design and planning values would result in fewer benefits, while higher ridership would result in more benefits.

### 7.1.2 Train Movement

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 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). Based on the EPA methodology for estimating emissions from wind erosion (EPA 2006c), HST operations would generate approximately 22 tpy of PM10 and 3.2 tpy of PM2.5. Details of these calculations are included in Appendix C.

### 7.1.3 Airport Emissions

The HST Project could affect travel at four regional airports in the study area: Fresno Yosemite International Airport, Merced Municipal/Macready Field, 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 be reduced by about one flight per day. This would reduce regional airport-related emissions of CO, $NO_x$, and VOCs relative to the No Project Alternative and existing conditions. As shown in Table 7-3, the HST is predicted to reduce the number of plane flights due to travelers using the HST rather than flying to their destination. EDMS was used to estimate airplane emission factors. The EDMS estimated the emissions generated from the projected number of LTO 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 servicing the San Francisco to Los Angeles corridor. The number of air trips removed due to the HST was estimated in the travel demand modeling analysis conducted for the project. In the existing conditions vs. existing plus project analysis, it is estimated that the project will reduce the number of air trips by over 200 flights per day statewide, resulting in a reduction of emissions from planes, as compared to the existing scenario, due to travelers choosing to use the HST rather than fly.

As shown in Table 7-3, the proposed project is predicted to either have no measurable effect or slightly reduce regional emissions in 2035 due to the HST as compared to the No Project Alternative.

**Table 7-3**
2035 Aircraft Emission Changes Due to the Project

| Origin | No. of Flights Removed | Change in Emission Burdens due to HST (tpy) | | | | | |
|---|---|---|---|---|---|---|---|
| | | VOC | CO | $NO_x$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ |
| Central Coast | -1 | 0 | -7.3 | -7.3 | -0.52 | 0 | 0 |
| Far North | -16 | -10.95 | -87.6 | -120.45 | -8.30 | 0 | 0 |
| Fresno/Madera | 0 | 0 | 0 | 0 | 0.00 | 0 | 0 |
| Kern | -16 | -10.95 | -87.6 | -120.45 | -8.30 | 0 | 0 |
| Los Angeles Basin_North | -43 | -25.55 | -240.9 | -321.2 | -22.31 | -3.65 | -3.65 |
| Los Angeles Basin_South | -88 | -54.75 | -489.1 | -657 | -45.65 | -3.65 | -3.65 |
| Merced | -1 | 0 | -7.3 | -7.3 | -0.52 | 0 | 0 |
| Monterey Bay | -16 | -10.95 | -87.6 | -120.45 | -8.30 | 0 | 0 |
| Sacramento Region | -16 | -10.95 | -87.6 | -120.45 | -8.30 | 0 | 0 |
| San Diego Region | -47 | -29.2 | -262.8 | -350.4 | -24.38 | -3.65 | -3.65 |
| San Joaquin | -7 | -3.65 | -40.15 | -51.1 | -3.63 | 0 | 0 |
| San Francisco Bay Area | -130 | -80.3 | -722.7 | -967.25 | -67.44 | -7.3 | -7.3 |
| South San Joaquin Valley | 0 | 0 | 0 | 0 | 0.00 | 0 | 0 |
| Stanislaus | -5 | -3.65 | -29.2 | -36.5 | -2.59 | 0 | 0 |
| Western Sierra Nevada | -1 | 0 | -7.3 | -7.3 | -0.52 | 0 | 0 |

| Origin | No. of Flights Removed | Change in Emission Burdens due to HST (tpy) | | | | | |
|---|---|---|---|---|---|---|---|
| | | VOC | CO | $NO_x$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ |
| Statewide Total | -387 | -237 | -2,154 | -2,884 | -201 | -22 | -22 |
| Regional Total | -1 | 0.00 | -7.3 | -7.3 | -0.52 | 0.00 | 0.00 |

### 7.1.4 Indirect Power Plant Emissions

The HST is expected to increase electrical requirements as compared to the No Project Alternative and existing conditions. Statewide, the electrical demand due to propulsion of the trains and operation of the trains at terminal stations, storage depots, and maintenance facilities were conservatively estimated to be 8.32 gigawatt-hours (GWh) per day (including transmission losses of approximately 3%) in 2035. To derive the portion of electricity usage required by the Merced to Fresno Section, the alignment distance for each alternative was divided by the total HST distance of 830 miles. The result was multiplied by the calculated emissions for the entire HST. Average emission factors (in terms of grams per kilowatt-hour) were derived from CARB statewide emission inventories of electrical and cogeneration facilities data along with the California Energy Commission's electrical generation data. As shown in Table 7-4, the project is expected to increase emissions. This change is predicted to occur in the 2035 build scenario. Increase in electrical requirements for the existing conditions plus project scenario are presented in Appendix E

**Table 7-4**
Power Plant Emission Changes Due to the Project

| Electricity Required (GWh per day) | Change in Emissions due to HST (tons/year) | | | | | |
|---|---|---|---|---|---|---|
| | VOC | CO | $NO_x$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ |
| 8.32 (Statewide) | 37 | 380 | 256 | 33 | 55 | 47 |
| 0.84 (Regional) | 3.7 | 38 | 26 | 3.3 | 5.5 | 4.8 |
| Note: Regional emission changes vary depending on the length of the alternative alignment. Regional emissions in the table represent the emissions corresponding to the longest alignment alternative. | | | | | | |

The system would be powered by the state's electrical grid, and, therefore, no single generation source for the electrical power requirements can be identified. Emission changes from power generation were therefore predicted on a statewide level only. The estimated emission changes shown in Table 7-4 are considered to be conservative because they are based on the current electrical profile of the state. The State of California is requiring an increasing fraction (33% by 2020) of electricity generated for the state's power portfolio to come from renewable energy sources. As such, the emissions generated for powering the HST System are expected to be lower in the future as compared to emission estimates used in this analysis based on the 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.

## 7.2 Local Operational Emission Sources

Operation of the Downtown Merced and Downtown Fresno stations and the HMF would produce criteria and GHG emissions. The operation of the power traction, switching, and paralleling stations would not result in appreciable quantities of air pollutants because site visits would be infrequent and power usage would be limited. Therefore, emissions from these stations were not quantified.

### 7.2.1 HST Stations

Operation of the Downtown Merced and Downtown Fresno stations and associated mobile sources would produce criteria and GHG emissions.

Emissions associated with the operation of the Downtown Merced and Fresno 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 train stations were considered negligible. URBEMIS2007 was used to estimate these emissions from each station, based on the square footage of the stations. Operation emissions for the Downtown Fresno Station were taken from *Fresno to Bakersfield Section Air Quality Technical Report* (Authority and FRA 2011b). The unmitigated criteria pollutant and GHG emissions were estimated for the design year and are included in Table 7-5.

**Table 7-5**
HST Station Operational Emissions

| Project Component | Emissions (tpy) | | | | | | |
|---|---|---|---|---|---|---|---|
| | VOCs | CO[a] | $NO_x$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ | $CO_2$ |
| **Operational Year 2035** | | | | | | | |
| Merced HST Station | 0.84 | 64 | 4.7 | 0.38 | 3.7 | 2.1 | 37,952 |
| Fresno HST Station | 0.55 | 41 | 3.4 | 0.25 | 2.4 | 1.4 | 24,530 |

[a] The operational emissions do not include CO emissions from traffic congestion in the parking structures.

### 7.2.2 Maintenance Facilities

#### 7.2.2.1 Overnight Layover/Servicing Facility

The activities that would occur at the overnight layover/servicing facilities associated with the HST include inspections (on-board diagnostics, train interiors, train exteriors), cleaning, washing, trash removal, toilet services, commissary restocking, minor repair work, replacement of module components, and welding. These facilities would also store oxygen, acetylene, grease, oil, cleaning solvents, batteries, and cleaning tanks.

None of these activities or storage requirements would result in the generation of air pollutant emissions in quantities that would limit the location of these maintenance facilities from nearby sensitive receptors. Setback constraints, if any, required for other environmental or land use disciplines (e.g., zoning, aesthetics, noise) should be sufficient to protect existing or future nearby land uses from potentially significant air quality impacts from these maintenance facilities.

#### 7.2.2.2 Heavy Maintenance Facility

HSTs require special facilities to support the commissioning activities, layup/storage, and maintenance program requirements. This section describes the processes related to the HMF along with their associated emissions. The overnight layover/servicing facilities would be co-located with the HMF.

Site-specific information for all activities at the HMF is not available at this time; however, reasonable assumptions were made based on the type of activities at the facility. If the proposed HMF is built, stationary sources would require permits from the SJVAPCD. The Permit to Operate (PTO) would include detailed emission calculations, permit conditions, and emission controls for these sources.

**HMF Sources with Minimal Air Emissions**

The following activities are associated with the maintenance activities that would occur at or near the HMF and are not likely to result in air emissions. These activities are not likely to result in air emissions because they do not involve the type or quantity of materials, chemicals, or activities regulated by federal, state, or local air quality regulatory agencies:

- Daily inspection tests and repair of small parts.
- Replacement of module components, as well as truck change-outs, air brake change-outs, motor/ wheel set change-outs, power supplies, batteries, and control groups.
- Overhauls that will remove, inspect, test, perform minor repair, and assemble components from the train car (e.g., power supply, air compressors, batteries, controls group, generators/ alternators).
- Steam-cleaning of exteriors and other parts.
- Battery charging and storage rooms.
- Electronic shop.
- Light interior car cleaning and trash removal.
- Toilet servicing.
- Overhead crane and heavy lifting equipment (e.g., forklifts) to facilitate vehicle assembly and disassembly. Based on a conversation with the engineer at Hatch Mott MacDonald, the cranes and lifts will likely be electric because this is what occurs at other maintenance facilities for HSTs around the world (Earle and Tamhane 2010). As a result, there will be minimal emissions from these activities.

**HMF Stationary Sources with Potential Permit Requirements**

The following activities associated with maintenance at the HMF could be a source of air emissions. These sources would meet federal, state, and local regulatory requirements and may require a permit to operate. The potential types of emissions and sourcesare discussed for identified activities:

- Paint Booths: To provide onsite painting of the exterior and parts associated with the train cars, the HMF would have onsite spray booths. The spray booths would be closed areas, which would maximize capture efficiency, and would have explosion-proof lights with ventilation/ filtration systems. Train car parts would likely be painted using an air gun in a closed or self-contained spray booth (PSC 2007). VOC and PM emissions are typical from spray booths. Additionally, TACs would likely be released, with the quantity and type depending on the type of paint used. VOC, PM, and TAC emissions are expected from these painting operations. A permit application and a health risk assessment would be required prior to operation of a spray booth.
- Stationary Diesel Engines: Potential stationary diesel engines at the HMF such as internal combustion engines and other stationary engines with 200 horsepower (hp) engine size. At this time, there is no site-specific information for these stationary sources; however, these sources would require a permit to operate (PTO) before the facility could be constructed. Criteria pollutant emissions, such as NOx, VOCs, $PM_{10}$, and $PM_{2.5}$ would be expected from these stationary sources.
- The emissions calculated for the onsite mobile diesel sources would represent the majority of emissions based on the diesel fuel use data.

**HMF Mobile Sources**

Typical mobile emissions at the HMF would be associated with employee trips to and from the facility, material and equipment deliveries, switchyard locomotives, and on-site diesel trucks. The main contributor to VOC and $NO_x$ emissions would be fuel consumption by onsite mobile sources at the HMF. There would be two switch locomotives (for maintenance-of-way operations) and twenty diesel trucks operating at the site.

The HMF may use some purchased power, but this would likely be small relative to the amount of fuel consumed by sources associated with maintenance activities during operation. Therefore, only GHG emissions associated with the combustion of fuel vehicles at the maintenance facilities were quantified.

Table 7-6 lists the emissions associated with the HMF and overnight layover/servicing facility. Details for the assumptions and emissions associated with each source are included in Appendix C.

**Table 7-6**
Maintenance Facility Operational Impacts

| Project Component | Emissions (tpy)[a] | | | | | | |
|---|---|---|---|---|---|---|---|
| | VOCs | CO [b] | $NO_x$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ | $CO_2$ |
| **Operational Year 2035** | | | | | | | |
| HMF onsite emissions | 0.56 | 9.0 | 3.5 | 0.47 | 0.13 | 0.12 | 18,563 |
| HMF offsite mobile source emissions | 0.21 | 12 | 1.6 | 0.072 | 0.70 | 0.40 | 7,094 |
| Overnight Layover/Servicing Facility offsite emissions | 0.0039 | 0.30 | 0.021 | 0.0018 | 0.018 | 0.010 | 176 |

[a] Since operational emissions from the alignment are not being considered, the operational impacts will be identical for the alternatives considered.
[b] The operational emissions do not include CO emissions from traffic congestion in the parking structures.

**HMF Air Dispersion Modeling Results**

***Criteria Pollutants***

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 property line of the HMF (Table 7-7). $PM_{10}$ 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 $PM_{2.5}$ NAAQS and CAAQS as well as the $PM_{10}$ CAAQS; therefore, the project emissions of $PM_{10}$ or $PM_{2.5}$ may contribute to the exceedance of these standards at the facility boundary where the worst-case ground-level concentration of pollutants from HMF would occur.

