CALIFORNIA HIGH-SPEED TRAIN

Project Environmental Impact Report / Environmental Impact Statement

Fresno to Bakersfield

Air Quality Technical Report

April 2014

CALIFORNIA High-Speed Rail Authority

U.S. Department of Transportation
Federal Railroad Administration

California High-Speed Train Project EIR/EIS

Fresno to Bakersfield

Air Quality Technical Report

Prepared For:

California High-Speed Rail Authority

And

U.S. Department of Transportation
Federal Railroad Administration

Prepared By:

URS/HMM/Arup Joint Venture
1333 Broadway, Suite 800
Oakland, CA 94612

April 2014

Table of Contents

Tables

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

Figures

Appendices (provided as separate documents)

This page intentionally left blank

Acronyms and Abbreviations

$\mu g/m^3$	microgram(s) per cubic meter
μm	micrometer(s)
AB	Assembly Bill
AIA	Air Impact Assessment
APCD	Air Pollution Control District
AQMD	Air Quality Management District
ARRA	American Recovery and Reinvestment Act
Authority	California High-Speed Rail Authority
BACT	best available control technology
BNSF	BNSF Railway
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CAFE	Corporate Average Fuel Economy
CALEEMOD	California Emission Estimator Model
Cal/EPA	California Environmental Protection Agency
CALINE4	CAlifornia LINE Source Dispersion Model, Version 4
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CAS	Climate Adaption Strategy
CCAA	California Clean Air Act
CDMG	California Department of Conservation, Division of Mines and Geology
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFC	chlorofluorocarbon
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide

CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COG	Council of Fresno County Governments; see also Fresno COG
CTI	California Toxics Inventory
DE	diesel exhaust
DEIS	draft environmental impact statement
DPM	diesel particulate matter
DPR	Department of Pesticide Regulation
DTSC	Department of Toxic Substances Control
E.O.	Executive Order
EDMS	Emissions and Dispersion Modeling System
EIR	environmental impact report
EIS	environmental impact statement
EMFAC2007	EMission FACtors 2007
EMFAC2011	EMission FACtors 2011
EMU	electric multiple unit
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FR	Federal Regulations
FRA	Federal Railroad Administration
Fresno COG	Council of Fresno County Governments; see also COG
FTA	Federal Transit Authority
FTIP	Federal Transportation Improvement Program
GAMAQI	Guide for Assessing and Mitigating Air Quality Impacts
GC	general conformity
GET	Golden Empire Transit
GHG	greenhouse gas
GNIS	Geographic Names Information System
GWh	gigawatt-hour(s)

GWP	Global Warming Potential
HAP	hazardous air pollutant
HC	hydrocarbon
HCFC	hydrochlorofluorocarbon
HEI	Health Effects Institute
HFC	hydrofluorocarbon
HFE	hydrofluorinated ether
HHRAP	Human Health Risk Assessment Protocol
HIA	acute noncancer hazard index
HIC	chronic noncancer hazard index
HMF	heavy maintenance facility
HMM	Hatch Mott MacDonald
hp	horsepower
HSC	Health and Safety Code
HST	(California) high-speed train
IRIS	Integrated Risk Information System
ISR	Indirect Source Review
IWMB	Integrated Waste Management Board
KCAG	Kings County Association of Governments
Kern COG	Kern Council of Governments
KTR	Kings/Tulare Regional station
LOS	Level of Service
LTO	landing and takeoff
MMT CO_2e	million metric tons of CO_2 equivalent
MOWF	maintenance-of-way facility
mph	mile(s) per hour
MPO	Metropolitan Planning Organization
MSAT	mobile source air toxic
N_2O	nitrous oxide

NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NF_3	nitrogen trifluoride
NHTSA	National Highway Traffic Safety Administration
NO	nitric oxide
NO_2	nitrogen dioxide
NOA	naturally occurring asbestos
NOAA	National Oceanic and Atmospheric Administration
NO_X	nitrogen oxides
O_3	ozone
OEHHA	Office of Environmental Health Hazard Assessment
PAH	polycyclic aromatic hydrocarbon
Pb	lead
PFC	perfluorocarbon
PM	particulate matter
$PM_{2.5}$	particulate matter smaller than or equal to 2.5 microns in diameter
PM_{10}	particulate matter smaller than or equal to 10 microns in diameter
POM	polycyclic organic matter
ppm	part(s) per million
PTO	Permit to Operate
REL	Reference Exposure Limit
RfC	reference dose concentration
ROG	reactive organic gases
RTAC	Regional Targets Advisory Committee
RTIP	Regional Transportation Improvement Program
RTP	Regional Transportation Plan

RTPA	Regional Transportation Planning Agency
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SBCAPCD	Santa Barbara County Air Pollution Control District
SCAQMD	South Coast Air Quality Management District
SCS	Sustainable Communities Strategies
SF_6	sulfur hexafluoride
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
SR	State Route
SWRCB	State Water Resources Control Board
TAC	toxic air contaminant
TCAG	Tulare County Association of Governments
TOG	total organic gas
TPSS	traction power supply station
tpy	ton(s) per year
UCD	University of California Davis
ULSD	ultra-low sulfur diesel (fuel)
USEPA	U.S. Environmental Protection Agency
USGS	United States Geological Survey
VERA	Voluntary emission reduction agreement
VMT	vehicle miles traveled
VOC	volatile organic compound

This page intentionally left blank

Chapter 1.0
Introduction

1.0 Introduction

The purpose of this report is to provide a detailed technical description of the analysis conducted for the Fresno to Bakersfield Section of the California High-Speed Train (HST) System. This 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 [USEPA]), 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 Fresno to Bakersfield Section with respect to the USEPA General Conformity (GC) Rule.

This page intentionally left blank

Chapter 2.0
Project Description and Study Area

2.0 Project Description

2.1 Project Introduction

The Fresno to Bakersfield Section of the HST project would be approximately 114 miles long, varying in length by only a few miles depending on the route alternatives selected. To comply with the Authority's guidance to use existing transportation corridors when feasible, the Fresno to Bakersfield HST Section would primarily be located adjacent to the existing BNSF Railway right-of-way. Alternative alignments are being considered where engineering constraints require deviation from the existing railroad corridor, and where necessary to avoid environmental impacts.

The Fresno to Bakersfield HST Section would cross both urban and rural lands and include stations in Fresno, the Hanford area, and Bakersfield, a potential heavy maintenance facility (HMF), and power substations along the alignment. The HST alignment would be entirely grade-separated, meaning that crossings with roads, railroads, and other transport facilities would be located at different heights (overpasses or underpasses) so that the HST would not interrupt nor interface with other modes of transport. The HST right-of-way would also be fenced to prohibit public or vehicle access. The project footprint would primarily consist of the train right-of-way, which would include both a northbound and southbound track in an area typically 120 feet wide. Additional right-of-way would be required to accommodate stations, multiple track at stations, maintenance facilities, and power substations.

The Fresno to Bakersfield Section would include at-grade, below-grade, and elevated track segments. The at-grade track would be laid on an earthen rail bed topped with rock ballast approximately 6 feet off the ground; fill and ballast for the rail bed would be obtained from permitted borrow sites and quarries. Below-grade track would be laid in an open or covered trench at a depth that would allow roadway and other grade-level uses above the track. Elevated track segments would span long sections of urban development or aerial roadway structures and consist of reinforced-concrete aerial structures with cast-in-place reinforced-concrete columns supporting the box girders and platforms. The height of elevated track sections would depend on the height of existing structures below, and would range from 40 to 80 feet. Columns would be spaced 60 to 120 feet apart.

2.2 Project Alternatives

2.2.1 Alignment Alternatives

This section describes the Fresno to Bakersfield HST Section project alternatives, including the No Project Alternative. The Project EIR/EIS for the Fresno to Bakersfield HST Section examines alternative alignments, stations, and HMF sites within the general BNSF Railway corridor. Discussion of the HST project alternatives begins with a single continuous alignment (the BNSF Alternative) from Fresno to Bakersfield. This alternative most closely aligns with the preferred alignment identified in the Record of Decision (ROD) for the Statewide Program EIR/EIS. Descriptions of the additional ten alternative alignments that deviate from the BNSF Alternative for portions of the route then follow. The alternative alignments that deviate from the BNSF Alternative were selected to avoid environmental, land use, or community issues identified for portions of the BNSF Alternative (Figure 2-1).

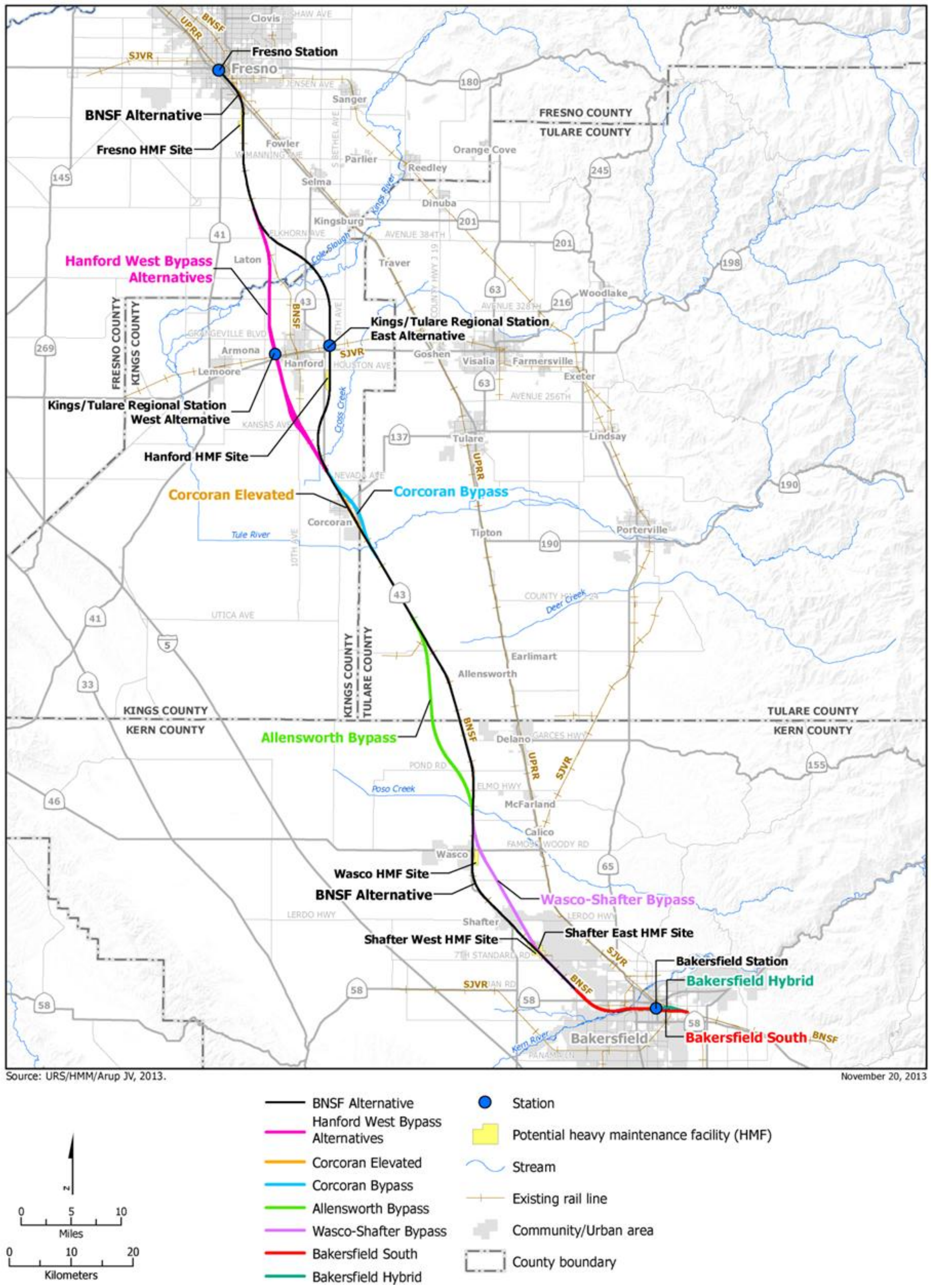


Figure 2-1
Fresno to Bakersfield HST alternatives

2.2.1.1 No Project Alternative

Under the No Project Alternative, the HST System would not be built. The No Project Alternative represents the condition of the Fresno to Bakersfield Section as it existed in 2009 (when the Notice of Preparation was issued), and as it would exist without the HST project at the planning horizon (2035). In assessing future conditions, it was assumed that all currently known programmed and funded improvements to the intercity transportation system (highway, rail, and transit), and reasonably foreseeable local development projects (with funding sources identified), would be developed by 2035. The No Project Alternative is based on a review of regional transportation plans (RTPs) for all modes of travel, the State of California Office of Planning and Research CEQAnet Database, the Federal Aviation Administration Air Carrier Activity Information System and Airport Improvement Plan grant data, the State Transportation Improvement Program, airport master plans and interviews with airport officials, intercity passenger rail plans, and city and county general plans and interviews with planning officials.