**Table 7-7**
Total Estimated Concentrations of Criteria Pollutants at HMF Property Line

| Pollutant | Averaging Time Period | CAAQS (µg/m3) | NAAQS (µg/m3) | Estimated Concentra-tions (µg/m3) | Background Concentra-tions (µg/m3) | Total Estimated Concentra-tions (µg/m3) | Exceed CAAQS? | Exceed NAAQS? |
|---|---|---|---|---|---|---|---|---|
| $NO_2$ | 1-hour | 339 | 188 | 25.2 | 81.8 | 106.9 | No | No |
| | Annual | 57 | 100 | 2.3 | 30.1 | 32.4 | No | No |
| $PM_{10}$ | 24-hr | 50 | 150 | 0.44 | 99.5 | 99.9 | Yes | No |
| | Annual | 20 | — | 0.15 | 40.5 | 40.7 | Yes | — |
| $PM_{2.5}$ | 24-hr | — | 35 | 0.25 | 81.6 | 81.8 | — | Yes |
| | Annual | 12 | 15 | 0.08 | 15.23 | 15.3 | Yes | Yes |

µg/$m^3$ micrograms per cubic meter
CAAQS California Ambient Air Quality Standards
NAAQS National Ambient Air Quality Standards
NO2 nitrogen dioxide
$PM_{10}$ particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$ particulate matter smaller than or equal to 2.5 microns in diameter

### *CO Hot-Spot Analysis*

Four of the five HMF sites are in rural areas away from sensitive receptors, but the Castle Commerce Center HMF site is close to sensitive receptors. Because CO hot spots typically occur in congested areas, they would not occur at most of the HMF locations. As discussed in the microscale CO analysis, intersections near the Castle Commerce Center HMF site were evaluated in the CO hot-spot analysis. The intersections modeled were found to have CO concentrations less than NAAQS and CAAQS.

### *Toxic Air Contaminants*

The HMF would be a source of TACs and particulate emissions, and sensitive receptors near the HMF site could be exposed to increased levels of these pollutants because of onsite operations and the increase in truck deliveries congregating around the HMF.

Chronic Noncancer Risk: Chronic noncancer risk was estimated for pollutants for which noncancer RfC (reference dose concentration) guideline values are available from EPA's Integrated Risk Information System (IRIS), Prioritized Chronic Dose-Response Values for Screening Risk Assessments (EPA 2007), and REL (Reference Exposure Limit) values from OEHHA Air Toxics Hot Spots Program Risk Assessment Guidelines, (Cal-EPA 2003), and OEHHA/ARB Approved Health Values for Use in Hot Spot Facility Risk Assessments. The total maximum chronic hazard index at the HMF property line is estimated to be less than 1, using both EPA and OEHHA health risk values. As such, potential chronic noncancer risks associated with HMF operations are considered to be less than significant. Detail analysis and chronic noncancer risk results can be found in Appendix F.

Acute Risk: Acute Risk was estimated for pollutants for which acute inhalation exposure criteria values are available from the Prioritized Chronic Dose-Response Values for Screening Risk Assessments (EPA 2007) and acute REL values from OEHHA Air Toxics Hot Spots Program Risk Assessment Guidelines (Cal-EPA 2003), OEHHA/ARB Approved Health Values for Use in Hot Spot Facility Risk Assessments. The total maximum acute hazard index at the HMF property line is estimated to be less than 1 – using both EPA and OEHHA health risk values. As such, potential acute health risks associated with HMF operations are not considered to be significant. Detailed analysis and acute risk results can be found in Appendix F.

Cancer Risk: Maximum cancer risks were estimated at various distances from the HMF boundary until impacts were not considered to be significant. Based on the results of these preliminary analyses, it was determined that at a distance of approximately 1,300 feet from the facility boundary, the overall incremental cancer impacts would decrease to below applicable significant thresholds. The maximum cancer risks at various distances from the HMF boundary were computed using procedures recommended by SJVAPCD and OEHHA, which assume continuous exposure over a 70-year life-time for residences. The calculations at various distances from the facility boundary were performed for DPM and other applicable carcinogenic pollutants (Table 7-8). As shown, incremental cancer risk would decrease to below 10 in a million ($10 \times 10^{-6}$) CEQA significance thresholds at a distance 1,300 feet from HMF boundary. As such, the estimated cancer risk at distances greater than 1,300 feet from the HMF boundary is considered to be less than significant. Three of the five HMF sites, Castle Commerce Center, Gordon-Shaw, and Kojima Development HMF sites, may have sensitive receptors located within 1,300 feet where the cancer risk exceeds 10 in a million. Therefore, there might be potential cancer risk impacts from HMF site operations at these HMF sites. Detailed risk analyses are presented in Appendix F.

## 7.3 Total Operational Emissions

Table 7-9 shows a summary of the total emission changes due to HST operation, including the indirect emissions from regional vehicle travel, aircraft, and power plants, and direct project operational emissions from HST stations, maintenance facilities, and train movements. The project would result in a net regional decrease in emissions of criteria pollutants. These decreases would be beneficial to the SJVAB and help the basin meet its attainment goals for $O_3$ and particulates ($PM_{10}$ and $PM_{2.5}$). However, lower ridership would result in fewer regional benefits, although even with lower ridership there would be a net benefit.

**Table 7-8**
Incremental Cancer Risk Values at Different Distances from HMF[a]

| Pollutant | 500 ft | | 1,000 ft | | 1,300 ft | | 2,000 ft | | 3,000 ft | | 5,000 ft | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Estimated Conc. ($ug/m^3$) | Cancer Risk per million | Estimated Conc. ($ug/m^3$) | Cancer Risk per million | Estimated Conc. ($ug/m^3$) | Cancer Risk per million | Estimated Conc. ($ug/m^3$) | Cancer Risk per million | Estimated Conc. ($ug/m^3$) | Cancer Risk per million | Estimated Conc. ($ug/m_3$) | Cancer Risk per million |
| Diesel PM | 0.04262 | 17.669 | 0.02858 | 11.846 | 0.02334 | 9.674 | 0.01640 | 6.797 | 0.01121 | 4.645 | 0.00636 | 2.637 |
| Benzene | 0.00079 | 0.030 | 0.00053 | 0.020 | 0.00043 | 0.016 | 0.00030 | 0.011 | 0.00021 | 0.008 | 0.00012 | 0.004 |
| Acetaldehyde | 0.00112 | 0.004 | 0.00075 | 0.003 | 0.00061 | 0.002 | 0.00043 | 0.002 | 0.00029 | 0.001 | 0.00017 | 0.001 |
| 1,3-Butadiene | 0.00003 | 0.007 | 0.00002 | 0.004 | 0.00002 | 0.004 | 0.00001 | 0.003 | 0.00001 | 0.002 | 0.000004 | 0.001 |
| Formaldehyde | 0.00223 | 0.018 | 0.00150 | 0.012 | 0.00122 | 0.010 | 0.00086 | 0.007 | 0.00059 | 0.005 | 0.00033 | 0.003 |
| Methylene Chloride | 0.00346 | 0.005 | 0.00232 | 0.003 | 0.00189 | 0.002 | 0.00133 | 0.002 | 0.00091 | 0.001 | 0.00052 | 0.001 |
| Total Incremental Cancer Risk | | 17.7 | | 11.9 | | 9.7 | | 6.8 | | 4.7 | | 2.6 |

[a] Based on the estimated 5-years average (2005-2009) annual ground-level concentrations
HMF - heavy maintenance facility

**Table 7-9**
Summary of Regional Emissions Changes Due to HST Operation in Design Year – 2035 (tpy)

| Activities | VOCs | 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 | 26 | 3.3 | 5.5 | 4.8 |
| **Direct Emissions** | | | | | | |
| Station operation | 1.4 | 105 | 8.2 | 0.63 | 6.1 | 3.5 |
| HMF onsite emissions | 0.56 | 9.0 | 3.5 | 0.47 | 0.13 | 0.12 |
| 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 | N/A | N/A | N/A | N/A | 22 | 3.2 |
| Total[b] | -70 | -1,375 | -383 | -3.8 | -45 | -34 |

[a]The changes in power plant emissions are presented for the longest alternative.
[b]The total includes the indirect and direct emissions.

## 7.4 Microscale CO Analysis

A CO hot-spot analysis was performed for intersections that could potentially cause a localized CO hot spot and the parking structures associated with the train stations. The modeled CO concentrations were combined with CO background concentrations and compared with the air quality standards. The CO hot-spot analysis results would be the same for all HST alternatives evaluated.

### 7.4.1 Intersections

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 intersections 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 or traffic conditions.

CO concentrations were modeled at three intersections near the proposed Downtown Merced HST station, three intersections near the proposed Downtown Fresno stations, three intersections near the proposed Castle Commerce Center HMF, and two intersections between Herndon Avenue and Shaw Ave north of SR 99. Additionally, three intersections affected by the realignment and widening of SR 99 were evaluated. Figures 7-1, 7-2, and 7-3 show the locations of the intersections evaluated for CO hot spots near the Downtown Merced Station and the Castle Commerce Center HMF site, Herndon Avenue and Shaw Avenue and along SR 99, and the Downtown Fresno Station, respectively.

Intersections modeled in this analysis are signalized, as traffic volumes at the unsignalized intersections in the study area are less than those at signalized intersections. Table 7-10 summarizes the modeled CO concentrations at the intersections around the proposed Downtown Merced Station and Castle Commerce Center HMF. Table 7-11 summarizes the modeled CO concentrations around the Downtown Fresno station and intersections in areas between Herndon Avenue and Shaw Avenue. Table 7-12 summarizes the modeled CO concentrations at the intersections along SR 99 for the roadway realignment projects. Modeling results for intersections near Downtown Fresno Station were taken from *Fresno to Bakersfield Section Air Quality Technical Report* (Authority and FRA 2011b).

The results presented in Tables 7-10 through 7-12 include the HST alternatives as well as the natural growth and other transportation improvement projects in the region, as described in the *Merced to Fresno Transportation Technical Report* (Authority and FRA 2011c). 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 those for existing conditions in 2009. HST alternatives would have slightly higher CO concentrations at intersections than the No Project Alternative in 2035 due to the additional traffic caused by the station or HMF operation. Predicted CO concentrations for all modeled intersections are below the national and state standards and, therefore, are not expected to cause violations of CO standards during project operation.

In addition to this analysis, a comparison was performed among the HST alternatives, not accounting for natural growth and other transportation improvement projects in the region (i.e., existing conditions plus project) relative to existing conditions. Details of the CO hot-spot analysis of the HST alternatives compared to existing conditions are included in Appendix E.

**Table 7-10**
Maximum Modeled CO Concentrations at Intersections near the Merced HST Station and Castle Commerce Center HMF Site[a]

| Intersection | 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 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] |
| **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 Downtown Merced Station contributes to the modeled impacts; therefore additional modeling was not done for the Castle Commerce Center HMF.

**Table 7-11**
Maximum Modeled CO Concentrations at Intersections near the Fresno HST Station[a] and Herndon Avenue and Shaw Avenue[b]

| Inter-section | Existing Conditions | | 2035 No Project/No Action | | 2035 Project Option | |
|---|---|---|---|---|---|---|
| | Max 1-Hour CO Concen-tration (ppm) | Max 8-Hour CO Concen-tration (ppm)[c] | Max 1-Hour CO Concen-tration (ppm) | Max 8-Hour CO Concen-tration (ppm)[c] | Max 1-Hour CO Concen-tration (ppm) | Max 8-Hour CO Concen-tration (ppm)[c] |
| **Fresno HST Station Area** | | | | | | |
| Van Ness Street/ Inyo Street | 3.6 | 2.7 | 3.3 | 2.5 | 3.3 | 2.5 |
| S Street/ Tulare Street | 3.6 | 2.7 | 3.5 | 2.6 | 3.5 | 2.6 |
| Van Ness Avenue/ Fresno Street | 3.8 | 2.8 | 3.3 | 2.5 | 3.4 | 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 | 4.7 | 2.98 |
| 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] | 4.5 | 2.84 | 4.7 | 2.98 |
| **Ambient Air Quality Standards** | | | | | | |
| CAAQS | 20 | 9 | 20 | 9 | 20 | 9 |
| NAAQS | 35 | 9 | 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).

[d] These intersections did not exist in 2009 but were included in the 2035 analysis based on the screening criteria.

**Table 7-12**
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).

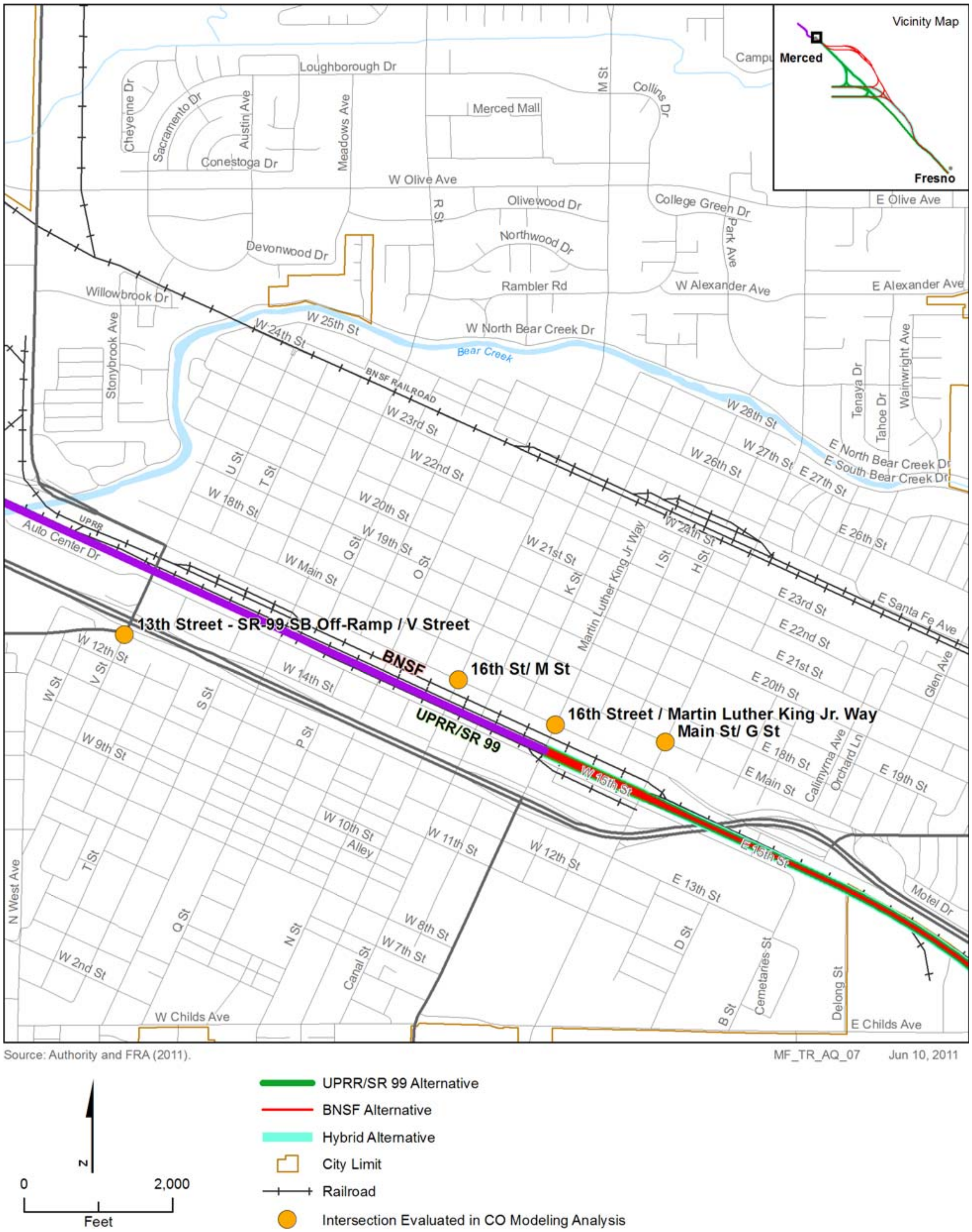



**Figure 7-1**
Intersections Evaluated for CO Hot Spots – Merced HST Station and Castle Commerce Center HMF

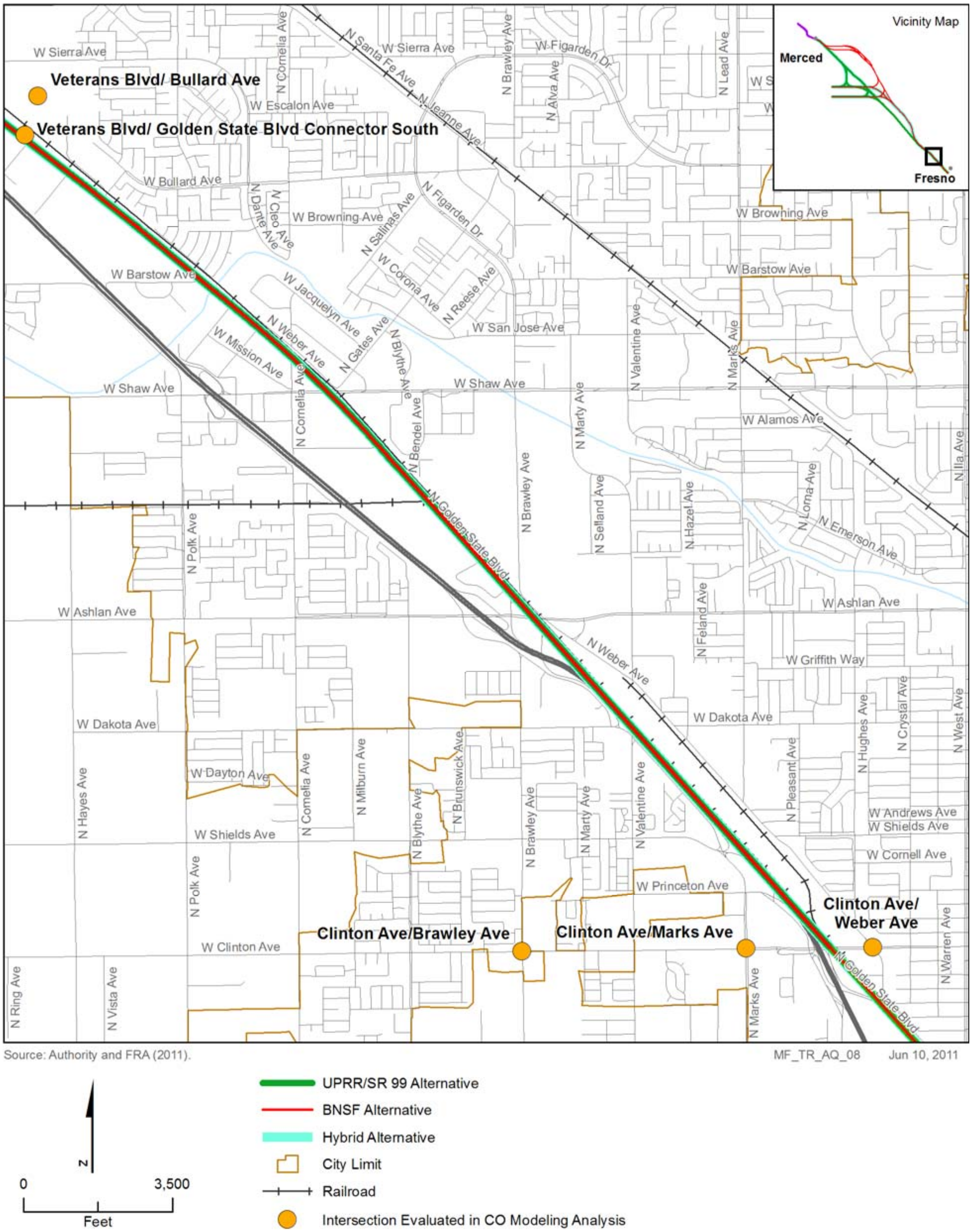



**Figure 7-2**
Intersections Evaluated for CO Hot Spots –
Near Herndon Avenue and Shaw Avenue and
Along SR 99


**Figure 7-3**
Intersections Evaluated for CO Hot Spots – Fresno HST Station

### 7.4.2 Parking Structures

#### 7.4.2.1 Merced Parking Structure

Maximum 1-hour and 8-hour CO concentrations were estimated near the Merced HST station parking structures using CALINE4 (Caltrans 1997). Emissions were estimated using 2035 vehicle counts and emission factors.

The Downtown Merced station parking area would consist of three adjacent structures. Structures A and B would each contain 7 parking levels and 2,850 parking spaces. Structure C would contain 5 parking levels and 2,000 parking spaces. To be conservative, it was assumed that all of the parking structures were at full capacity and all vehicles departed the parking structures within the same hour of the day. Table 7-13 presents the maximum CO concentrations associated with traffic leaving the Downtown Merced station parking structures. The parking structures CO hot-spot analysis shows that the maximum 1-hour and 8-hour CO concentrations would be much lower than the national and state standards. Therefore, traffic from the Downtown Merced station associated with the HST alternatives would not contribute to a violation of the CO standards.

**Table 7-13**
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 |

[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.

#### 7.4.2.2 Fresno Parking Structure

There are two options for the Downtown Fresno Station. Modeling results for the Downtown Fresno Station parking structures were taken from *Fresno to Bakersfield Section Air Quality Change Technical Report* (Authority and FRA 2011b). Table 7-14 presents the maximum CO concentrations associated with traffic leaving the Downtown Fresno Station parking structures. The parking structures CO hot-spot analysis shows that the maximum 1-hour and 8-hour CO concentrations would be much lower than the national and state standards. Therefore, traffic from the Fresno station associated with the HST alternatives would not contribute to a violation of the CO standards.

**Table 7-14**
Maximum Modeled 2035 CO Concentrations at Downtown Fresno Station Parking Facilities

| Downtown Fresno HST Station Alternative | 1-Hour Concentration (ppm) | | 8-Hour Concentration (ppm) | |
|---|---|---|---|---|
| | Maximum Modeled Increase | Total Concentration[a] | Maximum Modeled Increase[b] | Total Concentration[a] |
| Mariposa Street Station Alternative[c] | 0.5 | 3.6 | 0.35 | 2.69 |
| Kern Street Station 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 Downtown Fresno Station alternative parking structures (Mariposa Street Station Alternative and Kern Street Station Alternative) were found to be 3.10 ppm for 1-hour CO concentration and 2.34 ppm for 8-hour CO concentration.

## 7.5 Particulate Matter Analysis

Based on the PM hot-spot analysis performed and as discussed below, the project would provide regional benefits, 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 $PM_{2.5}$ emissions 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 2010d). 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:

1. *New or expanded highway projects that have a significant number of or significant increase in diesel vehicles.* The project is not a new or expanded highway project that would have a significant number of or a significant increase in diesel vehicles. 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 vehicles entering and leaving the stations would be passenger vehicles, which are typically not diesel-powered, with the exception of delivery trucks to support station activities. Furthermore, the HST project would improve regional traffic conditions by reducing traffic congestion, increasing vehicle speeds, and reducing regional VMT within the project vicinity.

2. *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 vehicle mix at signalized intersections. Although additional diesel vehicles would be used by the maintenance facilities, there were no signalized intersections identified with LOS D, E, or F for these facilities (Authority and FRA 2010b). In some cases, the LOS of intersections near the train 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, all transit buses in Fresno would be natural-gas-fueled (Shenson 2010), and buses in Merced would include a combination of natural-gas-fueled buses and

diesel buses equipped with current control technologies (Ghearing 2010). Therefore, the HST alternatives would not increase the number of diesel vehicles at affected intersections.

3. *New or expanded bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location.* The project would not have new or expanded bus or rail terminals or transfer points that significantly increase the number of diesel vehicles congregating at a single location. Although the project would include passenger rail terminals, there would not be a significant number of diesel vehicles congregating at a single location. The trains used for the project would be EMUs, powered by electricity, not diesel. Most vehicle trips entering and leaving the station would be passenger vehicles, which are not typically diesel-powered. Improved bus service is not part of the HST project. If the local bus service is improved to better serve the HST stations, it would be subject to the local transit authority's environmental review. 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.

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

For the reasons above, the proposed 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 would not likely cause an adverse impact on air quality for $PM_{10}$/$PM_{2.5}$ standards because, based on these criteria, it is not a project of air quality concern.

## 7.6 Odors

### 7.6.1 General Operations

No potentially odorous emissions would be associated with the train operation because the trains would be powered from the regional electrical grid. There would also 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 would have the potential to be odorous sources to sensitive receptors in areas where the stations are located.

Nearby sensitive land uses would be exposed daily to some odors when the stations are operational. However, the exposure would be less severe than the exposure to odors from other industrial activities that would occur in these areas under the No Project Alternative.

### 7.6.2 HMF Operations

HMF operations would be a source of potentially odorous emissions from paints and fuel combustion . Except at the Castle Commerce Center HMF site, the HMF would likely be far from urbanized areas with residential and business land uses. The HMF would be permitted through the SJVAPCD, with controls on operations generating odorous emissions to meet public nuisance requirements. Therefore, it is unlikely that it would cause objectionable odors affecting a substantial number of people.

## 7.7 Mobile Source Air Toxics Analysis

In accordance with FHWA's *Interim Guidance Update on Air Toxic Analysis in NEPA Documents,* released September 30, 2009, the qualitative assessment presented below is derived in part from a study conducted by FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives* (FHWA 2010). It is provided as a basis for identifying and comparing the potential differences in MSAT emissions, if any, among the alternatives.

There would be no difference in MSAT emissions among the three HST alternatives because the regional change in vehicle emissions would be the same. Therefore, this analysis compares the HST alternatives to the existing conditions and the No Project Alternative.