2.2.1.2 BNSF Alternative

The BNSF Alternative's cross sections include provisions for a 102-foot separation of the HST track centerline from the BNSF Railway track centerline, as well as separations that include swale or berm protection, or an intrusion protection barrier (wall) where the HST tracks are closer. A 102-foot separation between the centerlines of BNSF Railway and HST tracks is provided wherever feasible and appropriate. In urban areas where a 102-foot separation could result in substantial displacement of businesses, homes, and infrastructure, the separation between the BNSF Railway and HST was reduced. The areas with reduced separation require protection to prevent encroachment on the HST right-of-way in the event of a freight rail derailment. The use of a swale, berm, or wall protection would depend on the separation distance.

The BNSF Alternative would extend approximately 114 miles from Fresno to Bakersfield and would lie adjacent to the BNSF Railway route to the extent feasible (Figure 2-1). Minor deviations from the BNSF Railway corridor would be necessary to accommodate engineering constraints, namely wider curves necessary to accommodate the HST (as compared with the existing lower-speed freight line track alignment). The largest of these deviations occurs between approximately East Conejo Avenue in Fresno County and Nevada Avenue in Kings County. This segment of the BNSF Alternative would depart from BNSF Railway corridor and instead curve to the east on the northern side of the Kings River and away from Hanford, and would rejoin the BNSF Railway corridor north of Corcoran.

Although the majority of the alignment would be at-grade, the BNSF Alternative would include aerial structures in all of the four counties through which it travels. In Fresno County, an aerial structure would carry the alignment over Golden State Boulevard and SR 99, and a second would cross over the BNSF Railway tracks in the vicinity of East Conejo Avenue. The alignment would be elevated over Cole Slough and the Kings River as it crosses into Kings County.

In Kings County, the BNSF Alternative would be elevated east of Hanford where the alignment would pass over the San Joaquin Valley Railroad (SJVR) and SR 198. The alignment would also be elevated over Cross Creek, and again in the city of Corcoran to avoid a BNSF Railway spur and agricultural facilities located at the southern end of the city. In Tulare County, the BNSF Alternative would be elevated at the Tule River crossing and over Deer Creek and the Stoil railroad spur that runs west from the BNSF Railway mainline. In Kern County, the BNSF Alternative would be elevated through the cities of Wasco, Shafter, and Bakersfield. The BNSF Alternative would be at-grade through the rural areas between these cities.

The BNSF Alternative would provide wildlife crossing opportunities by means of a variety of engineered structures. Dedicated wildlife crossing structures would be provided from approximately Cross Creek (Kings County) south to Poso Creek (Kern County) in at-grade portions of the railroad embankment at approximately 0.3-mile intervals. In addition to those structures, wildlife crossing opportunities would be available at elevated portions of the alignment, at bridges over riparian corridors, at road overcrossings and undercrossings, and at drainage facilities (i.e., large-diameter [60 to 120 inches] culverts and paired 30-inch culverts). Where bridges, aerial structures, and road crossings coincide with proposed dedicated wildlife crossing structures, such features would serve the function of, and supersede the need for, dedicated wildlife crossing structures.

The preliminary wildlife crossing structure design consists of a modified culvert in the embankment that would support the HST tracks. The typical culvert would be 73 feet long from end to end (crossing structure distance), would span a width of approximately 10 feet (crossing structure width), and would provide 3 feet of vertical clearance (crossing structure height). Additional wildlife crossing structure designs could include circular or elliptical pipe culverts, and larger (longer) culverts with crossing structure distances of up to 100 feet. The design of the wildlife crossing structures may change depending on site-specific conditions and engineering considerations.

2.2.1.3 Hanford West Bypass 1 Alternative

The Hanford West Bypass 1 Alternative would parallel the BNSF Alternative from East Kamm Avenue to approximately East Elkhorn Avenue in Fresno County. At East Conejo Avenue where the BNSF Alternative crosses to the eastern side of the BNSF Railway tracks to pass the city of Hanford to the east, the Hanford West Bypass 1 Alternative continues south on the western side of the BNSF Railway tracks. The Hanford West Bypass 1 would diverge from the BNSF Railway corridor just south of East Elkhorn Avenue and ascend onto an elevated structure just south of East Harlan Avenue, crossing over the Kings River complex and Murphy Slough, and passing the community of Laton to the west. The Hanford West Bypass 1 Alternative would return to grade just north of Dover Avenue. The alignment would continue at-grade and would travel between the community of Armona to the west and the city of Hanford to the east on a southeasterly route toward the BNSF Railway corridor. In order to avoid a large dairy located at the intersection of Kent and 11th avenues, the Hanford West Bypass 1 Alternative must travel to its west and deviate from the BNSF Railway corridor in the area of Kansas Avenue. The alignment would pass to the west of a large complex of BNSF Railway serviced grain silos and loading bays before it rejoins the BNSF Railway corridor adjacent to its western side at about Lansing Avenue. The alignment would continue on the western side of the BNSF Railway corridor and ascend onto another elevated structure, traveling over Cross Creek and special aquatic features that exist north of Corcoran. This alignment would return to grade just north of Nevada Avenue and would connect to the BNSF Alternative traveling through Corcoran at-grade, maintaining an alignment on the western side of the BNSF Railway corridor. The total length of the Hanford West Bypass 1 Alternative would be approximately 28 miles.

The Hanford West Bypass 1 Alternative would cross SR 198 and several local roads. Roads including South Peach Avenue, East Clarkson Avenue, East Barrett Avenue, Elder Avenue, and South Tenth Avenue would be closed at the HST right-of-way, while other roads would be realigned and/or grade-separated from the HST with overcrossings/undercrossings. The Kings/Tulare Regional Station–West Alternative would be located along this alignment, at-grade and east of 13th Avenue, between Lacey Boulevard and the San Joaquin Valley Railroad (SJVR) spur.

2.2.1.4 Hanford West Bypass 1 Modified Alternative

The Hanford West Bypass 1 Modified Alternative would be the same as the Hanford West Bypass 1 Alternative from East Kamm Avenue to Flint Avenue. From there, where the Hanford West

Bypass 1 Alternative continues on a more southeasterly route, the Hanford West Bypass 1 Modified Alternative would continue south and would roughly parallel the Hanford West Bypass 1 Alternative to the west until it converges with the Hanford West Bypass 1 Alternative just north of Jackson Avenue. This portion of the modified alignment travels to the west of the Section 4(f) properties at 13148 Grangeville Boulevard and 9860 13th Avenue in Kings County by as much as 600 feet.

Hanford West Bypass 1 Modified Alternative would be below-grade between Grangeville Boulevard and Houston Avenue. The alignment would travel below-grade in the vicinity of the station in an open cut with side slopes as it transitions to a retained-cut profile. As the alignment transitions back to grade just north of Houston Avenue, the open-cut profile would be used once more. The Hanford West Bypass 1 Modified Alternative would then cross and roughly parallel the path of the Hanford West Bypass 1 Alternative to the east by as much as 1,000 feet until just south of Kansas Avenue.

Similar to Hanford West Bypass 1, the Hanford West Bypass 1 Modified Alternative would pass to the west of a large complex of BNSF Railway-serviced grain silos and loading bays before it rejoins the BNSF Railway corridor along its western side at about Lansing Avenue. The alignment would continue on the western side of the BNSF Railway corridor and ascend onto an elevated structure, traveling over Cross Creek and special aquatic features that exist north of Corcoran. This alignment would return to grade just north of Nevada Avenue and would connect to the BNSF Alternative and travel through Corcoran at-grade, maintaining an alignment on the western side of the BNSF Railway corridor. Hanford West Bypass 1 Modified would be about 28 miles long.

Similar to the Hanford West Bypass 1 Alternative, Hanford West Bypass 1 Modified would cross SR 198 and several local roads. Roads including South Peach Avenue, East Clarkson Avenue, East Barrett Avenue, Elder Avenue, and South 10th Avenue would be closed at the HST right-of-way, while other roads would be realigned and/or grade-separated from the HST with overcrossings/undercrossings. The Kings/Tulare Regional Station–West Alternative would be located along this alignment, below-grade and east of 13th Avenue, between Lacey Boulevard and the SJVR spur.

2.2.1.5 Hanford West Bypass 2 Alternative

The Hanford West Bypass 2 Alternative would be the same as the Hanford West Bypass 1 Alternative from East Kamm Avenue to just north of Jackson Avenue. The Hanford West Bypass 2 Alternative would then curve away from the Hanford West Bypass 1 Alternative to travel to the east of the dairy located at the intersection of Kent and 11th avenues toward the BNSF Railway corridor, approximately 0.3 mile east of the Hanford West Bypass 1 route. The Hanford West Bypass 2 Alternative would ascend over Kent Avenue and then cross over the BNSF Railway right-of-way to the northeast of the large complex of grain silos and loading bays located north of Kansas Avenue. The alignment would remain elevated for approximately 1.5 miles and parallel the BNSF Railway to the east, then cross over Kansas Avenue. The alignment would return to grade north of Lansing Avenue and continue along the BNSF Railway corridor on its eastern side. Similar to the Hanford West Bypass 1 Alternative, the Hanford West Bypass 2 Alternative would travel over Cross Creek and the special aquatic features located north of Corcoran and return to grade north of Nevada Avenue; however, the Hanford West Bypass 2 would be located on the eastern side of the BNSF Railway tracks in order to connect to either of the two Corcoran alternatives that would travel on the eastern side of the BNSF Railway corridor, the Corcoran Elevated Alternative or the Corcoran Bypass Alternative, described below. Like the Hanford West Bypass 1 Alternative, the total length of the Hanford West Bypass 2 Alternative would be approximately 28 miles.

Similar to the Hanford West Bypass 1 and Hanford West Bypass 1 Modified alternatives, the Hanford West Bypass 2 would cross SR 198 and several local roads. Road closures and modifications would be the same as those for the Hanford West Bypass 1, except that no roadway underpasses would be constructed in the vicinity of Kent and 11th avenues as the HST would be on an elevated structure in this area. The Hanford West Bypass 2 Alternative includes the same at-grade design between Grangeville Boulevard and Houston Avenue as the Hanford West Bypass 1 Alternative, as well as the same at-grade Kings/Tulare Regional Station–West Alternative described for the Hanford West Bypass 1 Alternative.

2.2.1.6 Hanford West Bypass 2 Modified Alternative

The Hanford West Bypass 2 Modified Alternative would be the same as the Hanford West Bypass 1 Modified Alternative from East Kamm Avenue to approximately Iona Avenue. In a manner similar to the route of the Hanford West Bypass 2 Alternative, the Hanford West Bypass 2 Modified Alternative would travel on an elevated structure over Kent Avenue, the BNSF Railway tracks, and Kansas Avenue, before returning to grade north of Lansing Avenue. This alternative would also travel over Cross Creek and the special aquatic features north of Corcoran, and return to grade north of Nevada Avenue. Like the Hanford West Bypass 2 Alternative, the Hanford West Bypass 2 Modified Alternative would connect with either the Corcoran Elevated or the Corcoran Bypass alternatives on the eastern side of the BNSF Railway railroad and SR 43. This alternative would also be approximately 28 miles long.

As previously discussed, road crossings are similar amongst the Hanford West Bypass alternatives. The Hanford West Bypass 2 Modified Alternative includes the same below-grade design between Grangeville Boulevard and Houston Avenue as the Hanford West Bypass 1 Modified Alternative, and the same below-grade Kings/Tulare Regional Station–West Alternative described for the Hanford West Bypass 1 Modified Alternative.

2.2.1.7 Corcoran Elevated Alternative

The Corcoran Elevated Alternative would be the same as the corresponding section of the BNSF Alternative from approximately Nevada Avenue to Avenue 136, except that it would pass through Corcoran on the eastern side of the BNSF Railway right-of-way on an aerial structure. The aerial structure begins at Niles Avenue and returns to grade south of 4th Avenue. The total length of the Corcoran Elevated Alternative would be approximately 10 miles. Approximately 0.2 mile of BNSF Railway tracks would be realigned at Patterson Avenue. Dedicated wildlife crossing structures would be provided from approximately Cross Creek south to Avenue 136 in at-grade portions of the railroad embankment at intervals of approximately 0.3 mile. Dedicated wildlife crossing structures would also be placed between 100 and 500 feet to the north and south of each of the Cross Creek and Tule River crossings.

This alternative alignment would pass over several local roads on an aerial structure. Santa Fe Avenue and Avenue 136 would be closed at the HST right-of-way.

2.2.1.8 Corcoran Bypass Alternative

The Corcoran Bypass Alternative would diverge from the BNSF Alternative at Nevada Avenue and swing east of Corcoran, rejoining the BNSF Railway route at Avenue 136. The total length of the Corcoran Bypass would be approximately 10 miles. Similar to the corresponding section of the BNSF Alternative, the majority of the Corcoran Bypass Alternative would be at-grade. However, an elevated structure would carry the HST over SR 43, the BNSF Railway, and the Tule River. Dedicated wildlife crossing structures would be provided from approximately Cross Creek south to Avenue 136 in at-grade portions of the railroad embankment at intervals of approximately 0.3 mile. Dedicated wildlife crossing structures would also be placed between 100 and 500 feet to the north and south of each of the Cross Creek and Tule River crossings.