### 7.7.1 Regional MSAT Impacts

Under the HST alternatives, the proposed HST would use EMUs, with the power distributed to each train car via the overhead contact system. Operation of the EMUs would not generate combustion emissions; therefore, no toxic emissions would be expected from operation of the HSTs.

The HST alternatives would decrease regional VMT and MSAT emissions compared to the existing conditions and No Project Alternative. The availability of the HSTs would reduce the number of individual vehicle trips on a regional basis. Because the HST alternatives would not substantially change the regional traffic mix, the amount of MSATs emitted from highways and other roadways within the study area would be proportional to the VMT. Because the regional VMT estimated for the HST alternatives would be less than the existing conditions and No Action Alternative in 2035, MSAT emissions from regional vehicle traffic would be less for the HST alternatives compared to the existing conditions in 2009 and the No Project Alternative in 2035.

The HST alternatives would also result in reduced traffic congestion and increased vehicle speed as more people use the HSTs instead of driving when compared to the No Project Alternative. According to EPA's MOBILE6.2 model, emissions of all priority MSATs, except for DPM, decrease as speed increases (EPA 2006d). Therefore, the HST alternatives would result in further decreased MSAT emissions due to the decline in traffic congestion.

In addition, regardless of the HST alternatives, emissions will likely be lower than present levels in 2035 as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by 72 percent between 1999 and 2050. 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 are likely to be lower in the future in nearly all cases.

### 7.7.2 Local MSAT Impacts

The potential MSAT emission sources directly related to project operation would be from vehicles used at maintenance facilities and passenger vehicles travelling to and from the train stations. Localized increases in MSAT emissions could occur near the stations, due to passenger commutes to and from the stations, and at the new HMF, where diesel vehicles would be used.

The localized increases in MSAT emissions would likely be most pronounced at the HMF, where in-yard diesel-fueled switch locomotives would be used to pull in or pull out the EMU for maintenance. The MSAT impact due to the localized emission increases would be limited by locating the HMF in areas farther away from sensitive receptors. Only the Castle Commerce Center HMF site is near dense populations with sensitive receptors. The Castle Commerce Center HMF is an option for the UPRR/SR 99 and the BNSF Alternatives. The sensitive receptors are located north of the HMF, so locating the in-yard locomotives and diesel mobile equipment in the southern portion of the footprint would limit the effect of MSATs on sensitive receptors. Details of the potential toxic emission impacts from the sources onsite at the HMF are included in Section 7.2.2.

Localized emissions related to the HMF would be substantially reduced due to implementation of EPA's vehicle and fuel regulations. The HST alternatives would decrease regional MSAT emissions compared to the No Project Alternative.

### 7.7.3 Uncertainties of MSAT Analysis

Because of the lack of a national consensus on an acceptable level of risk, uncertainties about other air quality criteria assumed to protect the public health and welfare, and uncertainties about the reliability of available technical tools, the project-specific health impacts of the emission changes associated with the alternatives evaluated in this assessment cannot be predicted with confidence. The outcome of such an assessment would be influenced more by the uncertainty introduced into the process by the assumptions made than insight into the actual health impacts from MSAT exposure directly attributable to the proposed action. Due to these limitations, the following discussion is included in accordance with CEQ regulations (40 CFR 1502.22[b]) regarding incomplete or unavailable information.

In FHWA's view, information is incomplete or unavailable to predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than insight into the actual health impacts directly attributable to MSAT exposure associated with the proposed action.

EPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. It is the lead authority for administering the CAA and its amendments and has specific statutory obligations with respect to HAPs and MSATs. EPA continues to assess human health effects, exposures, and risks posed by air pollutants. EPA maintains the Integrated Risk Information System (IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (http://www.epa.gov/ncea/iris/index.html). Each report contains assessments of noncancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures, with uncertainty spanning perhaps an order of magnitude.

Other organizations are also active in the research and analyses of the human health effects of MSATs, including the Health Effects Institute (HEI). Two HEI studies are summarized in Appendix D of FHWA's *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents*. Among the adverse health effects linked to MSAT compounds at high exposures are cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious are the adverse human health effects of MSAT compounds at current environmental concentrations (http://pubs.healtheffects.org/view.php?id=282) or in the future as vehicle emissions substantially decrease ( http://pubs.healtheffects.org/view.php?id=306).

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and final determination of health impacts: each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevent a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70-year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that timeframe, since such information is unavailable. The results produced by EPA's MOBILE6.2 model, California EPA's EMFAC model, and EPA's DraftMOVES2009 model in forecasting MSAT emissions are inconsistent. For example, indications from the development of the MOVES model are that MOBILE6.2 significantly underestimates DPM emissions and significantly overestimates benzene emissions.

Regarding air dispersion modeling, an extensive evaluation of EPA's guideline CAL3QHC model was conducted in a National Cooperative Highway Research Program (NCHRP) study (http://www.epa.gov/scram001/dispersion_alt.htm#hyroad), which documents poor model performance at 10 sites across the country: 3 where intensive monitoring was conducted plus 7 with less intensive monitoring. The study indicates a bias of the CAL3QHC model to overestimate concentrations near highly congested intersections and underestimate concentrations near uncongested intersections. The consequence of this is a tendency to overstate the air quality benefits of mitigating congestion at intersections. Such poor model performance is less difficult to manage for demonstrating compliance with

NAAQS for relatively short timeframes than it is for forecasting individual exposure over an entire lifetime, especially given that some information needed for estimating 70-year lifetime exposure is unavailable. It is particularly difficult to reliably forecast MSAT exposure near roadways and to determine the portion of time that people are actually exposed at a specific location.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT compounds, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (http://pubs.healtheffects.org/view.php?id=282 ). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for DPM. EPA (http://www.epa.gov/risk/basicinformation.htm#g ) and HEI (http://pubs.healtheffects.org/getfile.php?u=395) have not established a basis for quantitative risk assessment of DPM in ambient settings.

There is also a lack of a national consensus on an acceptable level of risk. The current context is the process used by EPA, as provided by the CAA, to determine whether more stringent controls are required to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine a "safe" or "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than 1 in a million; in some cases, the residual risk determination could indicate maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two-step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than safe or acceptable risk.

Because of the limitations in the methodologies for forecasting health impacts described above, any predicted difference in health impacts among alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision-makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.

## 7.8 Asbestos Impacts

The counties of Merced, Madera and Fresno, through which the Merced to Fresno Section would pass, are designated by CDMG as areas likely to contain NOA. However, the specific areas of the counties through which the alignments would be constructed are designated by the CDMG as areas not likely to contain NOA (CDMG 2000). NOA surveys would be conducted before project construction and NOA would not likely be disturbed during project operation.

## 7.9 Greenhouse Gas Impacts

The SJVAPCD released a guidance document in December 2009 for addressing GHG impacts within the context of CEQA. For a project to have a less-than-significant impact on an individual and cumulative basis, it 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 2008a). Overall, the project operation would have a net beneficial impact on GHG.

Table 7-15 summarizes the statewide GHG emission changes (expressed in terms of $CO_2$) resulting from the project. As shown in Table 7-15, the project is predicted to have a beneficial effect on statewide GHG emissions. The analysis estimated the emission changes from reduced on-road VMT, reduced intrastate air travel, and increased electrical demand.

As compared to existing conditions, the HST alternatives would also reduce GHG emissions due to the reduction in VMT of the HST alternatives compared to existing conditions.

**Table 7-15**
2035 Estimated GHG Emission Changes Due to HST

| Project Element | Change in $CO_2$ Emissions due to HST (Metric tpy) |
|---|---|
| Roadways | -5,231,496 |
| Planes | -481,252 |
| Energy | 912,748 |
| Total | -4,800,000 |

### 7.9.1 On-Road Vehicles

The HST alternatives would reduce statewide daily roadway VMT by more than 30 million miles due to travelers using the HST rather than driving (see Table 7-16). This equates to approximately 15,800 tons of $CO_2$ per day, or approximately 33,000 barrels of oil consumed per day. The on-road vehicle emission analysis is based on projected VMT changes and associated average daily speed estimates, calculated for each affected county as part of the project's transportation analysis. GHG emission factors were obtained from EMFAC2007, using parameters set within the program for each individual county to reflect travel within each specific county and statewide parameters to reflect travel through each county in the state. As shown in Table 7-16, the proposed project is predicted to reduce GHG emissions as compared to the No Project Alternative. This is demonstrated on both the county and statewide level. In the existing conditions vs. existing plus project analysis, it is estimated that the project will reduce daily VMT in every county and by over 17 million miles a day statewide. As such, it is predicted to reduce roadway GHG emissions by approximately 2% as compared to the existing conditions, due to travelers choosing to use the HST rather than drive.

**Table 7-16**
2035 On-Road Vehicle GHG Emission Changes

| County | No Project Daily VMT Total Traffic | Project Daily VMT Total Traffic | Change in $CO_2$ Emissions with HST (Metric tons/yr) |
|---|---|---|---|
| Alameda | 44,195,495 | 43,551,929 | -122,611 |
| Alpine | 1,403,945 | 1,401,217 | -433 |
| Amador | 4,661,019 | 4,646,828 | -2,251 |
| Calaveras | 1,414,871 | 1,383,696 | -5,042 |
| Contra Costa | 27,867,886 | 27,667,001 | -38,282 |

| County | No Project Daily VMT Total Traffic | Project Daily VMT Total Traffic | Change in $CO_2$ Emissions with HST (Metric tons/yr) |
|---|---|---|---|
| El Dorado | 9,405,356 | 9,379,731 | -4,325 |
| Fresno | 27,367,949 | 24,364,285 | -474,462 |
| Imperial | 12,187,692 | 12,170,172 | -3,596 |
| Inyo | 5,178,956 | 5,158,901 | -3,184 |
| Kern | 39,240,101 | 35,149,202 | -652,522 |
| Kings | 3,136,720 | 2,663,113 | -75,621 |
| Los Angeles | 265,560,319 | 259,698,490 | -1,011,836 |
| Madera | 8,532,552 | 8,256,392 | -43,848 |
| Marin | 7,961,630 | 7,866,736 | -18,493 |
| Mariposa | 873,461 | 846,009 | -4,377 |
| Merced | 13,534,370 | 12,018,453 | -238,931 |
| Mono | 1,378,612 | 1,365,352 | -2,248 |
| Monterey | 13,864,584 | 13,123,028 | -116,602 |
| Napa | 4,838,702 | 4,792,647 | -9,421 |
| Nevada | 7,648,230 | 7,575,684 | -11,459 |
| Orange | 94,555,953 | 92,699,029 | -314,180 |
| Placer | 12,357,969 | 12,212,333 | -24,275 |
| Riverside | 101,286,914 | 99,801,479 | -269,406 |
| Sacramento | 33,432,730 | 32,754,592 | -109,239 |
| San Benito | 3,361,404 | 2,968,595 | -61,832 |
| San Bernardino | 96,726,005 | 95,709,159 | -184,117 |
| San Diego | 158,273,980 | 156,278,290 | -352,099 |
| San Francisco | 10,557,241 | 10,413,805 | -28,962 |
| San Joaquin | 22,717,713 | 21,198,249 | -239,741 |
| San Luis Obispo | 8,411,244 | 7,940,789 | -74,696 |
| San Mateo | 24,218,646 | 23,804,290 | -66,644 |
| Santa Barbara | 8,094,082 | 7,592,558 | -78,860 |
| Santa Clara | 50,863,603 | 49,956,147 | -166,048 |
| Santa Cruz | 2,600,612 | 2,564,302 | -5,965 |
| Solano | 16,101,043 | 15,928,916 | -31,489 |
| Sonoma | 12,738,505 | 12,651,479 | -16,959 |
| Stanislaus | 11,477,980 | 10,480,727 | -159,118 |
| Sutter | 3,878,420 | 3,828,474 | -7,964 |
| Tulare | 10,112,011 | 9,648,380 | -73,061 |
| Tuolumne | 1,766,709 | 1,734,529 | -5,679 |
| Ventura | 26,635,805 | 26,352,804 | -50,409 |
| Yolo | 7,858,254 | 7,661,590 | -30,920 |
| Yuba | 2,207,207 | 2,185,401 | -3,526 |

| County | No Project Daily VMT Total Traffic | Project Daily VMT Total Traffic | Change in $CO_2$ Emissions with HST (Metric tons/yr) |
|---|---|---|---|
| Rest of CA (North of Bay Area/ Sacramento) | 34,117,813 | 33,886,195 | -36,765 |
| Statewide Total | 1,254,604,293 | 1,223,330,976 | -5,231,496 |

On a regional basis, under the HST alternatives, Fresno and Merced counties would have some of the larger VMT reductions in the state. Therefore, as shown in Table 7-16, on-road vehicle GHG emissions, on an annual basis, would be much lower than the No Project Alternative emissions for the design year and greatly contribute to the overall reduction throughout the state. The benefits presented here depend upon ridership. Therefore, lower ridership than that assumed in the design and planning values would result in fewer benefits.