This alternative alignment would cross SR 43, Whitley Avenue/SR 137, and several local roads. Nevada Avenue, SR 43, Waukena Avenue, and Whitley Avenue would be grade-separated from the HST with an overcrossing/undercrossing; other roads including Niles Avenue, Orange Avenue, and Avenue 136 would be closed at the HST right-of-way

2.2.1.9 Allensworth Bypass Alternative

The Allensworth Bypass Alternative passes west of the BNSF Alternative, avoiding Allensworth Ecological Reserve and the Allensworth State Historic Park. The total length of the Allensworth Bypass Alternative would be approximately 21 miles, beginning at Avenue 84 and rejoining the BNSF Alternative at Elmo Highway. The Allensworth Bypass Alternative would be constructed on an elevated structure where the alignment crosses Deer Creek and the Stoil railroad spur. The majority of the alignment would pass through Tulare County at-grade. Dedicated wildlife crossing structures would be provided from approximately Avenue 84 to Poso Creek at intervals of approximately 0.3 mile. Dedicated wildlife crossing structures would also be placed between 100 and 500 feet to the north and south of both the Deer Creek and Poso Creek crossings.

The Allensworth Bypass would cross several roads including County Road J22, Avenue 24, Garces Highway, Woollomes Avenue, Magnolia Avenue, Pond Road, and Elmo Highway. Avenue 24, Woollomes Avenue, Elmo Highway, and Blankenship Avenue would be closed at the HST right-of-way, while the other roads would be realigned and/or grade-separated from the HST with overcrossings

2.2.1.10 Wasco-Shafter Bypass Alternative

The Wasco-Shafter Bypass Alternative would diverge from the BNSF Alternative between Taussig Avenue and Zachary Avenue, crossing over to the eastern side of the BNSF Railway tracks and bypassing Wasco and Shafter to the east. The Wasco-Shafter Bypass Alternative would be at-grade except where it travels over Seventh Standard Road and the BNSF Railway to rejoin the BNSF Alternative. Approximately 4 miles of Santa Fe Way would be shifted to the west of the proposed alignment to accommodate the HST right-of-way, from approximately Galpin Street to south of Renfro Road. The total length of the Wasco-Shafter Bypass Alternative would be 21 miles.

The Wasco-Shafter Bypass was refined to avoid the Occidental Petroleum tank farm as well as a historic property potentially eligible for listing on the National Register of Historic Places. The Wasco-Shafter Bypass would cross SR 43, SR 46, East Lerdo Highway, and several local roads. Roads including SR 46, Kimberlina Road, Shafter Avenue, Beech Avenue, Cherry Avenue, and Kratzmeyer Road would be grade-separated from the HST with overcrossings/undercrossings; other roads would be closed at the HST right-of-way.

2.2.1.11 Bakersfield South Alternative

From the Rosedale Highway (SR 58) in Bakersfield, the Bakersfield South Alternative parallels the BNSF Alternative at varying distances to the north. At Chester Avenue, the Bakersfield South Alternative curves south, and parallels California Avenue. As with the BNSF Alternative, the Bakersfield South Alternative would begin at-grade and become elevated starting at Country Breeze Place through Bakersfield to its terminus at Oswell Street. The elevated section would range in height from 50 to 90 feet to the top of the rail. The realignment of BNSF Railway tracks from Jomani Drive to Glenn Street in Bakersfield would be required, as it is for the BNSF Alternative. Dedicated wildlife crossing structures would not be required as this alternative would be elevated to the north and south of the Kern River.

The Bakersfield South Alternative would be approximately 12 miles long and would cross many of the same roads as the BNSF Alternative. This alternative includes the Bakersfield Station–South Alternative.

2.2.1.12 Bakersfield Hybrid Alternative

From Rosedale Highway (SR 58) in Bakersfield, the Bakersfield Hybrid Alternative follows the Bakersfield South Alternative as it parallels the BNSF Alternative at varying distances to the north. At approximately A Street, the Bakersfield Hybrid Alternative diverges from the Bakersfield South Alternative, crosses over Chester Avenue and the BNSF right-of-way in a southeasterly direction, then curves back to the northeast to parallel the BNSF Railway tracks towards Kern Junction. After crossing Truxtun Avenue, the alignment curves to the southeast to parallel the UPRR tracks and Edison Highway to its terminus at Oswell Street. As with the BNSF and Bakersfield South alternatives, the Bakersfield Hybrid Alternative would begin at-grade and become elevated starting at Country Breeze Place through Bakersfield to Oswell Street. The realignment of BNSF Railway tracks from Jomani Drive to Glenn Street in Bakersfield would be required, as it is for both the BNSF and Bakersfield South alternatives. Dedicated wildlife crossing structures would not be required because this alternative would be elevated to the north and south of the Kern River.

The Bakersfield Hybrid Alternative would be approximately 12 miles long and would cross many of the same roads as the BNSF and Bakersfield South alternatives. This alternative includes the Bakersfield Station–Hybrid Alternative.

2.2.2 Station Alternatives

The Fresno to Bakersfield HST Section would include a new station in Fresno, a Kings/Tulare Regional Station in the vicinity of Hanford, and a new station in Bakersfield.

Stations would be designed to address the purpose of the HST, particularly to allow for intercity travel and connection to local transit, airports, and highways. Stations would include the station platforms, a station building, and associated access structure, as well as lengths of bypass tracks to accommodate local and express service at the stations. All stations would contain the following elements:

- Passenger boarding and alighting platforms.
- Station head house with ticketing, waiting areas, passenger amenities, vertical circulation, administration and employee areas, and baggage and freight-handling service.
- Vehicle parking (short-term and long-term) and "kiss-and-ride."[1]
- Motorcycle/scooter parking.
- Bicycle parking.
- Waiting areas and queuing space for taxis and shuttle buses.
- Pedestrian walkway connections.

2.2.2.1 Fresno Station

The Fresno Station would be located in Downtown Fresno, less than 0.5 mile east of SR 99 on the BNSF Alternative. 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 64 feet.

[1] "Kiss-and-ride" refers to the station area where riders may be dropped off or picked up before or after riding the HST.

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 to one another next to the station. The first level would contain the public concourse, passenger service areas, and station and operation offices. The second level would include a mezzanine, a pedestrian overcrossing above the HST guideway and the UPRR tracks, and an additional public concourse area. Entrances would be located at both G and H streets. A conceptual site plan of the Fresno Station is provided in Figure 2-2.

The majority of station facilities would be east of the UPRR tracks. The station and associated facilities would occupy approximately 20.5 acres, including 13 acres dedicated to the station, short-term parking, and kiss-and-ride accommodations. A new intermodal facility, not a part of this proposed undertaking, would be located 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 (designated "Intermodal Transit Center" in Figure 2-2). Among other uses, the intermodal facility would accommodate the Greyhound facilities and services that would be relocated from the northwestern corner of Tulare and H streets.

The site proposal includes the potential for up to three parking structures that would occupy a total of approximately 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 be slightly smaller in footprint (1.5 acres), with five levels and a capacity of approximately 1,100 cars. An additional 2-acre surface parking lot would provide approximately 300 parking spaces.

Under this alternative, the historic Southern Pacific Railroad depot and associated Pullman Sheds would remain intact. While these structures could be used for station-related purposes, they are assumed not to be functionally required for the HST project, and are therefore not proposed to be physically altered as part of the project. The Mariposa station building footprint has been configured to preserve views of the historic railroad depot and associated sheds.

The Authority Board selected this Fresno station location on May 3, 2012 following certification of the Merced to Fresno Section Final EIR/EIS. The FRA issued a ROD which included this station site in September 2012.

2.2.2.2 Kings/Tulare Regional Station

Two alternative sites are under consideration for the Kings/Tulare Regional Station.

<u>Kings/Tulare Regional Station–East Alternative</u>

The Kings/Tulare Regional Station would be located east of SR 43 (Avenue 8) and north of the SJVR on the BNSF Alternative (Figure 2-3). The station building would be approximately 40,000 square feet with a maximum height of approximately 75 feet. The entire site would be approximately 25 acres, including 8 acres designated for the station, bus transit center, short-term parking, and kiss-and-ride. An additional approximately 17.25 acres would support a surface parking lot with approximately 2,280 spaces.

<u>Kings/Tulare Regional Station–West Alternative</u>

The Kings/Tulare Regional Station–West Alternative would be located east of Thirteenth Avenue and north of the SJVR on the Hanford West Bypass 1 and 2 alternatives. The station would be

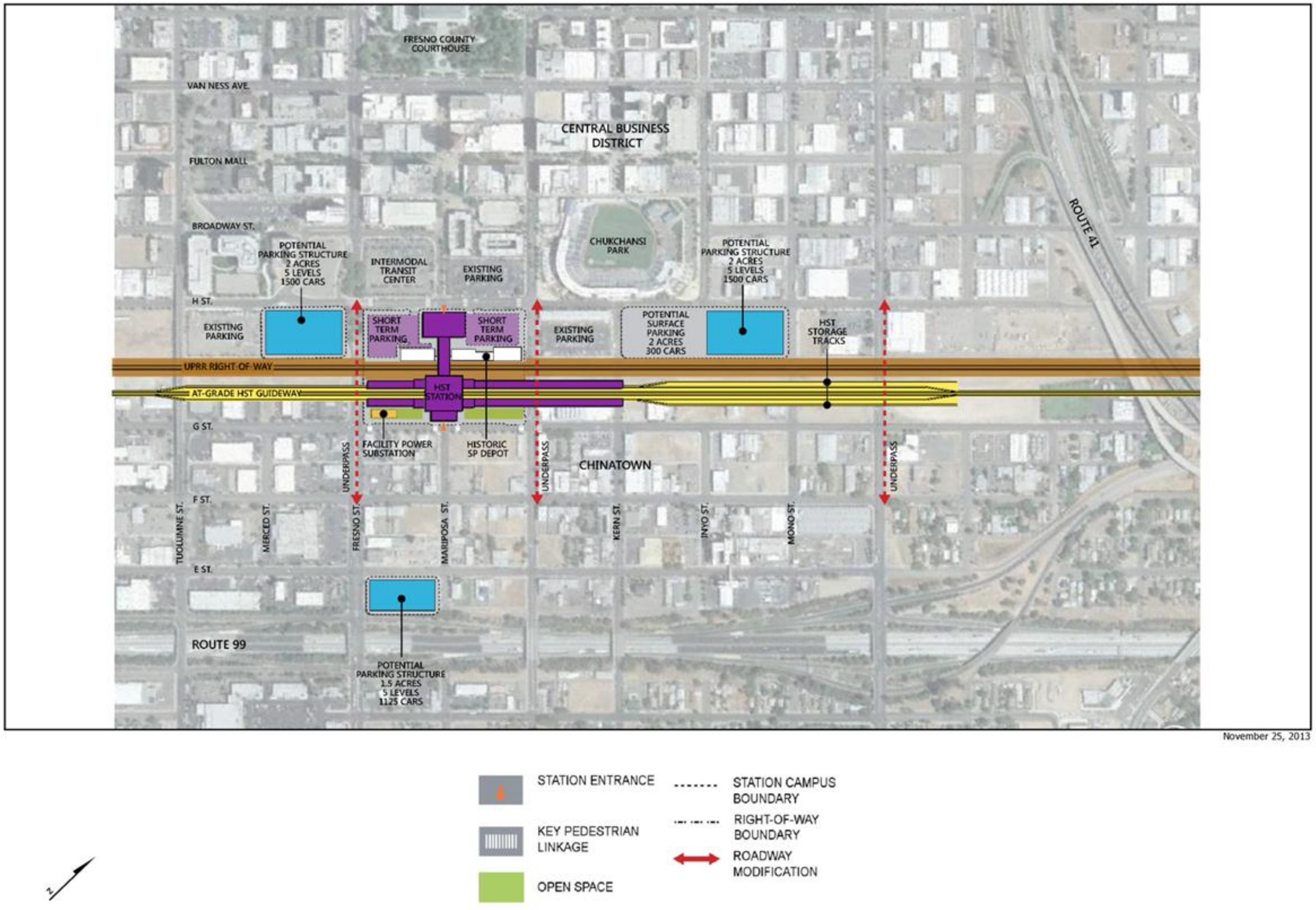
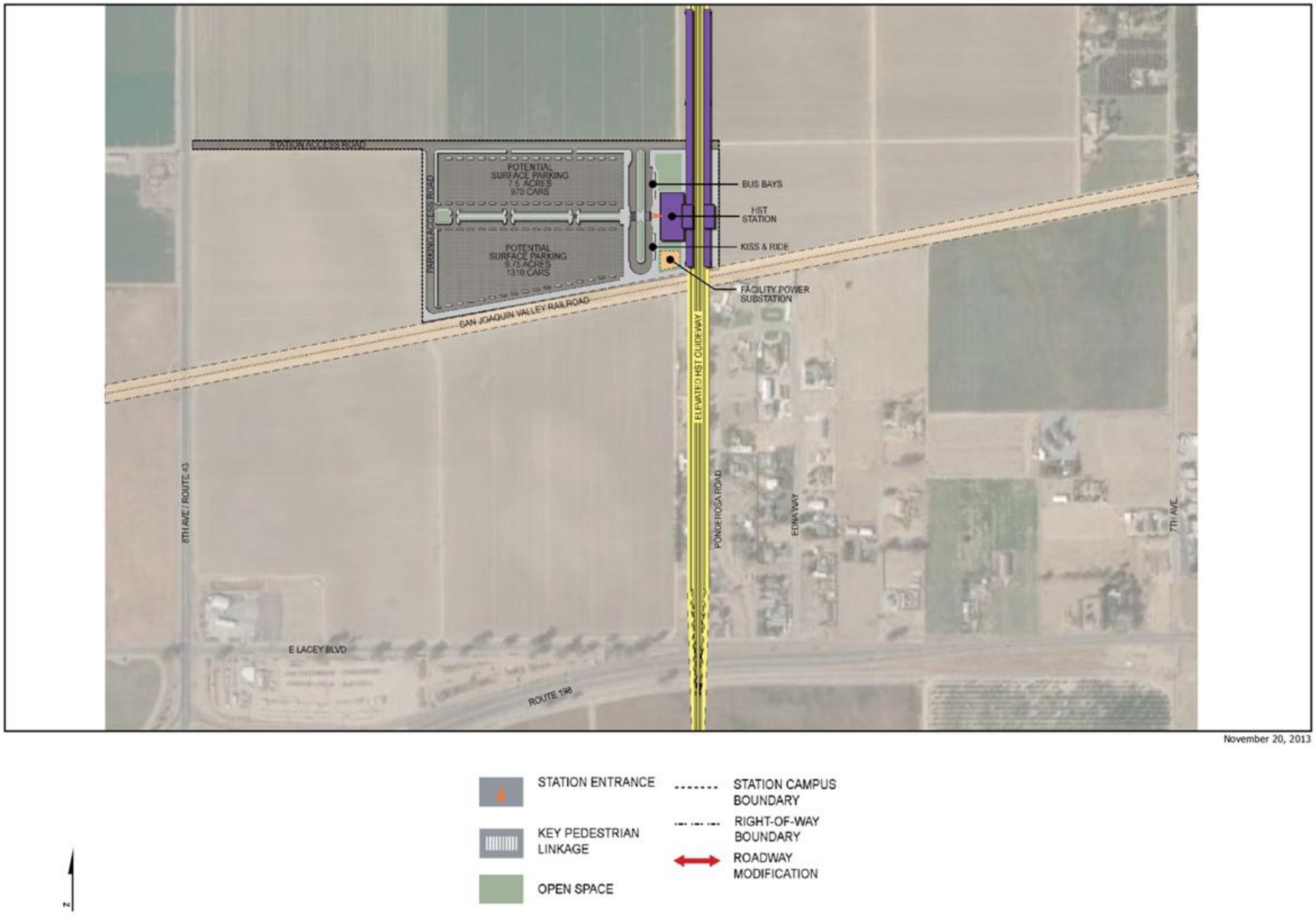