### 7.9.2 Airport Emissions

As shown in Table 7-17, the HST is predicted to reduce the number of plane flights due to travelers using the HST rather than flying to their destination. Therefore, the proposed project would either have no measurable effect or may reduce regional emissions due to the HST compared to the No Project Alternative. The EDMS was used to estimate an airplane's GHG emission factors. The EDMS estimated the emissions generated from the projected number of LTO cycles. Along with the emissions from the planes themselves, emissions generated from associated ground maintenance requirements are included. Average plane GHG emissions are calculated based on the profile of aircraft currently servicing the San Francisco to Los Angeles corridor. The number of air trips removed due to the HST was estimated in the travel demand modeling analysis conducted for the project.

As shown in Table 7-17, the proposed project is predicted to either have no measurable effect or slightly reduce regional emissions due to the HST, as compared to the No Project Alternative. Because the project is predicted to decrease plane flights in the existing plus project scenario as compared to the existing conditions scenario, the trend illustrated in Table 7-17 would be demonstrated by the existing plus project scenario.

**Table 7-17**
2035 Aircraft $CO_2$ Emission Changes Due to HST

| Origin | Number of Flights Removed | Change in $CO_2$ Emissions Due to HST (metric tons/year) |
|---|---|---|
| Central Coast | -1 | -1,245 |
| Far North | -16 | -19,897 |
| Fresno/Madera | 0 | 0 |
| Kern | -16 | -19,897 |
| Los Angeles Basin – North | -43 | -53,474 |
| Los Angeles Basin – South | -88 | -109,430 |
| Merced | -1 | -1,245 |
| Monterey Bay | -16 | -19,897 |
| Sacramento Region | -16 | -19,897 |
| San Diego Region | -47 | -58,447 |

| Origin | Number of Flights Removed | Change in $CO_2$ Emissions Due to HST (metric tons/year) |
|---|---|---|
| San Joaquin | -7 | -8,705 |
| San Francisco Bay Area | -130 | -161,662 |
| South San Jose Valley | 0 | 0 |
| Stanislaus | -5 | -6,219 |
| Western Sierra Nevada | -1 | -1,245 |
| Statewide Total | -387 | -481,252 |

### 7.9.3 Power Plant Emissions

The HST would increase electrical requirements compared to the No Project Alternative. The electrical demands from propulsion of the trains and operation of the trains at terminal stations, in storage depots, and in maintenance facilities were conservatively estimated to be 8.32 GWh per day in 2035. As shown in Table 7-18, the project would increase statewide indirect GHG emissions. Increase in electrical requirements for the existing conditions plus project scenario are presented in Appendix E.

**Table 7-18**
2035 Statewide Power Plant Emission Changes Due to HST

| Electricity required (GWh/day) | Change in $CO_2$ Emissions Due to HST (metric tons/year) |
|---|---|
| 8.32 (Statewide) | 912,748 |

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.

The State's electrical grid would power the HST System and, therefore, no single generation source for the electrical power requirements can be identified. The estimated emission changes for power plants are considered to be conservative because they are based on the current electrical 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 to 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.

### 7.9.4 HST Stations and HMF Emissions

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. Operation of the trains would only result in indirect GHG emissions from energy consumption, as discussed in the power plant analysis. Table 7-19 shows a summary of the GHG emissions from HST stations and HMF operation.

**Table 7-19**
2035 HST Stations and HMF GHG Emissions

| Emission Source | $CO_2$ Emissions (metric tpy) |
|---|---|
| Merced Train Station | 34,430 |
| Fresno Train Station | 22,253 |
| Overnight Layover/Servicing Facility | 160 |
| Train Dust Wake | - |
| HMF | 23,276 |
| Total | 80,119 |

### 7.9.5 Regional GHG Emission from Project Operation

A summary of the regional GHG emissions, which include the emissions from the vehicle, aircraft, power plants, and HST and HMF station operation within the project area, is shown in Table 7-20. As shown in Table 7-19, the proposed project would reduce regional GHG emissions compared to the No Project alternative. Comparisons of the HST GHG emission change against the existing conditions are included in Appendix E.

**Table 7-20**
2035 HST Alternative Regional GHG Emissions

| Emission Sources | 2035 $CO_2$ Emissions (metric tons/year) | | |
|---|---|---|---|
| | UPRR/SR 99 Alternative | BNSF Alternative | Hybrid Alternative |
| Regional VMT | -757,241 | -757,241 | -757,241 |
| Regional (Fresno-Yosemite International) Airport | -1,245 | -1,245 | -1,245 |
| Indirect Regional Power | 81,777 | 92,200 | 80,011 |
| HST and HMF Station Operation | 80,119 | 80,119 | 80,119 |
| Net Regional Difference | -596,590 | -586,167 | -598,355 |
| Note: Emission factors for $CO_2$ do not account for improvements in technology. | | | |

## 7.10 Construction Period Impacts

### 7.10.1 Summary

#### 7.10.1.1 Construction Emissions

Construction activities associated with the UPRR/SR 99, BNSF, and Hybrid Alternatives would result in criteria pollutant and GHG emissions. The main differences in construction emissions among the HST alternatives would be from differences in the length and alignment profiles and emissions associated with the reconstruction and new construction of roadways and bridges/overpasses. The other project components (HST stations, substations, and HMF) would have the same construction emissions for all HST alternatives.

Project construction activities expected to occur during the same calendar year were summed per the construction schedule presented in Appendix A. The project emissions were compared to the GC *de minimis* emission thresholds on a calendar-year basis; consequently, thresholds can be exceeded for any calendar year in which emissions occur.

There are no future natural growth or other non-HST related improvements included in the project construction impacts. Therefore, project construction emissions presented in this report were used for impacts compared against both existing conditions and the No Project Alternative.

As shown in Table 7-21, over the entire construction duration, the UPRR/SR 99 Alternative would have the highest amount of emissions, the BNSF Alternative would have the second highest, and the Hybrid Alternative would have the lowest. For each alternative, the main source of emissions would be rail construction, contributing to approximately 60% of the total construction emissions.

**Table 7-21**
HST Construction Emissions – Total (ton/construction duration)

| Alternative | VOCs | CO | $NO_x$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|---|---|
| UPRR/SR 99 Alternative with Ave 21 Wye | 740 | 3,500 | 6,340 | 3 | 809 | 499 |
| UPRR/SR 99 Alternative with Ave 24 Wye | 735 | 3,452 | 6,291 | 3 | 798 | 481 |
| BNSF Alternative with Ave 21 Wye | 697 | 3,206 | 5,969 | 3 | 703 | 420 |
| BNSF Alternative with Ave 24 Wye | 721 | 3,339 | 6,181 | 3 | 725 | 441 |
| Hybrid Alternative with Ave 24 Wye | 592 | 2,641 | 5,018 | 2 | 624 | 346 |
| Hybrid Alternative with Ave 21 Wye | 667 | 3,070 | 5,687 | 3 | 695 | 413 |
| Note: Emissions include HST construction as well as roadway projects that are not included in RTPs. | | | | | | |

Table 7-21 includes emissions from construction of the roadway projects that are not included in the RTPs. Table 7-22 presents the emissions from construction of the roadway projects that are included in the RTPs, which are used strictly for transportation conformity determinations.

**Table 7-22**
Construction Impacts from Roadway Projects Included in the RTPs (ton/year)

| Alternative | VOCs | CO | $NO_x$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|---|---|
| UPRR/SR 99 Alternative Projects | 5 | 24 | 38 | 0 | 4 | 2 |
| BNSF Alternative Projects | 3 | 16 | 25 | 0 | 3 | 1 |
| Hybrid Alternative Projects | 5 | 22 | 36 | 0 | 4 | 2 |

Demolition of existing structures along the HST alignment and HST station sites would occur prior to construction. The emissions associated with demolition activities are included in the construction emissions summarized over the construction duration in Table 7-21 and for each HST alternative in Tables 7-23 through 7-25.

#### 7.10.1.2 Construction Impacts Summary

**Construction Impacts within the SJVAB**

Direct impacts from the construction phase 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 $NO_x$. The $PM_{10}$ GC threshold would be exceeded during several, but not all, years of construction. The $SO_2$ GC threshold was not exceeded during any years of construction. With the exception of one construction year for one alternative, the $PM_{2.5}$ GC threshold was not exceeded. Emissions from construction would also exceed the SJVAPCD CEQA thresholds for VOCs, $NO_x$, $PM_{10}$, and $PM_{2.5}$.The predominant pollutants associated with construction of the guideway, stations, and maintenance facilities would be fugitive dust ($PM_{10}$ and $PM_{2.5}$) from earthmoving and disturbed earth surfaces and from combustion pollutants, particularly $O_3$ precursors ($NO_x$ and VOCs), from heavy equipment and trucks.

During construction, programmatic emission 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 these control measures, and using construction equipment that meets Tier 4 emissions standards, VOC, CO, and $NO_x$ impacts would be reduced but would remain substantial under NEPA for most of the construction phase. $PM_{10}$ 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 (refer to Section 8.0). $SO_2$ impacts would remain negligible under NEPA while the $PM_{2.5}$ impacts would be mitigated to negligible under NEPA.

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 be reduced below the CEQA thresholds for all construction years except 2013. There is no CEQA threshold for $SO_2$ from SJVAPCD. With implementation of mitigation measures, $SO_2$ impacts would be reduced to less than significant. 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.

Details of emissions from each HST alternative are presented in the following sections. Emissions presented for each alternative include emissions from all construction phases of the HST, the regional roadway realignment, and the HMF.

***UPRR/SR 99 Alternative***

The UPRR/SR 99 Alternative has two wye design options: Ave 24 and Ave 21. Both wye options were evaluated for the UPRR/SR 99 Alternative based on the lengths and profiles of the alignment. Emissions from construction of the alignment, including the material hauled to the site within the SJVAB, demolition of structures along the alignment, and the regional roadway realignment construction are estimated using information specific to the UPRR/SR 99 Alternative. The construction of the alignment would be the major emissions contributor, particularly laying of the at-grade, elevated, and retained fill track.

Ave 21 Wye emissions would be generally 1% to 3% higher than Ave 24 Wye emissions for the entire construction duration. Table 7-23 includes the programmatic emissions for construction of the UPRR/SR 99 Alternative with the Ave 21 Wye, and emission calculations for both wye alternatives can be found in Appendix B. Results for exceedance of NEPA and CEQA thresholds are the same for both wye alternatives except for the $PM_{2.5}$ impacts in 2013.

**Table 7-23**
Programmatic Construction Emissions – UPRR/SR 99 with Ave 21 Wye Alternative[a]

| Construction Year [b] | VOCs (tpy) | CO (tpy) | $NO_x$ (tpy) | $SO_2$ (tpy) | $PM_{10}$ (tpy) | $PM_{2.5}$ (tpy) |
|---|---|---|---|---|---|---|
| CEQA Threshold of Significance [c] | 10 | N/A | 10 | N/A | 15 | 15 |
| NEPA *de minimis* Threshold [d] | 10 | 100 | 10 | 100 | 100 | 100 |
| 2013 Emissions | 65 | 302 | 722 | 0 | 310 | 101 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | Yes | Yes |
| 2014 | 127 | 671 | 1,167 | 1 | 129 | 87 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | Yes | No |
| 2015 | 125 | 671 | 1,123 | 1 | 114 | 82 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | Yes | No |
| 2016 | 122 | 657 | 1,060 | 1 | 81 | 73 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2017 | 133 | 659 | 1,117 | 0 | 93 | 78 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2018 | 55 | 154 | 420 | 0 | 18 | 17 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2019 | 65 | 144 | 416 | 0 | 18 | 17 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2021 | 47 | 243 | 315 | 0 | 47 | 44 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |

[a] The wye option with generally the higher emissions is presented for the alternative.
[b] Emissions from construction of the HMF are included in the annual totals listed above.
[c] N/A indicates that the SJVAPCD has not established quantitative CEQA significance thresholds for this pollutant.
[d] N/A indicates that the area is in attainment for this pollutant; therefore, the threshold is not applicable.

The programmatic 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. The $SO_2$ emissions would be lower than the GC threshold for the entire construction duration. The $PM_{2.5}$ emissions would be lower than the GC threshold for every construction year except 2013. Even with the mitigation measures discussed in Section 8.0, construction emissions would still exceed the GC thresholds for the same duration and same pollutants as the programmatic emissions, except for $PM_{10}$ emissions, which would only exceed the GC threshold in 2013, and $PM_{2.5}$ emissions, which would not exceed the GC threshold for any construction year. Detailed information on mitigated emissions is presented in Section 8.3.3.

Construction emissions would exceed the VOC, $NO_X$, $PM_{10}$, and $PM_{2.5}$ CEQA thresholds for the entire construction duration. There is no CEQA threshold for $SO_2$ or CO. However, 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.

***BNSF Alternative***

The BNSF Alternative has two wye design options: Ave 21 and Ave 24. Both wye options were evaluated for the BNSF Alternative based on the lengths and profiles. The construction of the alignment, including the material hauled to the site within the SJVAB, demolition of structures along the alignment, and the regional roadway realignment construction emissions were estimated using information specific to the BNSF Alternative. The construction of the alignment would be the major emissions contributor, particularly laying of the track.

Ave 24 Wye emissions were generally 3% to 5% higher than Ave 21 Wye emissions for the entire construction due to its longer elevated track length. Table 7-24 includes the programmatic emissions for construction of the BNSF Alternative with the Ave 24 Wye, and emission calculations for both wye alternatives can be found in Appendix B. Results for exceedance of NEPA and CEQA thresholds are the same for both wye alternatives.

**Table 7-24**
Programmatic Construction Emissions – BNSF with Ave 24 Wye Alternative[a]

| Construction Year [b] | VOCs (tpy) | CO (tpy) | $NO_x$ (tpy) | $SO_2$ (tpy) | $PM_{10}$ (tpy) | $PM_{2.5}$ (tpy) |
|---|---|---|---|---|---|---|
| CEQA Threshold of Significance [c] | 10 | N/A | 10 | N/A | 15 | 15 |
| GC *de minimis* Threshold [d] | 10 | 100 | 10 | 100 | 100 | 100 |
| 2013 | 59 | 261 | 645 | 0 | 242 | 76 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | Yes | No |
| 2014 | 130 | 666 | 1,191 | 1 | 137 | 82 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | Yes | No |
| 2015 | 123 | 641 | 1,106 | 1 | 113 | 75 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | Yes | No |
| 2016 | 119 | 627 | 1,039 | 0 | 70 | 64 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2017 | 124 | 604 | 1,048 | 0 | 80 | 66 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |

| Construction Year [b] | VOCs (tpy) | CO (tpy) | $NO_x$ (tpy) | $SO_2$ (tpy) | $PM_{10}$ (tpy) | $PM_{2.5}$ (tpy) |
|---|---|---|---|---|---|---|
| 2018 | 55 | 154 | 420 | 0 | 18 | 17 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2019 | 65 | 144 | 416 | 0 | 18 | 17 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2021 | 47 | 243 | 315 | 0 | 47 | 44 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |

[a] The wye option with generally the higher emissions is presented for the alternative.
[b] Emissions from the construction of the HMF are included in the annual totals listed above.
[c] N/A indicates that the SJVAPCD has not established quantitative CEQA significance thresholds for this pollutant.
[d] N/A indicates that the area is in attainment for this pollutant; therefore, the threshold is not applicable.

The programmatic BNSF Alternative construction emissions would be similar or slightly lower than the emissions associated with the UPRR/SR 99 Alternative such that emissions would still exceed the CO, $NO_X$, and VOC GC thresholds for the entire construction duration. The $PM_{10}$ emissions would exceed the GC threshold for 3 of the 8 construction years. The $SO_2$ and $PM_{2.5}$ emissions would be lower than the GC thresholds for the entire construction duration. With the mitigation measures discussed in Section 8.0, construction emissions from the BNSF Alternative would still exceed the GC thresholds for the same duration and same pollutants as the programmatic emissions, except for $PM_{10}$ emissions, which would only exceed the GC threshold in 2013. Details of the mitigated emissions are discussed in Section 8.3.3.

The BNSF Alternative Construction emissions would exceed the VOC, $NO_X$, $PM_{10}$, and $PM_{2.5}$ CEQA thresholds for the entire construction duration. There is no CEQA threshold for $SO_2$ or CO. However, 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.

#### *Hybrid Alternative*

The Hybrid Alternative has two options for the wye connections: Ave 21 and Ave 24. Both wye options were evaluated for the Hybrid Alternative based on the lengths and profiles. The construction of the alignment, including the material hauled to the site within the SJVAB, demolition of structures along the alignment, and the regional roadway realignment construction emissions were estimated using information specific to the Hybrid Alternative. The construction of the alignment would be the major emissions contributor, particularly laying of the track.

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. Table 7-25 includes the programmatic emissions for construction of the Hybrid Alternative with the Ave 21 Wye, and emission calculations for both wye alternatives can be found in Appendix B. Results for exceedance of NEPA and CEQA thresholds are the same for both wye alternatives.

**Table 7-25**
Programmatic Construction Emissions – Hybrid with Ave 21 Wye Alternative[a]

| Construction Year [b] | VOCs (tpy) | CO (tpy) | $NO_x$ (tpy) | $SO_2$ (tpy) | $PM_{10}$ (tpy) | $PM_{2.5}$ (tpy) |
|---|---|---|---|---|---|---|
| CEQA Threshold of Significance [c] | 10 | N/A | 10 | N/A | 15 | 15 |
| GC *de minimis* Threshold [d] | 10 | 100 | 10 | 100 | 100 | 100 |
| 2013 | 56 | 251 | 625 | 0 | 257 | 79 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | Yes | No |
| 2014 | 111 | 585 | 1,039 | 0 | 118 | 72 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | Yes | No |
| 2015 | 108 | 567 | 971 | 0 | 98 | 66 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2016 | 105 | 557 | 915 | 0 | 62 | 56 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2017 | 118 | 571 | 986 | 0 | 76 | 62 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2018 | 55 | 154 | 420 | 0 | 18 | 17 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2019 | 65 | 144 | 416 | 0 | 18 | 17 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2021 | 47 | 243 | 315 | 0 | 47 | 44 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |

[a] The wye option with generally the higher emissions is presented for the alternative.
[b] Emissions from the construction of the HMF are included in the annual totals listed above.
[c] N/A indicates that the SJVAPCD has not established quantitative CEQA significance thresholds for this pollutant.
[d] N/A indicates that the area is in attainment for this pollutant; therefore, the threshold is not applicable.

As shown, 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. 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. With the mitigation measures discussed in Section 8.0, the Hybrid Alternative would have less impact on air quality than either the UPRR/SR 99 or the BNSF alternative because there would be fewer emissions per year, although the mitigated emissions would still exceed the GC thresholds for the same pollutants and years as both the UPRR/SR 99 and BNSF alternatives. Details of the mitigated emissions are discussed in Section 8.3.3.

Construction emissions would exceed the VOC, $NO_X$, $PM_{10}$, and $PM_{2.5}$ CEQA thresholds for the entire construction duration. There is no CEQA threshold for $SO_2$ or CO. However, 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.

**Construction Impacts Outside the SJVAB from Material Hauling**

Construction emissions included in the regional impacts analysis considered emissions within the SJVAB. Rail would be constructed using 100% ballast and subballast. Material other than the ballast and the subballast would be available within the SJVAB; however, the ballast and subballast 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.

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

Tables 7-26 and Table 7-27 present the programmatic emissions for material hauling outside the air basin for the worst-case scenario (Scenario 1) compared to the GC *de minimis* thresholds and CEQA thresholds respectively. Detailed analysis and emission calculations for material hauling outside the SJVAB for all scenarios can be found in Appendix H.

**Table 7-26**
Worst-Case Emissions for Scenario 1 Compared to GC *De Minimis* Thresholds

| Nonattainment/Maintenance Area (Air Basin) | Emissions (tons per year) | | | | | |
|---|---|---|---|---|---|---|
| | CO | NOx | $PM_{2.5}$ | $PM_{10}$ | $SO_2$ | VOC |
| Coachella Valley, Riverside County (Mojave Desert) | 7.86 | 39.9 | 1.03 | 1.06 | 0.03 | 1.80 |
| GC *de minimis* threshold[a] | 100 | 25 | N/A | 70 | N/A | 25 |
| Western San Bernardino/Los Angeles County (Mojave Desert) | 2.93 | 14.9 | 0.38 | 0.40 | 0.01 | 0.67 |
| GC *de minimis* threshold[a] | 100 | 100 | N/A | 100 | N/A | 50 |
| Los Angeles County (South Coast) | 5.54 | 28.1 | 0.73 | 0.75 | 0.02 | 1.27 |
| GC *de minimis* threshold[a] | 100 | 10 | 100 | 70 | 100 | 10 |
| East Kern County (Mojave Desert) | 3.04 | 15.4 | 0.40 | 0.41 | 0.01 | 0.70 |
| GC *de minimis* threshold[a] | 100 | 100 | N/A | 70 | N/A | 50 |

* The use of bold, italic font indicates that emissions exceed the GC *de minimis* thresholds for that air basin
[a] N/A indicates that the area is in attainment for this pollutant; therefore, the threshold is not applicable.

**Table 7-27**
Worst-Case Emissions for Scenario 1 Compared to CEQA Annual/Daily Thresholds

| Air Quality Management District/ Air Pollution Control District (AQMD/APCD) | Emissions (tons per year) | | | | | | Emissions (pounds per day) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | $NO_x$ | $PM_{2.5}$ | $PM_{10}$ | $SO_2$ | VOC | CO | $NO_x$ | $PM_{2.5}$ | $PM_{10}$ | $SO_2$ | VOC |
| San Bernardino/Los Angeles County (Mojave Desert AQMD) | 2.93 | 14.9 | 0.38 | 0.40 | 0.01 | 0.67 | 56.4 | 286 | 7.40 | 7.63 | 0.20 | 12.9 |
| CEQA Annual Threshold Limits[a] | 100 | 25 | 15 | 15 | 25 | 25 | 548 | 137 | 82 | 82 | 137 | 137 |
| Los Angeles County/Riverside County (South Coast AQMD) | 13.4 | 67.9 | 1.76 | 1.81 | 0.05 | 3.07 | 258 | 1306 | 33.8 | 34.8 | 0.93 | 59.0 |
| CEQA Annual Threshold Limits[a] | N/A | N/A | N/A | N/A | N/A | N/A | 550 | 100 | 55 | 150 | 150 | 75 |
| East Kern County (Kern County APCD) | 3.04 | 15.4 | 0.40 | 0.41 | 0.01 | 0.70 | 58.5 | 297 | 7.68 | 7.92 | 0.21 | 13.4 |
| CEQA Annual Threshold Limits[a] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 137 | N/A | N/A | N/A | 137 |

* The use of bold, italic font indicates that emissions exceed the CEQA annual/daily thresholds for that AQMD/APCD
[a] N/A indicates that there is no CEQA annual threshold for this pollutant in the AQMD/APCD

The emission results demonstrated that the emissions from all five scenarios would be above the GC thresholds for $NO_x$ in the South Coast Air Basin and four of five scenarios exceed the GC threshold in Mojave Desert Air Basin. The emissions for $NO_x$ in the other air basins would be below the GC thresholds for all scenarios. The emissions for all other pollutants would be below the GC thresholds in all air basins.

As discussed in Section 8.0, with mitigation, NOx emissions from Scenarios 4 and 5 would be reduced to less than GC threshold in all air basins. NOx emissions from Scenarios 1, 2, and 3 would remain exceeding the GC thresholds.

NOx impacts due to material hauling in the Bay Area AQMD and the East Kern APCD would still exceed the CEQA significance thresholds. NOx emissions would be offset to less than the significance thresholds in South Coast AQMD and Mojave Desert AQMD through the mobile source offset program. 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.

## 7.10.2 Other Localized Construction Impacts

### 7.10.2.1 Concrete Batch Plant

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 tpy of particulate emissions for the Hybrid Alternative, 20 tpy for the BNSF Alternative, and 29 tpy 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. To mitigate localized impacts from the plants, Mitigation Measure AQ-MM#8 would be implemented. This would require concrete batch plants to be at least 1,000 feet from sensitive receptors, such as schools and hospitals.

### 7.10.2.2 Heavy Maintenance Facility

Activities associated with construction of the HMF include mass site grading, asphalt paving, building construction, and architectural coating as well as construction of the HMF guideway. The construction activities are divided into three unique phases: Phase 1 consists of mass site grading; Phase 2 consists of construction of the overnight layover/servicing facility and related track; Phase 3 consists of construction of the HMF and related track. The emissions estimated for each construction activity and phase are included in the regional construction emissions for each alternative. Phases 1 and 2 would occur simultaneously with other HST construction activities, but Phase 3 is the only construction activity occurring in 2021. As a result, the 2021 emissions are solely due to 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 65 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 noncancer chronic health risks to sensitive receptors.

## 7.10.3 Asbestos

The demolition of asbestos-containing materials is subject to the limitations of the 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 adverse impact (SJVAPCD 2002).

The counties of Merced, Madera, and Fresno, through which the HST would pass, are designated by CDMG as areas likely to contain NOA. However, the specific areas of the counties through which the alignments would be built are designated as areas not likely to contain NOA (CDMG 2000). Therefore, NOA would not likely be disturbed during construction. Nevertheless, NOA surveys would be conducted before any excavation starts.

## 7.10.4 Greenhouse Gas Construction Impacts

### 7.10.4.1 Construction Impacts within the SJVAB

GHG emissions generated from construction of the project would be short-term. However, because the time that $CO_2$ remains in the atmosphere cannot be definitively quantified due to 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 7-28, because GHG emissions from the construction phase of each alternative would be greater than 25,000 metric tons of $CO_2e$, these GHG emissions were quantified as per the CEQ guidelines (CEQ 2010a). The total GHG construction emissions of the HST project would be less than 0.2% of the annual statewide GHG emissions.[3]

Table 7-28 also shows the amortized GHG emissions during project construction. 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 would be much longer) (Barber 2010). The amortized GHG construction emissions for each alternative would be less than 40,000 metric tons $CO_2e$ per year, as shown in Table 7-26.