Figure 2-2
Fresno Station

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration



NOT TO SCALE

Figure 2-3
Kings/Tulare Regional Station–East Alternative

located either at-grade or below-grade depending on which Hanford West Bypass alignment is chosen.

The at-grade Kings/Tulare Regional Station–West Alternative would be located along either the Hanford West Bypass 1 or 2 alternatives and would include a station building of approximately 100,000 square feet with a maximum height of approximately 36 feet. The entire site would be approximately 48 acres, including 6 acres designated for the station, bus bays, short-term parking, and kiss-and-ride areas. Approximately 5 acres would support a surface parking lot with approximately 700 spaces. An additional 3.5 acres would support two parking structures with a combined parking capacity of 2,100 spaces (Figure 2-4).

The below-grade Kings/Tulare Regional Station–West Alternative would be located along either the Hanford West Bypass 1 or 2 Modified alternatives and would include a station building of approximately the same size and height. The below-grade station site would include the same components as the at-grade station option on the same number of acres; however, the station platform would be located below-grade instead of at ground level. Approximately 4 acres would support a surface parking lot with approximately 600 spaces and an additional 4 acres would support two parking structures with a combined parking capacity of 2,200 spaces (Figure 2-5).

2.2.2.3 Bakersfield Station Alternatives

Three options are under consideration for the Bakersfield Station.

Bakersfield Station–North Alternative

The Bakersfield Station–North Alternative would be located at the corner of Truxtun and Union Avenue/SR 204 along the BNSF Alternative (Figure 2-6). The three-level station building would be 52,000 square feet, with a maximum height of approximately 95 feet. The first level would house station operation offices and would also accommodate trains running along the BNSF Railway line. The second level would include the mezzanine; the HST platforms and guideway would pass through the third level. Under this alternative, the station building would be located at the western end of the parcel footprint. Two new boulevards would be constructed to access the station and the supporting facilities.

The 19-acre site would designate 11.5 acres for the station, bus transit center, short-term parking, and kiss-and-ride. An additional 7.5 acres would house two parking structures that together would accommodate approximately 4,500 cars. The bus transit center and the smaller of the two parking structures (2.5 acres) would be located north of the HST tracks. The BNSF Railway line would run through the station at-grade, with the HST alignment running on an elevated guideway.

Bakersfield Station–South Alternative

The Bakersfield Station–South Alternative would be would be similarly located in downtown Bakersfield, but situated on the Bakersfield South Alternative along Union and California avenues, just south of the BNSF Railway right-of-way (Figure 2-7). The two-level station building would be 51,000 square feet, with a maximum height of approximately 95 feet. The first floor would house the concourse, and the platforms and the guideway would be on the second floor. Access to the site would be from two new boulevards, one branching off from California Avenue and the other from Union Avenue.

The entire site would be 20 acres, with 15 acres designated for the station, bus transit center, short-term parking, and kiss-and-ride. An additional 5 acres would support one six-level parking structure with a capacity of approximately 4,500 cars. Unlike the Bakersfield Station–North Alternative, this station site would be located entirely south of the BNSF Railway right-of-way.

Bakersfield Station–Hybrid Alternative

The Bakersfield Station–Hybrid Alternative would be in the same area as the North and South Station alternatives, and located at the corner of Truxtun and Union Avenue/SR 204 on the Bakersfield Hybrid Alternative (Figure 2-8). The station design includes an approximately 57,000 square-foot main station building and an approximately 5,500 square-foot entry concourse located north of the BNSF Railway right-of-way. The station building would have two levels with a maximum height of approximately 95 feet. The first floor would house the concourse, and the platforms and guideway would be on the second floor. Additionally, a pedestrian overcrossing would connect the main station building to the north entry concourse across the BNSF right-of-way.

The entire site would be approximately 24 acres, with 15 acres designated for the station, bus transit center, short-term parking, and kiss-and-ride areas. Approximately 4.5 of the 24 acres would support three parking structures with a total capacity of approximately 4,500 cars. Each parking structure would be seven levels; one with a planned capacity of 1,750 cars, another with a capacity of 1,315 cars, and the third with a planned capacity of 1,435 cars. An additional 460 parking spaces would be provided in surface lots covering a total of approximately 4.5 acres of the station site. Access to the station site would be from Truxtun and Union avenues, as well as from Hayden Court. Under this alternative, the BNSF Railway track runs through the station site, and the main station building and majority of station facilities would be sited south of the BNSF Railway right-of-way.

2.2.3 Heavy Maintenance Facility

One HST heavy vehicle maintenance and layover facility would be sited along either the Merced to Fresno or Fresno to Bakersfield HST section. Before the start-up of initial operations, the HMF would support the assembly, testing, commissioning, and acceptance of high-speed rolling stock. During regular operations, the HMF would provide maintenance and repair functions, activation of new rolling stock, and train storage. The HMF concept plan indicates that the site would encompass approximately 154 acres to accommodate shops, tracks, parking, administration, roadways, power substation, and storage areas. The HMF would include tracks that allow trains to enter and leave under their own electric power or under tow. The HMF would also have management, administrative, and employee support facilities. Up to 1,500 employees could work at the HMF during any 24-hour period.

The Authority has determined that one HMF would be located between Merced and Bakersfield; however, the specific location has not yet been finalized. The property boundaries for each HMF site would be larger than the acreage needed for the actual facility because of the unique site characteristics and constraints of each location. Five HMF sites are under consideration in the Fresno to Bakersfield Section (Figure 2-1):

- The Fresno Works–Fresno HMF site lies within the southern limits of the city of Fresno and county of Fresno next to the BNSF Railway right-of-way between SR 99 and Adams Avenue. Up to 590 acres are available for the facility at this site.
- The Kings County–Hanford HMF site lies southeast of the city of Hanford, adjacent to and east of SR 43, between Houston and Idaho avenues. Up to 510 acres are available at the site.
- The Kern Council of Governments–Wasco HMF site lies directly east of Wasco between SR 46 and Filburn Street. Up to 420 acres are available for the facility at this site.

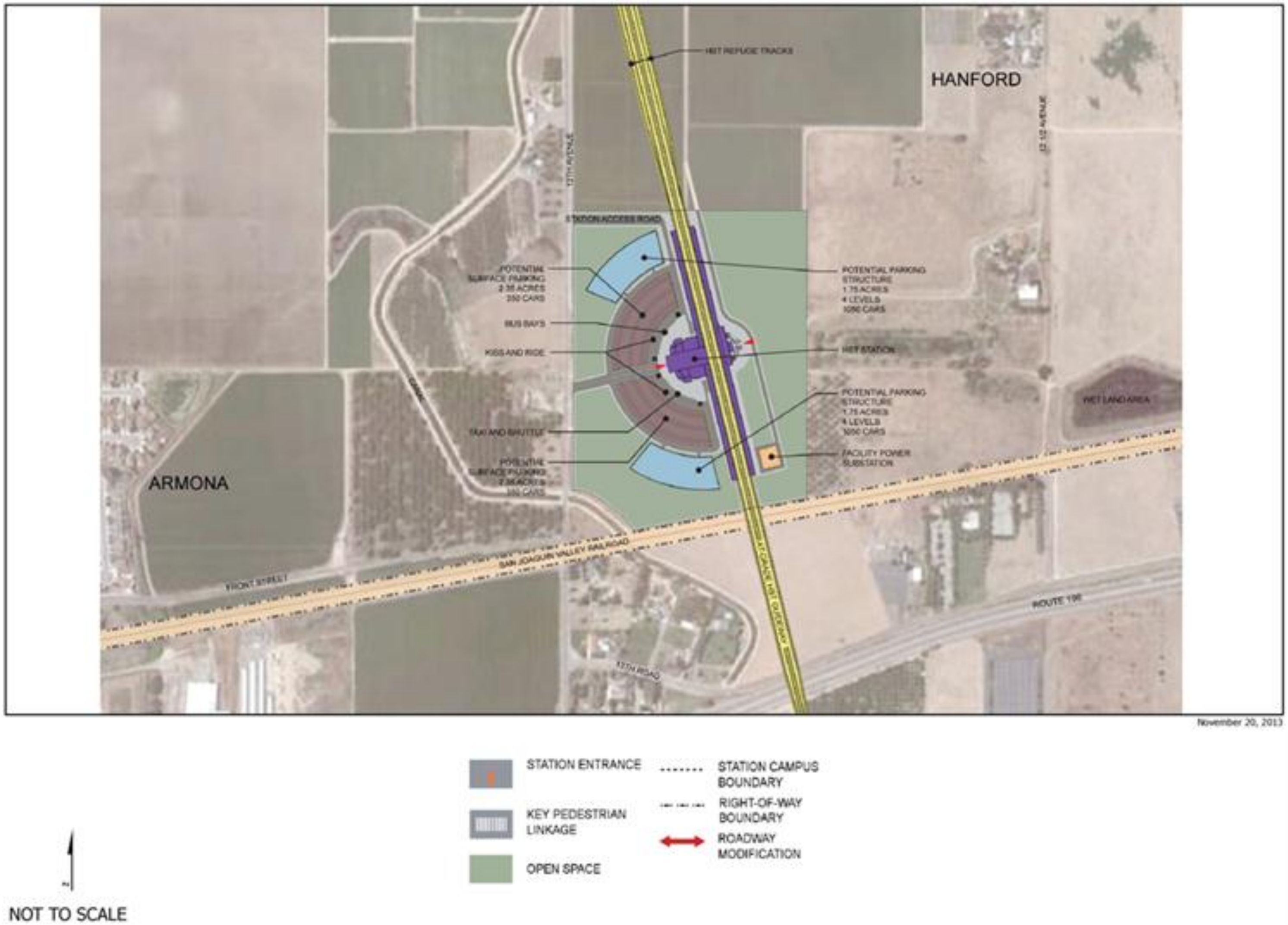


Figure 2-4
Kings/Tulare Regional Station–West Alternative (at-grade)