Although the GHG emissions associated with construction and operation of the HST alternatives would be a net increase compared to the No Project Alternative and existing conditions, the GHG construction emissions would be less than 0.2% of the total statewide GHG emissions.[4] In addition, based on the large reduction of GHG emissions from the operational phase, the GHG emissions from construction would be "paid back," meaning they would account for the increases in construction emissions, in a little over 1 year of HST System operation under the worst-case construction-phase emission scenario.

### 7.10.4.2 Material Hauling Outside the SJVAB

GHG emissions associated with material hauling outside the SJVAB would be short-term. As shown in Table 7-29, GHG emissions from the material hauling for various scenarios would be less than 15,000

[3] 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 (CARB 2010) , which estimated the annual $CO_2e$ emissions in California are about 484 million metric tons (CARB 2009b).

[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), which estimated the annual $CO_2e$ emissions in California are about 484 million metric tons (CARB 2009b).

metric tons of $CO_2$e. The total GHG construction emissions of the HST project would be less than 0.1% of the annual statewide GHG emissions.[5]

**Table 7-28**
HST Alternative GHG Emissions

| Total Construction Emissions | Metric Tons/Construction Period | | |
|---|---|---|---|
| | UPRR/SR 99 | BNSF | Hybrid |
| $CO_2$ | 933,161 | 888,377 | 821,783 |
| $CO_2$e[b] | 979,819 | 932,796 | 862,872 |
| **Amortized GHG Emissions** | **(Metric Tons/Year)** | | |
| $CO_2$ | 37,326 | 35,535 | 32,871 |
| $CO_2$e[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 *Air Quality and Global Climate Change Technical Report* (Authority and FRA 2010a).

[b] 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 $CO_2$e emissions. In addition, the URBEMIS2007 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 $CO_2$e emissions. It was assumed that this approach for passenger vehicles was applicable to emissions sources..

**Table 7-29**
GHG Emissions from Material Hauling outside SJVAB

| Scenarios | $CO_2$ (metric tons) | $CO_2$e (metric tons)[a] |
|---|---|---|
| Scenario 1 | 6744 | 7081 |
| Scenario 2 | 5036 | 5288 |
| Scenario 3 | 4914 | 5160 |
| Scenario 4 | 12,262 | 12,875 |
| Scenario 5 | 13,877 | 14,571 |

Source: EPA (2005c).

[a] According to the 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 $CO_2$e emissions. In addition, the URBEMIS2007 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 $CO_2$e emissions. It was assumed that this approach for passenger vehicles was applicable to emissions sources.

Acronyms:
$CO_2$ carbon dioxide
$CO_2$e carbon dioxide equivalent
GHG greenhouse gas

[5] 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 (2008), which estimated the annual $CO_2$e emissions in California are about 478 million metric tons (CARB 2009b).

## 7.11 Cumulative Impacts

### 7.11.1 Air Quality and Global Climate Change

The study area for the cumulative analysis of air quality is the SJVAB**.** The SJVAB is in an area federally designated as nonattainment for $O_3$ and $PM_{2.5}$, federal maintenance for $PM_{10}$ and CO (urban portion of Fresno County only), and state nonattainment for $O_3$, $PM_{10}$, and $PM_{2.5}$. As a result, the area is subject to stringent emissions requirements for $O_3$ precursors (VOC and $NO_x$) and particulate matter. Transportation projects included in the fiscally constrained regional transportation plans were modeled at the regional level and were shown to be consistent with transportation conformity requirements. Therefore, the regional impacts for the project are the same as those in the cumulative analysis. The local impacts for the project were also evaluated with the reasonably foreseeable projects within each county to determine if they would cause a significant cumulative impact.

Regulatory agencies continue to pass more stringent criteria pollutant and greenhouse gas emission standards with the goal of reducing the amount of pollutant emissions in the atmosphere. Many of these regulations are not yet implemented but would be prior to the project planning horizon of 2035. Overall air quality has improved and is anticipated to continue to improve because of these regulations. However, growth and proposed developments will result in thousands of new homes and millions of square feet of new retail uses. The associated increase in slow-moving traffic will continue to affect air quality to some incremental degree.

### 7.11.2 Construction

The SJVAPCD has adopted a cumulative threshold of significance of 10 tons per year for ozone precursors (VOC and $NO_x$) and 15 tons per year for $PM_{10}$ and $PM_{2.5}$. Emissions from construction would exceed the SJVAPCD CEQA thresholds for VOC, $NO_x$, $PM_{10}$, and $PM_{2.5}$ before mitigation. With mitigation, VOC, $NO_x$, and $PM_{10}$ impacts would be reduced but would remain significant for most of the construction phase. Although construction emissions would be temporary, they would contribute to air quality degradation and impede the region's ability to attain air quality standards. In addition, past, present and reasonably foreseeable projects would have significant VOC, $NO_X$, and $PM_{10}$ emissions. Because these projects would be constructed during the same timeframe as the HST alternatives, there would be a substantial air quality effect under NEPA and a significant impact under CEQA.

### 7.11.3 Short and Long-Term Operations

On a regional scale, past, present, and foreseeable projects would contribute to congestion associated with long-term growth and worsen air quality. Although there would be significant cumulative impacts in the region, the HST alternatives would help the region attain air quality standards and plans by reducing the amount of regional traffic and providing an alternative mode of transportation. Operation of the project would not exceed the SJVAPCD cumulative thresholds of significance for ozone precursors. Because the operation of the HST alternatives would help the region attain air quality standards, the HST alternatives' contribution to the cumulative impact would be less than cumulatively considerable.

Regulatory agencies continue to pass more stringent GHG emission standards with the goal of reducing the amount of pollutant emissions in the atmosphere. While many of these regulations have not yet been implemented, they are anticipated to be in effect prior to the project planning horizon of 2035. Even with these regulatory reductions, the expected growth in the region would result in significant cumulative increases in GHG emissions. There is also a possibility that the HST alternatives' demand for electricity would result in indirect GHG emissions impacts from power generation facilities. However, the HST alternatives would decrease GHG emissions by reducing vehicle and aircraft trips. This reduction in GHG emissions would more than offset the increase in GHG emissions associated with project facilities.

Therefore, the HST alternatives would result in a net decrease in GHG emissions and would have a cumulatively beneficial effect on global climate change.

Cumulative CO impacts are accounted for in the CO hotspot analysis. The CALINE4 air dispersion modeling evaluation indicated that the HST alternatives would cause a less than significant impact for CO emissions. Therefore, project CO effects would be cumulatively negligible under NEPA, and the cumulative impacts would be less than significant.

Operations at the HMF may emit Hazardous Air Pollutants (HAPs) on a local scale. No other past, present, or foreseeable future projects would contribute to HAPs emissions. Therefore, there is no cumulative effect of HAPs emissions.

As described in the 2005 Statewide Program EIR/EIS and the 2008 Bay Area to Central Valley Program EIR/EIS, the HST system as a whole would have less than significant impacts on air quality. The HST system would reduce vehicle miles traveled and result in systemwide air quality benefits. Temporary short-term emissions increases associated with construction activities and localized air pollution increases associated with traffic near proposed HST stations would be substantially reduced by mitigation strategies and design practices.

The HST system would result in beneficial impacts related to GHGs and global climate change. Any additional carbon entering the atmosphere, whether by emissions from the system itself, indirect emissions from electrical power generation, or by removal of carbon sequestering plants (including agricultural crops), would be more than offset by the beneficial reduction of carbon resulting from the project due to a reduction in automobile vehicle miles traveled (mobile sources) and reduction in the number of airplane trips.

### 7.11.4 Summary of NEPA/CEQA Impacts

The cumulative construction impacts of the HST alternatives and other past, present, and reasonably foreseeable projects on air quality would be substantial under NEPA and cumulatively considerable under CEQA. Construction of the HST alternatives would increase regional pollutant emissions and exceed the SJVAPCD CEQA thresholds.

Cumulative operations impacts on air quality caused by the build-out of the projects envisioned by the general plans would be beneficial for ozone precursors (NOx and VOC) and $PM_{10}/PM_{2.5}$ emissions and negligible under NEPA and not cumulatively considerable under CEQA for CO and $SO_2$. Specifically, operation of the HST alternatives would reduce regional VMT and consequently reduce ozone precursors and $PM_{10}/PM_{2.5}$ emissions; the project would generate CO that would not exceed levels under the No Project Alternative and other reasonably foreseeable future projects.

### 7.11.5 Mitigation

With implementation of mitigation measures for air quality provided in Chapter 8.0, cumulative impacts on air quality during construction would remain substantial under NEPA and significant and unavoidable under CEQA.

# 8.0 Mitigation Analysis

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.

## 8.1 Mitigation Measures

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 or the no project. Temporary, short-term emission increases associated with construction activities would be substantially reduced with mitigation strategies and design practices. Operation of the HMF will also result in localized emission increase and will be reduced using mitigated strategies. 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.

**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 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, 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 one 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 HMF site 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 will apply to scenarios where the ballast and subballast material is hauled from quarries located outside the SJVAB. NOx offsets will be purchased from the South Coast AQMD and the Mojave Desert AQMD if offsets are available.

## 8.2 Mitigation Calculation Methods

### 8.2.1 Fugitive Dust

Fugitive dust mitigation measures were applied to reduce fugitive dust emissions from cut and fill activities during construction of the alignment. The most reductions were achieved by assuming that haul trucks used to move cut and fill material to and from the site would be completely covered. A secure cover would reduce offsite fugitive dust emissions from haul trucks by almost 100%. Fugitive dust emissions from onsite activities related to the cut and fill activities would also be reduced by watering exposed surfaces three times daily, as part of the programmatic reduction measures.

Fugitive dust emissions from demolition activities would be controlled through water techniques required by the programmatic reduction measures; therefore, additional mitigation measures would not apply to demolition activities.

### 8.2.2 On-Road Equipment Exhaust

Exhaust mitigation measures were also applied to reduce the emissions from material hauling. Emissions from haul trucks were mitigated by assuming that all trucks used to haul materials for the alignment construction were at least model year 2010 (UCD 2007). By 2010, additional $NO_x$ reduction measures were phased-in, thereby greatly reducing $NO_x$ emissions from on-road travel.

### 8.2.3 Construction Equipment Exhaust

To estimate emissions for off-road diesel construction equipment, mitigation was applied to the exhaust emissions based on the fleet-average tier mix and the required percent reductions to meet CARB Tier 4 standards (SCAQMD 2010).The URBEMIS model estimates that the construction fleet in the first construction year 2013 would be mixture of Tier 2 and tier 3 equipment. The year 2013 was chosen to represent the fleet mix because this would be the first year of construction activities. For each piece of equipment, a percent reduction was calculated, based on the reduction amount required to reduce the default URBEMIS2007 emission factors to the Tier 4 standard for each pollutant.

The fleet-average reduction was calculated as the average of reductions required for all construction equipment to meet Tier 4 standards. This average reduction was applied to exhaust emissions from off-road diesel construction equipment. Exhaust emission reductions were only applied to pollutants with Tier 4 standards, shown in Table 8-1. PM reductions were applied equally to both $PM_{10}$ and $PM_{2.5}$ emissions. The details of the averaging analysis are included in Appendix B.

**Table 8-1**
Tier 4 Emissions Standards

| Pollutant | Emission Standard (g/bhp-hr) |
|---|---|
| VOC | 0.14 |
| $NO_x$ | 0.3 |
| PM | 0.015 |
| g/bhp-hr = grams per brake-horsepower hour | |

## 8.3 Mitigated Impacts: Construction

Table 8-2 presents the mitigated construction emissions that would occur during construction activities for the HST alternatives, including emissions from construction of the HST alignment, HMF, and roadways.

**Table 8-2**
Mitigated Construction Emissions

| Alternative | Emissions (tons per construction period) | | | | | |
|---|---|---|---|---|---|---|
| | VOCs | CO | $NO_x$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ |
| UPRR/SR 99 with Ave 21 Wye | 301 | 3,344 | 1,215 | 3 | 348 | 110 |
| UPRR/SR 99 with Ave 24 Wye | 300 | 3,305 | 1,215 | 3 | 350 | 110 |
| BNSF with Ave 21 Wye | 284 | 3,080 | 1,151 | 3 | 287 | 94 |
| BNSF with Ave 24 Wye | 293 | 3,204 | 1,183 | 3 | 290 | 96 |
| Hybrid with Ave 24 Wye | 243 | 2,549 | 988 | 2 | 293 | 90 |
| Hybrid with Ave 21 Wye | 272 | 2,949 | 1,097 | 3 | 301 | 96 |

Table 8-3 presents the mitigated emissions associated with construction of the roadway projects included in the RTPs. The mitigated emissions associated with the roadway projects not included in the RTPs are included in Tables 8-4 through 8-6.