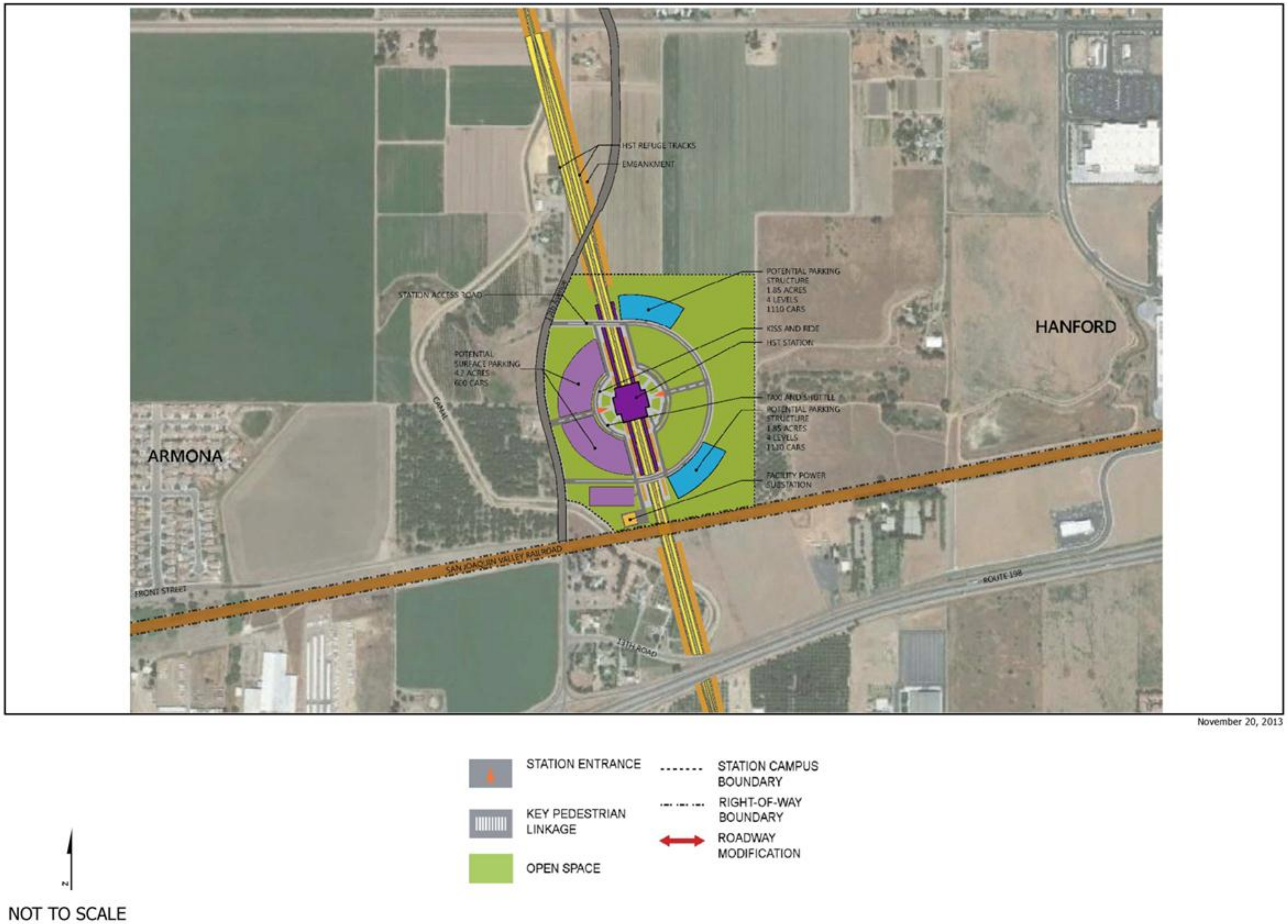


Figure 2-5
Kings/Tulare Regional Station–West Alternative (below-grade)

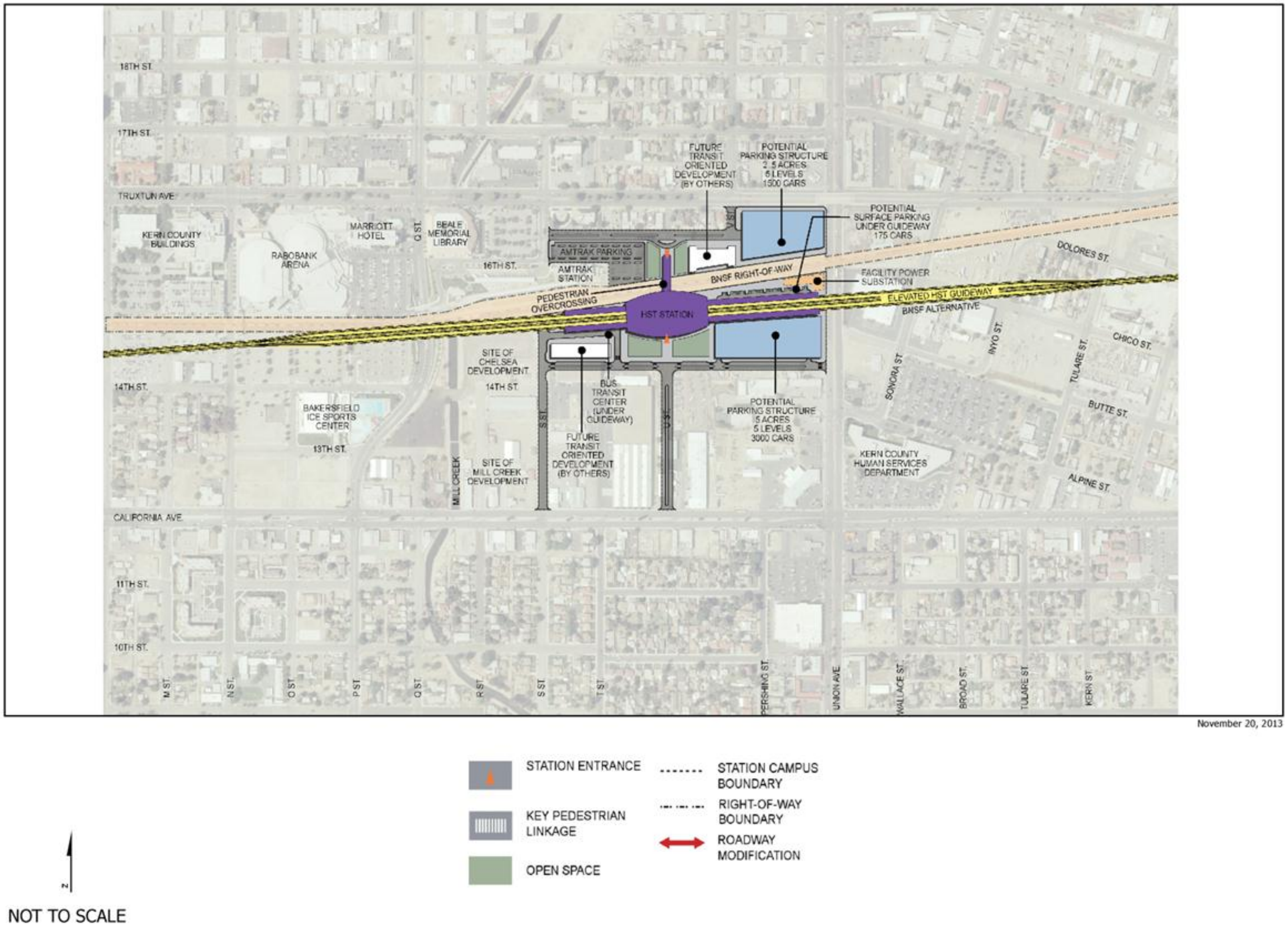
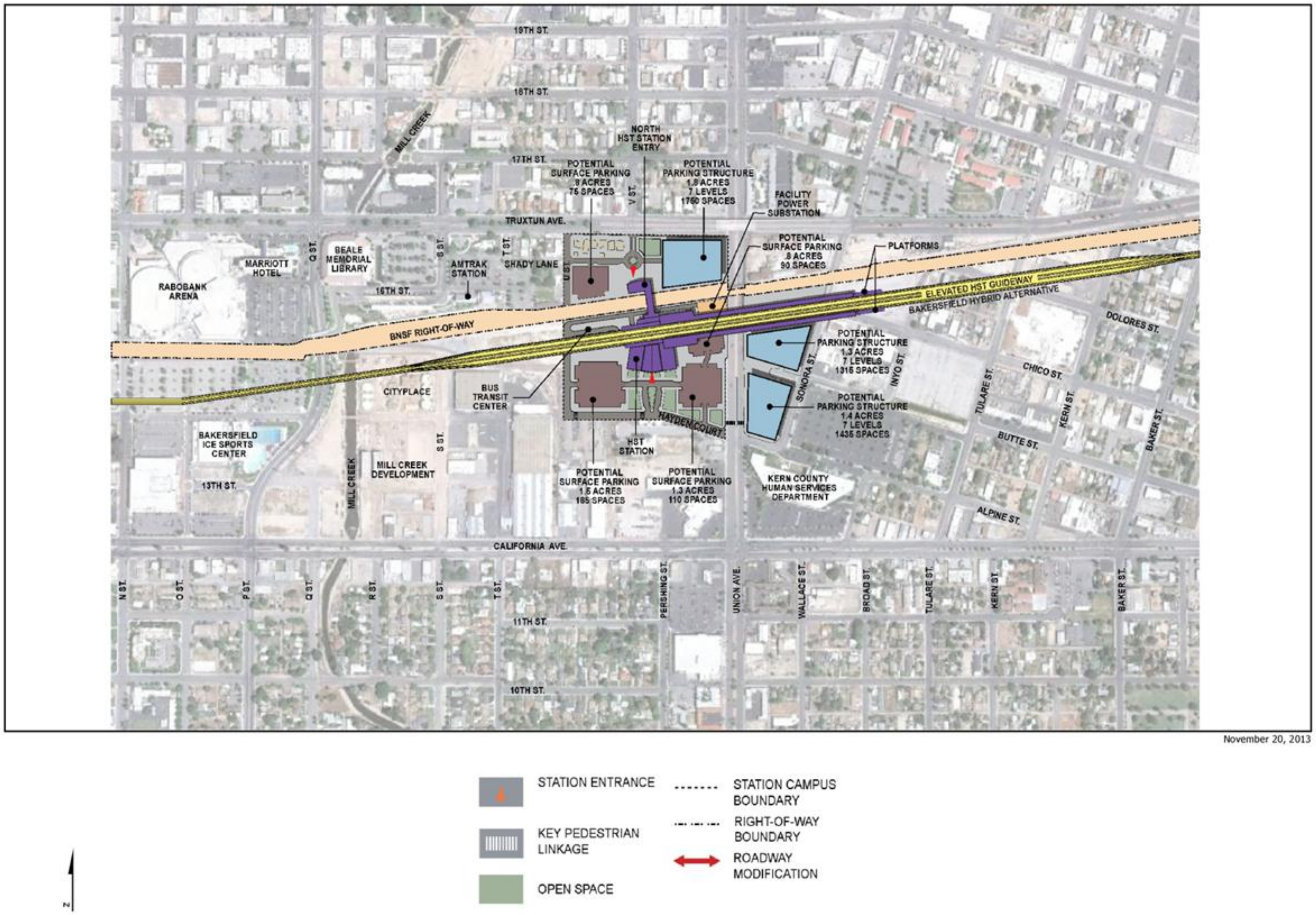


Figure 2-6
Bakersfield Station–North Alternative

NOT TO SCALE

Figure 2-7
Bakersfield Station–South Alternative



NOT TO SCALE

Figure 2-8
Bakersfield Station–Hybrid Alternative

- The Kern Council of Governments–Shafter East HMF site lies in the city of Shafter between Burbank Street and 7th Standard Road to the east of the BNSF Railway right-of-way. This site has up to 490 acres available for the facility.

The Kern Council of Governments–Shafter West HMF site lies in the city of Shafter between Burbank Street and 7th Standard Road to the west of the BNSF Railway right-of-way. This site has up to 480 acres available for the facility.

2.3 Power

Power for the HST System would be drawn from California's electricity grid and distributed to the trains via an overhead contact system. The project would not include the construction of a separate power source, although it would include the extension of power lines to a series of power substations positioned along the HST corridor. The transformation and distribution of electricity would occur in three types of stations:

- Traction power substations (TPSSs) transform high-voltage electricity supplied by public utilities to the train operating voltage. TPSSs would be sited adjacent to existing utility transmission lines and the HST right-of-way, and would be located approximately every 30 miles along the route. Each TPSS would be 200 feet by 160 feet.

- Switching stations connect and balance the electrical load between tracks, and switch power on or off to tracks in the event of a power outage or emergency. Switching stations would be located midway between, and approximately 15 miles from, the nearest TPSS. Each switching station would be 120 feet by 80 feet and be located adjacent to the HST right-of-way.

- Paralleling stations, or autotransformer stations, provide voltage stabilization and equalize current flow. Paralleling stations would be located every 5 miles between the TPSSs and the switching stations. Each paralleling station would be 100 feet by 80 feet and located adjacent to the HST right-of-way.

2.4 Project Construction

The construction plan developed by the Authority and described below would maintain eligibility for eligibility for federal American Recovery and Reinvestment Act (ARRA) funding. For the Fresno to Bakersfield Section, specific construction elements would include at-grade, below-grade, and elevated track, track work, grade crossings, and installation of a positive train control system. At-grade track sections would be built using conventional railroad construction techniques. A typical sequence includes clearing, grubbing, grading, and compacting the rail bed; applying crushed rock ballast; laying track; and installing electrical and communications systems.

The precast segmental construction method is proposed for elevated track sections. In this construction method, large concrete bridge segments would be mass-produced at an onsite temporary casting yard. Precast segments would then be transported atop the already completed portions of the elevated track and installed using a special gantry crane positioned on the aerial structure. Although the precast segmental method is the favored technique for aerial structure construction, other methods may be used, including cast-in-place, box girder, or precast span-by-span techniques.

Preconstruction activities would be conducted during final design and include geotechnical investigations, identification of staging areas, initiation of site preparation and demolition, relocation of utilities, and implementation of temporary, long-term, and permanent road closures.

Additional studies and investigations to develop construction requirements and worksite traffic control plans would be conducted as needed.

Major construction activities for the Fresno to Bakersfield Section would include earthwork and excavation support systems construction, bridge and aerial structure construction, railroad systems construction (including trackwork, traction electrification, signaling, and communications), and station construction. During peak construction periods, work is envisioned to be underway at several locations along the route, with overlapping construction of various project elements. Working hours and workers present at any time will vary depending on the activities being performed.

The Authority intends to build the project using sustainable methods that:

- Minimize the use of nonrenewable resources.
- Minimize the impacts on the natural environment.
- Protect environmental diversity.
- Emphasize the use of renewable resources in a sustainable manner.

The approximate schedule for construction is provided in Table 2-1.

Table 2-1
Approximate Construction Schedule[a,b]

Activity	Tasks	Duration
Right-of-way Acquisition	Proceed with right-of-way acquisitions once State Legislature appropriates funds in annual budget	March 2013–March 2015
Survey and Preconstruction	Locate utilities, establish right-of-way and project control points and centerlines, establish or relocate survey monuments	March 2013–October 2013
Mobilization	Safety devices and special construction equipment mobilization	April 2014–July 2014
Site Preparation	Utilities relocation; clearing/grubbing right-of-way; establishment of detours and haul routes; preparation of construction equipment yards, stockpile materials, and precast concrete segment casting yard	July 2014–November 2014 (two site preparation periods)
Earth Moving	Excavation and earth support structures	November 2014–November 2016
Construction of Road Crossings	Surface street modifications, grade separations	November 2014–November 2016
Construction of Aerial Structures	Aerial structure and bridge foundations, substructure, and superstructure	November 2014–January 2017
Track Laying	Includes backfilling operations and drainage facilities	November 2016–July 2017
Systems	Train control systems, overhead contact system, communication system, signaling equipment	November 2016–May 2019
Demobilization	Includes site cleanup	October 2016–April 2017 (two demobilization periods)

Table 2-1
Approximate Construction Schedule[a,b]

Activity	Tasks	Duration
HMF Phase 1[c]	Test Track Assembly and Storage	May 2017–November 2018
HMF Phase 2[c]	Test Track Light Maintenance Facility	May 2017–December 2018
Maintenance-of-Way Facility	Potentially collocated with HMF[a]	May 2017–November 2018
HMF Phase 3[c]	Heavy Maintenance Facility	May 2017–November 2018
HST Stations	Demolition, site preparation, foundations, structural frame, electrical and mechanical systems, finishes	Fresno: June 2017–April 2020 Kings/Tulare Regional: June 2020–June 2023[d] Bakersfield: June 2018–April 2021

Notes:
[a] Based on a two-phase implementation of the project: first construction will meet the ARRA funding deadline and be completed in 2017; the remainder of the Initial Operating Segment will be completed by 2022 per the Business Plan and based on anticipated funding flow.
[b] Final design will be completed by the design-build contractor following contract award and issuance of the Notice to Proceed for each construction package.
[c] HMF would be sited in either the Merced to Fresno or Fresno to Bakersfield Section.
[d] Right-of-way would be acquired for the Kings/Tulare Regional Station; however, the station itself would not be part of initial construction.

Chapter 3.0
Regulatory Framework

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 USEPA. 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

USEPA 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. USEPA 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 USEPA, the reader can contact USEPA's general internet address found at www.epa.gov. Additional information on the activities of USEPA 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 (RWQCBs), 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 Clean Air Act

The California Clean Air Act (CCAA) requires nonattainment areas to achieve and maintain the health-based State Ambient Air Quality Standards by the earliest practicable date. The Act is administered by CARB at the state level and by local air quality management districts at the regional level, whereby the air districts are required to develop plans and control programs for attaining the state standards.

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

3.1.3 Local

3.1.3.1 San Joaquin Valley Air Pollution Control 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 Fresno to Bakersfield Section include the Council of Fresno County Governments (Fresno COG), the Kings County Association of Governments (KCAG), the Tulare County Association of Governments (TCAG), and the Kern Council of Governments (Kern COG). Members of the Fresno 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 KCAG comprises representatives from Kings County and the cities of Avenal, Corcoran, Hanford, and Lemoore (KCAG 2010a). The TCAG represents the cities of Dinuba, Exeter, Farmersville, Lindsay, Porterville, Tulare, Visalia, Woodlake, Tulare County, the Tule River Indian Tribe, and tribal communities in the transportation planning process (TCAG 2010). The Kern COG addresses regional transportation issues in the County of Kern and the 11 incorporated cities within Kern County: Arvin, California City, Maricopa, Ridgecrest, Taft, Wasco, Bakersfield, Delano, McFarland, Shafter, and Tehachapi (Kern COG 2010a).

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 Fresno to Bakersfield 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 USEPA. 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 USEPAs' 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, USEPA promulgated Title 40 of the Code of Federal Regulations Part 51 (40 Code of Federal Regulations [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 Fed. Reg. 63214 [November 30, 1993], as amended, 75 Fed. Reg. 17253 [April 5, 2010]). These regulations, commonly referred to as the General Conformity Rule, apply to all federal actions including those by FRA, 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.

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 Fed. Reg. 17255).

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

In addition, federal activities may not cause or contribute to new violations of air quality standards, exacerbate existing violations, or interfere with timely attainment or required interim emissions reductions toward attainment. The proposed project is subject to review under the USEPA 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, USEPA 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 3.2-1. 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.

3.2.3 Mobile Source Air Toxics

In addition to the NAAQS criteria pollutants, USEPA regulates MSATs. In February 2007, USEPA 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. USEPA 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, USEPA's existing programs have reduced MSATs by more than 1 million tons from 1999 levels (USEPA 2013). In addition to controlling pollutants, such as hydrocarbons, PM, and nitrogen oxides (NO_x), recent USEPA regulations controlling emissions from highway vehicles and nonroad equipment will result in large reductions in toxic emissions to the air. Furthermore, USEPA has programs under development that would provide additional benefits (further controls) for small nonroad gasoline engines, diesel locomotives, and marine engines. A variety of USEPA 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. 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, USEPA has not established NAAQS or provided standards for hazardous air pollutants.

Table 3.2-1
State and Federal Ambient Air Quality Standards

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		National Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
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	—	—	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 µg/m^3		
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m^3)	—	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	—	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	
Nitrogen Dioxide (NO_2)[8]	1 Hour	0.18 ppm (339 µg/m^3)	Gas Phase Chemiluminescence	100 ppb (188 µg/m^3)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 µg/m3)		53 ppb (100 µg/m^3)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[9]	1 Hour	0.25 ppm (655 µg/m^3)	Ultraviolet Fluorescence	75 ppb (196 µg/m^3)	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	—		—	0.5 ppm (1300 µg/m^3)	
	24 Hour	0.04 ppm (105 µg/m^3)		0.14 ppm (for certain areas)[9]	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas)[9]	—	
Lead[10,11]	30 Day Average	1.5 µg/m^3	Atomic Absorption	—	—	High Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 µg/m^3 (for certain areas)[11]	Same as Primary Standard	
	Rolling 3-Month Average	—		0.15 µg/m^3		
Visibility Reducing Particles[12]	8 Hour	See footnote 12	Beta Attenuation and Transmittance through Filter Tape	No National 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 (2/7/12)

Table 3.2-1
State and Federal Ambient Air Quality Standards (Continued)

1. California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, and 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 arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over 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 the U.S. EPA for further clarification and current national 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 measurement method 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 U.S. 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 U.S. EPA.

8. To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 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, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

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

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. The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

12. In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

For more information please call ARB-PIO at (916) 322-2990 **California Air Resources Board (2/7/12)**

Source: CARB 2013

3.2.4 Federal Greenhouse Gas Regulations

Climate change and greenhouse gas (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 USEPA has the authority to regulate GHG.

On September 22, 2009, USEPA 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. USEPA 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 must submit annual reports to USEPA 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. However, the methodology developed as part of this regulation is helpful in identifying potential GHG emissions.

On October 5, 2009, President Obama signed Executive Order (E.O.) 13514; *Federal Leadership in Environmental, Energy, and Economic Performance*. E.O. 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 (USEPA 2010a).

Based on the endangerment finding, USEPA is revising vehicle emission standards under the CAA. USEPA and National Highway Traffic Safety Administration (NHTSA) updated the Corporate Average Fuel Economy (CAFE) fuel standards on May 7, 2010 (75 Fed. Reg. 25324), requiring substantial improvements in fuel economy for all vehicles sold in the Unites States. The new standards apply to new passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering model years 2012 through 2016. The USEPA GHG standards require these vehicles to meet an estimated combined average emissions level of 250 grams of CO_2 per mile in the model year 2016, which would be the equivalent to 35.5 miles per gallon if the automotive industry were to meet this CO_2 level solely through fuel economy improvements.

On September 15, 2011, USEPA and NHTSA issued a Final Rule of Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles (76 Fed. Reg. 57107). This final rule is tailored to each of the three regulatory categories of heavy-duty vehicles: combination tractors, heavy-duty pickup trucks and cars, and vocational vehicles. USEPA and NHTSA estimated that the new standards in this rule will reduce CO_2 emissions by approximately 270 million metric tons (MMT) and save 530 million barrels of oil over the life of vehicles sold during the 2014 through 2018 model years.

In January 2012, the California Air Resources Board (CARB) approved a vehicle emission control program for model years 2017 through 2025. This is called the Advanced Clean Cars Program. On August 28, 2012, U.S. EPA and the NHTSA issued a joint final rulemaking to establish 2017 through 2025 GHG emissions and CAFE Standards. To further California's support of the national program to regulate emissions, CARB submitted a proposal that would allow automobile manufacturer compliance with U.S.EPA's requirements to show compliance with California's requirements for the same model years. The Final Rulemaking Package was filed on December 6, 2012, and the final rulemaking became effective December 31, 2012.

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 pro-active 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 emissions standards apply to automobiles and light trucks beginning with the 2009 model year. Although litigation was filed challenging these regulations and USEPA initially denied California's related request for a waiver, a waiver has since been granted (CARB 2009).

3.2.6.2 Executive Order S-3-05

On June 1, 2005, Governor Schwarzenegger signed E.O. S-3-05. The goal of E.O. 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. E.O. 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 E.O. S-03-05 is further reinforced by AB 32, the Global Warming Solutions Act of 2006. AB 32 sets overall GHG emissions 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." E.O. S-20-06 further directs state agencies to begin implementing AB 32, including the recommendations made by the state's Climate Action Team (Office of the Governor 2006).

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 greenhouse gas emissions in 1990 to serve as the emissions limit to be achieved by 2020 (HSC Section 38550). In December 2007, CARB approved the 2020 emission limit of 427 MMT CO_2e of GHG.

- Adopt a regulation requiring the mandatory reporting of greenhouse gas 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 E.O. S-01-07, Governor Schwarzenegger set forth the low-carbon fuel standard for California. Under this E.O., 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 2009).

Provisions of the CEQA amendments include the following (California Natural Resources Agency 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), mitigation may include specific measures that may be implemented on a project-by-project basis. Mitigation may also incorporate specific measures or policies found 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 the 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 the California's 18 MPOs. The MPOs have been tasked with creating Sustainable Communities 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 adopted the final targets on September 23, 2010. CARB must update the regional targets every 8 years (or 4 years if it so chooses) consistent with each MPO update of its RTP.

3.2.6.7 Governor's Executive Order S-13-08

On November 14, 2008, the Governor signed an E.O. 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, USEPA is responsible for enforcing regulations relating to asbestos renovations and demolitions; however, USEPA 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 2008). 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 will 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 the implementation of control measures for fugitive dust emission sources. The project would also implement the mandatory control measures listed in Table 6-2 in the *Guide for Assessing and Mitigating Air Quality Impacts* (GAMAQI) (SJVAPCD 2002) to reduce fugitive dust emissions. These measures are not considered mitigation measures because they are required by law.

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

- All disturbed areas, including storage piles, which are not being actively used for construction purposes, will be effectively stabilized for 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 for 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.

- All materials are transported offsite 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 (SJVAPCD 2005). 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. Construction of the HST alignment (specifically, onsite off-road construction exhaust emissions) would be subject to ISR. Accordingly, the Authority would have to submit an Air Impact Assessment (AIA) application to the SJVAPCD with commitments to reduce construction exhaust NO_x and PM_{10} emissions by 20% and 45%, respectively. According to SJVAPCD, if successful, AQ-MM#1 might, as a practical matter, satisfy these numerical reduction requirements; if not, AQ-MM#4 would satisfy the ISR requirements. Operation of the HST would be exempt under sections 4.1 and 4.2 of Rule 9510.

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 (SJVAPCD 2002). 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.