**Table 8-3**
Mitigated State Route Construction Emissions (Projects included in RTP)

| Alternative | Emissions (tons per project life) | | | | | | |
|---|---|---|---|---|---|---|---|
| | VOCs | CO | $NO_x$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ | $CO_2$ |
| UPRR/SR 99 | 2 | 24 | 4 | 0 | 2 | 1 | 5,490 |
| BNSF | 1 | 16 | 3 | 0 | 1 | 0 | 3,678 |
| Hybrid | 2 | 22 | 4 | 0 | 2 | 1 | 5,048 |

### 8.3.1 UPRR/SR 99 Alternative Construction

As shown in Table 8-4, the mitigated emissions from construction of the UPRR/SR 99 Alternative would still exceed the *de minimis* and SJVAPCD GAMAQI thresholds for VOC, CO, and $NO_x$ for all years of construction. Mitigated $PM_{10}$ emissions would still exceed the *de minimis* thresholds for one of the construction years and the SJVAPCD GAMAQI thresholds for four of the construction years. Mitigated $PM_{2.5}$ emissions would still exceed the SJVAPCD GAMAQI threshold for one of the construction years. $SO_2$ emissions would continue to be below the *de minimis* thresholds for all construction years.

**Table 8-4**
Mitigated Construction Emissions – UPRR/SR 99 Alternative[a]

| Construction Year [b] | VOCs (tpy) | CO (tpy) | $NO_x$ (tpy) | $SO_2$ (tpy) | $PM_{10}$ (tpy) | $PM_{2.5}$ (tpy) |
|---|---|---|---|---|---|---|
| CEQA Threshold of Significance [c] | 10 | N/A | 10 | N/A | 15 | 15 |
| NEPA *de minimis* Threshold [d] | 10 | 100 | 10 | 100 | 100 | 100 |
| 2013 | 31 | 283 | 233 | 0 | 259 | 61 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | Yes | No |
| 2014 | 50 | 928 | 216 | 1 | 23 | 12 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2015 | 50 | 636 | 211 | 1 | 22 | 11 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2016 | 49 | 633 | 203 | 1 | 13 | 9 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | No | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2017 | 52 | 639 | 182 | 0 | 22 | 10 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2018 | 20 | 154 | 49 | 0 | 2 | 2 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | No | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2019 | 26 | 144 | 47 | 0 | 2 | 2 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | No | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2021 | 23 | 226 | 75 | 0 | 6 | 4 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | No | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |

[a] The wye option with generally the higher emissions is presented for the alternative.
[b] Emissions from construction of the HMF are included in the annual totals listed above.
[c] N/A indicates that the SJVAPCD has not established quantitative CEQA significance thresholds for this pollutant.
[d] N/A indicates that the area is in attainment for this pollutant; therefore, the threshold is not applicable.

### 8.3.2 BNSF Alternative Construction

As shown in Table 8-5, the mitigated emissions from construction of the BNSF Alternative would still exceed the *de minimis* and SJVAPCD GAMAQI thresholds for VOC, CO, and $NO_x$ for all years of construction. Mitigated $PM_{10}$ emissions would still exceed the *de minimis* thresholds for one of the construction years and the SJVAPCD GAMAQI thresholds for four of the construction years. Mitigated $PM_{2.5}$ emissions would still exceed the SJVAPCD GAMAQI threshold for one of the construction years. $SO_2$ emissions would continue to be below the *de minimis* thresholds for all construction years

**Table 8-5**
Mitigated Construction Emissions – BNSF Alternative[a]

| Construction Year [b] | VOCs (tpy) | CO (tpy) | $NO_x$ (tpy) | $SO_2$ (tpy) | $PM_{10}$ (tpy) | $PM_{2.5}$ (tpy) |
|---|---|---|---|---|---|---|
| CEQA Threshold of Significance [c] | 10 | N/A | 10 | N/A | 15 | 15 |
| NEPA *de minimis* Threshold [d] | 10 | 100 | 10 | 100 | 100 | 100 |
| 2013 | 27 | 245 | 186 | 0 | 199 | 47 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | Yes | No |
| 2014 | 51 | 626 | 226 | 1 | 27 | 12 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2015 | 49 | 610 | 217 | 1 | 22 | 11 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2016 | 48 | 610 | 206 | 0 | 12 | 8 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | No | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2017 | 49 | 589 | 177 | 0 | 20 | 9 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2018 | 20 | 154 | 49 | 0 | 2 | 2 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | No | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2019 | 26 | 144 | 47 | 0 | 2 | 2 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | No | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2021 | 23 | 226 | 75 | 0 | 6 | 4 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | No | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |

[a] The wye option with generally the higher emissions is presented for the alternative.
[b] Emissions from construction of the HMF are included in the annual totals listed above.
[c] N/A indicates that the SJVAPCD has not established quantitative CEQA significance thresholds for this pollutant.
[d] N/A indicates that the area is in attainment for this pollutant; therefore, the threshold is not applicable.

### 8.3.3 Hybrid Alternative Construction

As shown in Table 8-6, the mitigated emissions from construction of the Hybrid Alternative would still exceed the *de minimis* and SJVAPCD GAMAQI thresholds for VOC, CO, and $NO_x$ for all years of construction. Mitigated $PM_{10}$ emissions would still exceed the *de minimis* thresholds for one of the construction years and the SJVAPCD GAMAQI thresholds for four of the construction years. Mitigated $PM_{2.5}$ emissions would still exceed the SJVAPCD GAMAQI threshold for one of the construction years. $SO_2$ emissions would continue to be below the *de minimis* thresholds for all construction years

**Table 8-6**
Mitigated Construction Emissions – Hybrid Alternative[a]

| Construction Year [b] | VOCs (tpy) | CO (tpy) | $NO_x$ (tpy) | $SO_2$ (tpy) | $PM_{10}$ (tpy) | $PM_{2.5}$ (tpy) |
|---|---|---|---|---|---|---|
| CEQA Threshold of Significance [c] | 10 | N/A | 10 | N/A | 15 | 15 |
| NEPA *de minimis* Threshold [d] | 10 | 100 | 10 | 100 | 100 | 100 |
| 2013 | 26 | 237 | 196 | 0 | 217 | 51 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | Yes |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | Yes | No |
| 2014 | 45 | 550 | 197 | 0 | 23 | 11 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2015 | 43 | 540 | 189 | 0 | 19 | 10 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2016 | 43 | 541 | 181 | 0 | 11 | 7 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | No | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2017 | 46 | 558 | 163 | 0 | 20 | 9 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | Yes | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2018 | 20 | 154 | 49 | 0 | 2 | 2 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | No | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2019 | 26 | 144 | 47 | 0 | 2 | 2 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | No | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |
| 2021 | 23 | 226 | 75 | 0 | 6 | 4 |
| Exceed CEQA Threshold | Yes | N/A | Yes | N/A | No | No |
| Exceed GC *de minimis* Threshold | Yes | Yes | Yes | No | No | No |

[a] The wye option with generally the higher emissions is presented for the alternative.
[b] Emissions from construction of the HMF are included in the annual totals listed above.
[c] N/A indicates that the SJVAPCD has not established quantitative CEQA significance thresholds for this pollutant.
[d] N/A indicates that the area is in attainment for this pollutant; therefore, the threshold is not applicable.

### 8.3.4 Material hauling from Outside SJVAB

Material hauling outside of the SJVAB would have emissions exceed the NOx GG thresholds in two air basins and the CEQA significance thresholds in multiple AQMDs and APCDs. Mitigation measures AQ-MM#5 and AQ-MM#9 will be implemented to reduce $NO_x$ emissions in these regions.

For scenarios using rail or a combination of rail and trucks for the material hauling, the emissions after reducing on-road truck exhaust and purchasing $NO_x$ offset would make the material hauling emissions in the SCAQMD and the Mojave Desert AQMD, where mobile source emission offset program are available, less than the CEQA significance thresholds. The Bay Area AQMD and the East Kern APCD do not have offset programs for mobile sources to reduce the $NO_x$ impacts in. $NO_x$ emissions due to material hauling in the Bay Area AQMD and the East Kern APCD would remain exceeding the CEQA significance thresholds after implementing on-road truck mitigation measures. NOx emissions for Scenarios 4 and 5 when material is hauled solely by trucks would be reduced to less than the CEQA significance thresholds for all affected AQMDs/APCDs.

With mitigation, NOx emissions from Scenarios 4 and 5 would be reduced to less than GC thresholds in all air basins. NOx emissions from Scenarios 1, 2, and 3 would continue to exceed the GC thresholds.

Detailed information of material hauling emissions and the comparisons to the GC and CEQA thresholds is in Appendix H.

# 9.0 Conformity Analysis

Projects requiring approval or funding from federal agencies that are in areas designated as nonattainment or maintenance for the NAAQS may be subject to EPA's Conformity Rule. The two types of federal conformity are transportation conformity and general conformity (GC).

"Conformity" refers to conforming to, or being consistent with, an SIP for compliance with the CAA. EPA's Conformity Rule requires SIP conformity determinations on transportation plans, programs, and projects before they are approved or adopted, i.e., eliminating or reducing the severity and number of violations of the NAAQS, and achieving expeditious attainment of such standards (40 CFR Part 93). Federal activities, such as federally sponsored projects, may not cause or contribute to new violations of air quality standards, exacerbate existing violations, or interfere with timely attainment or required interim emission reductions toward attainment.

As noted above, there are two types of project conformity determinations: transportation conformity and general conformity. Transportation conformity applies to those projects that will have FHWA or FTA funding or require FHWA/FTA approval. General conformity applies to those projects that will have funding or require approval from any federal agency other than FHWA/FTA.

FRA and EPA have determined that general conformity may be applicable to the California HST Project. The lead agency for the project is FRA, and FHWA/FTA involvement is not anticipated other than incidental FHWA or FTA funding for joint-benefit components.

If a component of the HST is funded by FHWA or FTA, or if a minor action is required to approve the HST project, such as the need for an FHWA-approved grade crossing, it is anticipated that the subject project element will be added to the affected area's RTIP or RTP for transportation conformity purposes. However, conformity of HST projects implementing sections of the overall HST System will be addressed through application of the general conformity rule and requirements.

## 9.1 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 federally 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, the GC Rule is not applicable, and no additional analyses are required. If the emissions are greater than these values, compliance with the GC Rule must be demonstrated.

GC requirements apply only to federally designated maintenance and nonattainment areas. The HST Project study area is in an area federally designated as extreme nonattainment for the 8-hour $O_3$ standard, nonattainment for $PM_{2.5}$, and maintenance for $PM_{10}$ and CO. The applicability threshold values for this area, according to 40 CFR Part 93, are 10 tpy for VOCs, 10 tpy for $NO_x$, and 100 tpy for $PM_{2.5}$, $PM_{10}$, CO, and $SO_2$.

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.

The construction-phase emissions are greater than the applicability threshold(s) in the SJVAB:

- VOCs for entire construction duration (March 2013 – July 2021, excluding 2020).
- $NO_x$ for entire construction duration (March 2013 – July 2021, excluding 2020).
- CO for entire construction duration (March 2013 – July 2021, excluding 2020).

- $PM_{10}$ for 3 years under the UPRR/SR 99 and BNSF alternatives (2013 – 2015) and for 2 years under the Hybrid Alternative (2013 and 2014).
- $PM_{2.5}$ for 1 year under the UPRR/SR 99 alternative (2013) and no years under the BNSF and Hybrid alternatives.
- VOCs for entire construction duration (March 2013 – July 2021, excluding 2020).

In addition, the construction-phase emissions associated with material-hauling outside the SJVAB are greater than the applicability threshold (s) for:

- $NO_x$ in the South Coast Air Basin and the Mojave Desert Air Basin for certain hauling scenarios.

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 *de minimis* 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 area's SIP without exceeding emission budgets.
- By offsetting the project's construction-phase emissions in each year that the thresholds are exceeded.
- Through an air quality modeling analysis demonstrating that the project would not cause or exacerbate a NAAQS violation; however, this cannot be used for $O_3$ precursors for $O_3$ nonattainment areas.

Compliance with the GC Rule would be demonstrated by the project through one or more of the methods listed above once a full preferred project alternative is selected and more site-specific construction information, including scheduling and equipment, becomes available.

## 9.2 Transportation Conformity

Transportation conformity is an analytical process required for all federally funded transportation projects. Under the 1990 CAA Amendments, the U.S. Department of Transportation cannot fund, authorize, or approve federal actions to support programs or projects 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 project are subject to transportation conformity. These individual projects are not currently listed in the Fresno Council of Governments (FCOG) 2011 RTP, but are in the process of being included in the next version of the RTP.

Based on the microscale CO analysis and PM hot-spot analysis performed for the roadway projects in the 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. It is assumed that the project components that are subject to transportation conformity would demonstrate project-level conformity once they are included in the conforming RTP.

# 10.0 References

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# 11.0 Preparer Qualifications

| Preparer & Title | Degrees/Qualifications |
|---|---|
| Andrea White, Project Engineer | B.S. Chemical Engineering, Registered Professional Chemical Engineer |
| Hong Zhuang, Project Engineer | M.S. Environmental Science and Engineering/Chemical Engineering |
| Mark Bennett, Principal Technologist | Ph.D. Chemical Engineering |
| Elyse Pieper, Staff Engineer | B.S. Chemical Engineering, Engineer In Training |
| Ben Beattie, Staff Engineer | B.S. Chemical Engineering |
| Elizabeth Schwing, Staff Engineer | B.S. Chemical Engineering, Engineer in Training |