This page intentionally left blank

Chapter 4.0
Pollutants of Concern

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 on Figure 4.1-1, O_3 is found in both 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 comprised primarily of atoms of hydrogen and carbon. TOG 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 paints 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 ROG 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.

Source: EPA 2003

Figure 4.1-1
Ozone in the atmosphere

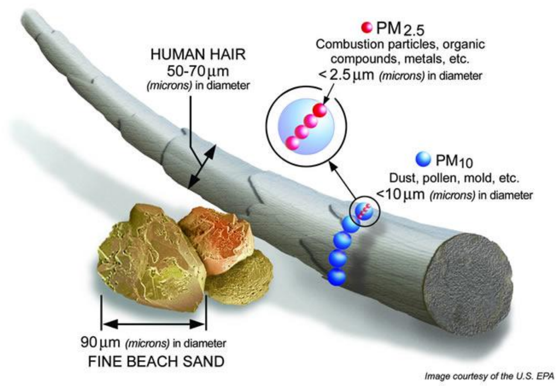
Substantial O_3 formations generally require a stable atmosphere with strong sunlight; therefore, high levels of O_3 are generally a concern in the summer. O_3 is the main ingredient of smog. O_3 enters the bloodstream through the respiratory system and interferes with the transfer of oxygen, depriving 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 also can be 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 4.1-2). PM pollution consists of very small liquid and solid particles floating in the air, and can include smoke, soot, dust, salts, acids, and metals. PM can forms when gases emitted from motor vehicles undergo chemical reactions in the atmosphere.

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 lands; and atmospheric chemical and photochemical reactions. These suspended particulates produce haze and reduce visibility.



Source: EPA no date

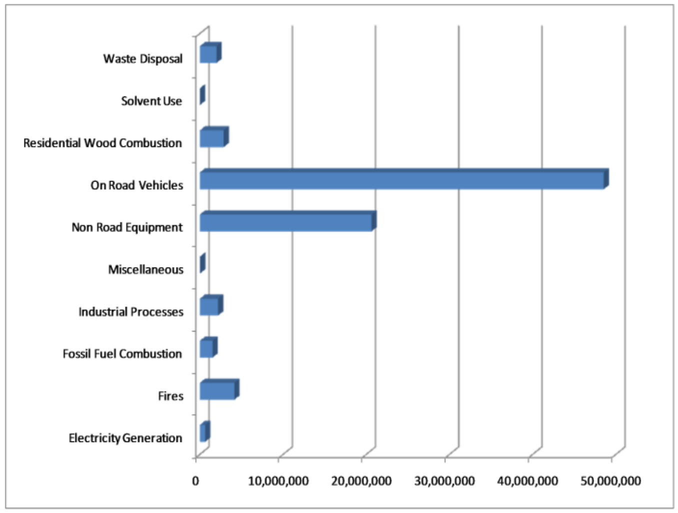
Figure 4.1-2
Relative particulate matter size

Data collected during numerous 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 tissues. 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



Source: EPA 2011a.

Figure 4.1-3
Sources of CO

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 on Figure 4.1-3, 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 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." As with O_3, NO_2 can be formed through a reaction between nitric oxide (NO) and atmospheric oxygen. 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 and 3 years old) has also been observed at concentrations below 0.3 part 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 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 USEPA (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 and is not conducted for this project. 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." USEPA 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 USEPA 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 alignment. In addition, asbestos-containing materials may have been used in constructing buildings that will 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. USEPA 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.

USEPA has assessed this expansive list in their 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. USEPA identified seven compounds with significant contributions from mobile sources that are among the national- and regional-scale cancer risk drivers from its National Air Toxics Assessment (USEPA 1999). 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 USEPA 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. USEPA 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. USEPA 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 (ATSDR 1992). No information is available on reproductive or developmental effects of 1,3-butadiene in humans. USEPA has classified 1,3-butadiene as a probable human carcinogen by inhalation.

DPM/Diesel Exhaust Organic Gases are a complex mixture 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, 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. USEPA 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. USEPA considers formaldehyde to be a probable human carcinogen.

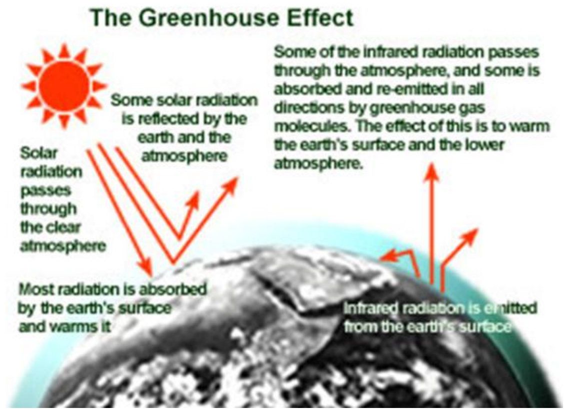
Naphthalene is used in the production of phthalic anhydride; it is also used in mothballs. Acute (short-term) exposure of humans to naphthalene by inhalation, ingestion, and dermal contact is associated with hemolytic anemia, damage to the liver, and neurological damage. Cataracts have also been reported 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. USEPA 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. USEPA 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 4.1-4). 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 2010 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.

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.



Source: EPA 2012a.

Figure 4.1-4
The greenhouse effect

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 system, GHGs will be examined on a statewide level and regional level.

This page intentionally left blank

Chapter 5.0
Existing Conditions

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 USEPA and the State of California have set ambient air quality standards or those 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 2011b).

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 2011).

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 3425 North First Street in Fresno, 310 North Church Street in Visalia, 1128 Golden State Highway in Bakersfield, 1520 Patterson Avenue in Corcoran, 801 South Irwin Street in Hanford, 548 Walter Street in Shafter,. These stations monitor NO_2, O_3, PM_{10}, CO, $PM_{2.5}$ and 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 on Figure 5.2-1. Table 5.2-1 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 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 from 2007 through 2009.
- The PM_{10} values for the region exceed the state 24-hour PM_{10} standard for all stations for years 2007 through 2009. The national 24-hour PM_{10} standard was only exceeded at the Bakersfield monitoring station in 2008, at the Corcoran monitoring station in 2008 and 2009,

and at the Hanford monitoring station in 2008. The state annual PM_{10} standard was exceeded at the Fresno, Corcoran, Hanford, and Visalia monitoring stations multiple times for years 2007 through 2009.

- The $PM_{2.5}$ values for the region exceed the national 24-hour $PM_{2.5}$ for the Fresno, Corcoran, Visalia, and Bakersfield monitoring stations from 2007 through 2009. The national annual standard was exceeded at these monitoring stations for all years 2007 through 2009. The state annual standard was exceeded at the Fresno and Visalia stations for all years 2007 through 2009; the standard was exceeded at the Corcoran station only in 2007 and 2008, and at the Bakersfield station only in 2007.
- SO_2 values were only monitored at the Fresno station and do not exceed the 24-hour SO_2 CAAQS. No otherSO_2 values were monitored at the other monitoring stations.

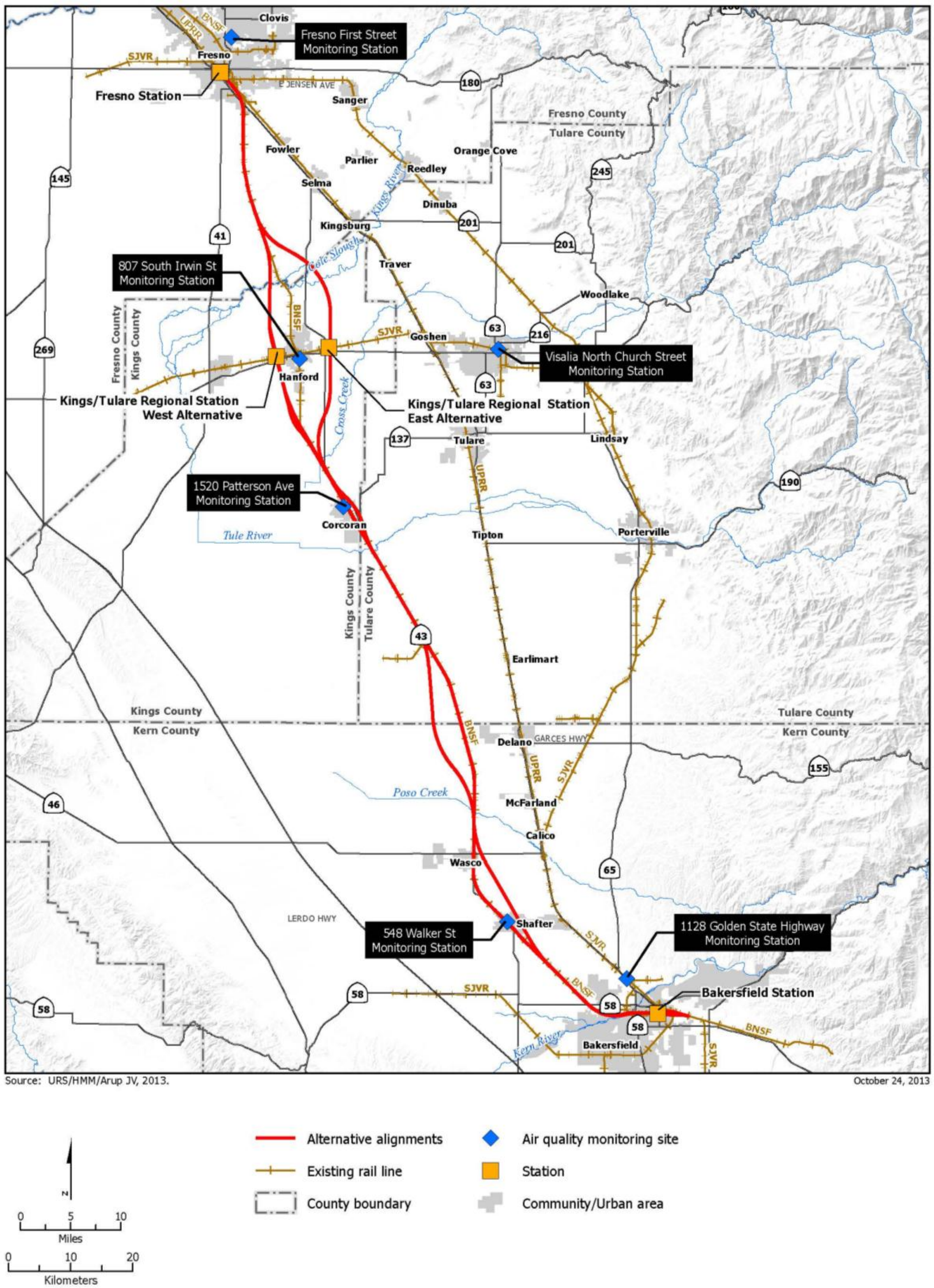


Figure 5.2-1
Air quality monitoring stations closest to project

Table 5.2-1
Ambient Criteria Pollutant Concentration Data at Air Quality Monitoring Stations Closest to the Project

Air Pollutant	Standard/Exceedance	3425 N. First Street, Fresno			310 N. Church Street, Visalia			1128 Golden State Hwy, Bakersfield		
		2007	2008	2009	2007	2008	2009	2007	2008	2009
Carbon Monoxide (CO)	Year Coverage	98%	96%	97%	NM	NM	NM	96%	88%	94%
	Max. 1-hour Concentration (ppm)	3.4	3.1	NM	NM	NM	NM	2.8	3.5	NM
	Max. 8-hour Concentration (ppm)	2.60	2.34	2.07	NM	NM	NM	1.97	2.17	1.51
	# Days>Federal 1-hour Std. of >35 ppm	0	0	0	NM	NM	NM	0	0	0
	# Days>Federal 8-hour Std. of >9 ppm	0	0	0	NM	NM	NM	0	0	0
	# Days>California 8-hour Std. of >9 ppm	0	0	0	NM	NM	NM	0	0	0
Ozone (O_3)	Year Coverage[a]	98%	98%	99%	99%	98%	99%	98%	91%	87%
	Max. 1-hour Concentration (ppm)	0.119	0.157	0.121	0.107	0.130	0.120	0.127	0.115	0.096
	Max. 8-hour Concentration (ppm)	0.102*	0.132*	0.104*	0.100*	0.122*	0.093*	0.103*	0.106*	0.085*
	# Days>Federal 8-hour Std. of >0.075 ppm	37	62	51	31	60	48	14	21	4
	# Days>California 1-hour Std. of >0.09 ppm	14	44	36	11	44	23	1	9	1
	# Days>California 8-hour Std. of >0.07 ppm	62	86	73	56	94	68	26	36	24
Nitrogen Dioxide (NO_2)	Year Coverage	99%	95%	99%	98%	99%	100%	95%	95%	89%
	Max. 1-hour Concentration (ppm)	0.086	0.070	0.068	0.071	0.077	0.068	0.073	0.075	0.073
	Annual Average (ppm)	0.017	0.016	0.014	0.015	0.014	0.015	0.020	0.019	0.018
	# Days>California 1-hour Std. of >0.18 ppm	0	0	0	0	0	0	0	0	0
Sulfur Dioxide (SO_2)	Year Coverage	89%	98%	99%	NM	NM	NM	NM	NM	NM
	Max. 24-hour Concentration (ppm)	0.007	0.003	0.005	NM	NM	NM	NM	NM	NM
	Annual Average (ppm)	NM	NM	NM	NM	NM	NM	NM	NM	NM
	# Days>California 24-hour Std. of >0.04 ppm	NM	NM	NM	NM	NM	NM	NM	NM	NM

Table 5.2-1
Ambient Criteria Pollutant Concentration Data at Air Quality Monitoring Stations Closest to the Project

Air Pollutant	Standard/Exceedance	3425 N. First Street, Fresno			310 N. Church Street, Visalia			1128 Golden State Hwy, Bakersfield		
		2007	2008	2009	2007	2008	2009	2007	2008	2009
Respirable Particulate Matter (PM_{10})	Year Coverage	97%	100%	99%	100%	94%	100%	96%	81%	93%
	Max. 24-hour Concentration (µg/m^3)	107.0	78.3	75.3	99.0	104.7	93.2	135.0	266.8*	139.5
	#Days>Fed. 24-hour Std. of >150 µg/m^3	0	0	0	0	0	0	0	1	0
	#Days>California 24-hour Std. of >50 µg/m^3	9	15	8	15	26	20	28	31	31
	Annual Average (µg/m^3)	32.4	35.1	30.9	42.3	47.1	41.8	NM	NM	NM
Fine Particulate Matter ($PM_{2.5}$)	Year Coverage	98%	99%	98%	92%	97%	100%	88%	90%	37%
	Max. 24-hour Concentration (µg/m^3)	103.8*	93.0*	82.3*	73.3*	88.5*	74.5*	154.0*	88.7*	71.5*
	State Annual Average (µg/m^3)	22.3	21.2	15.1	22.5	19.8	16.6	25.2	NM	NM
	#Days>Fed. 24-hour Std. of >35 µg/m^3	64	50	35	60.4	52.3	23.9	17	13	6
	Annual Average (µg/m^3)	18.8*	17.3*	15.1*	20.3*	19.8*	16.0*	19.9*	17.8*	15.1*

Sources: CARB 2013b.

Note:
[a] Coverage is for 8-hour standard.

Acronyms and Abbreviations:
- > greater than
- * Exceeds annual NAAQS
- µg/m^3 micrograms per cubic meter

Acronyms and Abbreviations (continued):
- NM not monitored
- N/A not available
- 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
- ppm part(s) per million

Table 5.2-1
Ambient Criteria Pollutant Concentration Data at Air Quality Monitoring Stations Closest to the Project

Air Pollutant	Standard/Exceedance	1520 Patterson Ave Corcoran			807 South Irwin St Hanford			548 Walker St Shafter		
		2007	2008	2009	2007	2008	2009	2007	2008	2009
Carbon Monoxide (CO)	Year Coverage	NM	NM	NM	NM	NM	NM	NM	NM	NM
	Max. 1-hour Concentration (ppm)	NM	NM	NM	NM	NM	NM	NM	NM	NM
	Max. 8-hour Concentration (ppm)	NM	NM	NM	NM	NM	NM	NM	NM	NM
	# Days>Federal 1-hour Std. of >35 ppm	NM	NM	NM	NM	NM	NM	NM	NM	NM
	# Days>Federal 8-hour Std. of >9 ppm									
	# Days>California 8-hour Std. of >9 ppm	NM	NM	NM	NM	NM	NM	NM	NM	NM
		NM	NM	NM	NM	NM	NM	NM	NM	NM
Ozone (O_3)	Year Coverage[a]	NM	95%	88%	81%	NM	NM	99%	99%	98%
	Max. 1-hour Concentration (ppm)	NM	0.132	0.123	0.102	NM	NM	0.111	0.131	0.105
	Max. 8-hour Concentration (ppm)	NM	0.124	0.091	0.091	NM	NM	0.103	0.111	0.084
	# Days>Federal 8-hour Std. of >0.075 ppm	NM	38	21	8	NM	NM	18	33	11
	# Days>California 1-hour Std. of >0.09 ppm	NM	28	6	2	NM	NM	3	14	2
	# Days>California 8-hour Std. of >0.07 ppm	NM	66	43	20	NM	NM	47	45	31
Nitrogen Dioxide (NO_2)	Year Coverage	NM	NM	NM	78%	NM	NM	95%	95%	95%
	Max. 1-hour Concentration (ppm)	NM	NM	NM	0.058	NM	NM	0.101	0.057	0.052
	Annual Average (ppm)	NM	NM	NM	N/A	NM	NM	0.014	0.014	0.012
	# Days>California 1-hour Std. of >0.18 ppm	NM	NM	NM	0	NM	NM	0	0	0

Table 5.2-1
Ambient Criteria Pollutant Concentration Data at Air Quality Monitoring Stations Closest to the Project

Air Pollutant	Standard/Exceedance	1520 Patterson Ave Corcoran			807 South Irwin St Hanford			548 Walker St Shafter		
		2007	2008	2009	2007	2008	2009	2007	2008	2009
Sulfur Dioxide (SO_2)	Year Coverage	NM	NM	NM	NM	NM	NM	NM	NM	NM
	Max. 24-hour Concentration (ppm)	NM	NM	NM	NM	NM	NM	NM	NM	NM
	Annual Average (ppm)	NM	NM	NM	NM	NM	NM	NM	NM	NM
	# Days>California 24-hour Std. of >0.04 ppm	NM	NM	NM	NM	NM	NM	NM	NM	NM
Respirable Particulate Matter (PM_{10})	Year Coverage	100%	100%	99%	94%	96%	100%	NM	NM	NM
	Max. 24-hour Concentration (µg/m^3)	125.0	353.5	124.4	106.0	230.6	105.2	NM	NM	NM
	#Days>Fed. 24-hour Std. of >150 µg/m^3	0	6.6	1	0	10.6	0	NM	NM	NM
	#Days>California 24-hour Std. of >50 µg/m^3	134	182.2	106.9	145.1	N/A	109.2	NM	NM	NM
	Annual Average (µg/m^3)	45.6	55.9	42.5	44.3	N/A	42.1	NM	NM	NM
Fine Particulate Matter ($PM_{2.5}$)	Year Coverage	96%	90%	100%	NM	NM	NM	NM	NM	NM
	Max. 24-hour Concentration (µg/m^3)	75	51	75.7	NM	NM	NM	NM	NM	NM
	State Annual Average (µg/m^3)	21.1	19.9	N/A	NM	NM	NM	NM	NM	NM
	#Days>Fed. 24-hour Std. of >35 µg/m^3	55	33.5	42.9	NM	NM	NM	NM	NM	NM
	Annual Average (µg/m^3)	18.3	15.7	17.7	NM	NM	NM	NM	NM	NM

Source: CARB 2013b.

Note:
[a] Coverage is for 8-hour standard.

Acronyms and Abbreviations:
> greater than
* Exceeds annual NAAQS
µg/m3 micrograms per cubic meter
NM not monitored
N/A not available
PM10 particulate matter smaller than or equal to 10 microns in diameter
PM2.5 particulate matter smaller than or equal to 2.5 microns in diameter
ppm part(s) per million

5.3 Attainment Status of the Study Area

USEPA 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 a maintenance area. Table 5.3-1 summarizes the federal (under NAAQS) and state (under CAAQS) attainment status for the air basin.

Under the federal criteria, the SJVAB is currently designated as nonattainment for 8-hour O_3, the 1997 annual $PM_{2.5}$ standard (annual standard of 15 micrograms per cubic meter [$\mu g/m^3$]) and 24-hour standard of 65 $\mu g/m^3$), and the 2006 24-hour $PM_{2.5}$ standard (35 $\mu g/m^3$). The SJVAB is a maintenance area for the PM_{10}, and the Fresno and Bakersfield urbanized areas are 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 NO_2, SO_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.

Table 5.3-1
Federal and State Attainment Status for SJVAB

Pollutants	Federal Classification	State Classification
O_3	Nonattainment (Extreme)	Nonattainment
PM_{10}	Maintenance	Nonattainment
$PM_{2.5}$	Nonattainment	Nonattainment
CO	Urban portion of Fresno County and Kern County: Maintenance Remaining Basin: Attainment	Attainment
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment

Sources: USEPA 2013b; SJVAPCD 2013a.
Acronyms:
CO carbon monoxide
NO_2 nitrogen dioxide
O_3 ozone
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
SJVAB San Joaquin Valley Air Basin
SO_2 sulfur dioxide

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 USEPA. The SJVAB is presently guided by the California SIP (CARB 2012) and other planning documents. The following lists the relevant SIP documents for the SJVAB:

- 2007 Ozone Plan (SJVAPCD 2007a).
- 2004 Extreme Ozone Attainment Demonstration Plan (SJVAPCD 2004b).
- 2012 $PM_{2.5}$ Plan (SJVAPCD 2012b).
- 2004 Revision to the California State Implementation Plan for Carbon Monoxide (CARB 2004).
- 2007 PM_{10} Maintenance Plan and Request for Redesignation (SJVAPCD 2007b).

5.4.1.1 2007 Ozone Attainment Plan

On May 5, 2010, USEPA 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 (USEPA 2012c).

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, USEPA found that the motor vehicle budgets for 2008, 2020, and 2030 from the 2007 8-hour Ozone Plan were not adequate for transportation conformity purposes (USEPA 2009a).

5.4.1.2 2004 Extreme Ozone Attainment Plan

Although USEPA 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 (USEPA 2008). On March 8, 2010, USEPA approved San Joaquin Valley's 2004 Extreme Ozone Attainment Demonstration Plan for 1-hour O_3. However, effective June 15, 2005, USEPA revoked the federal 1-hour O_3 standard for certain areas, including the SJVAB (SJVAPCD 2013b). Due to subsequent litigation, USEPA withdrew its plan approval in November 2012 and the SJVAPCD and ARB withdrew this plan from consideration. SJVAPCD adopted a revised plan in September 2013 and is currently seeking CARB's approval.

5.4.1.3 2012 $PM_{2.5}$ Plan

The SJVAPCD Governing Board adopted the 2012 $PM_{2.5}$ Plan following a public hearing in December 2012. On January 24, 2013, CARB adopted the plan and subsequently submitted the plan to USEPA as a revision to California's SIP (CARB 2013c). This far-reaching plan provides measures designed to reduce emissions such that the valley will attain the 2006 $PM_{2.5}$ federal standards and the state standard as soon as possible. USEPA designated the SJVAB as nonattainment under the 2006 $PM_{2.5}$ national standard on October 8, 2009. This plan satisfies the SIP requirements for compliance with the 2006 $PM_{2.5}$ standard. The federal annual $PM_{2.5}$ has recently been revised by USEPA, but designations are not anticipated until December 2014.

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, USEPA approved and promulgated the Implementation Plans and Designation of Areas for Air Quality Purposes (USEPA 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 5.4-1.

Table 5.4-1
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: USEPA 2009b.
Acronym:
CO carbon monoxide

5.4.1.5 2007 PM_{10} Maintenance Plan and Request for Redesignation

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

5.4.2 Transportation Plans and Programs

Regional Transportation Planning Agencies (RTPAs and MPOs) within the SJVAB and the study area (i.e., the Fresno COG, the KCAG, the TCAG, and the Kern 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 Fresno COG adopted the 2011 RTP and associated transportation conformity determination in July 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 (Kern COG 2010a). However, the HST project is not included in the unconstrained project list in

Appendix D of the Fresno COG's 2011 RTP, or the 2011 FTIP and is therefore not included in the conformity determination (Kern COG 2010b).

The KCAG and TCAG adopted their respective 2011 RTPs, the 2011 FTIPs, and final associated transportation conformity analyses in July 2010. The KCAG and TCAG 2011 RTP both discuss the background and purpose of the high-speed train through the Central Valley. However, the HST project is not included in the unconstrained projects listed in Appendix II of the KCAG 2011 RTP (KCAG 2010a) or in Appendix D of the KCAG 2011 FTIP (KCAG 2010b) and is therefore not part of the air conformity analysis. In addition, the TCAG air conformity analysis, Appendix B (Transportation Project Listing), did not list the HST project, and therefore the HST project was not considered in the TCAG air conformity analysis (TCAG 2010).

The Kern COG adopted the 2011 RTP, the 2011 FTIP, and the air conformity determination in July 2010. The Fresno to Bakersfield Section of the HST and the HMF are included in the constrained program of projects in the Kern COG 2011 RTP, Table 4.1 (Kern COG 2010a). However, neither the HST project nor the HMF are listed in the mass transportation list of projects in the Kern COG 2011 FTIP or in the projects listed in the air conformity determination, Appendix B (Kern COG 2010b). This means that the project was not considered in the Kern COG 2011 air conformity analysis.

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 comprises of data submitted to CARB by the SJVAPCD plus estimates for certain source categories, which are provided by CARB staff. The 2010 inventory data for the SJVAB is summarized in Table 5.5-1.

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 oxide (SO_X) emissions.

Table 5.5-1
2010 Estimated Annual Average Emissions for the 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

Table 5.5-1
2010 Estimated Annual Average Emissions for the SJVAB
(tons per day)

Source Category	TOG	ROG	CO	NO_x	SO_x	PM	PM_{10}	$PM_{2.5}$
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 2011b.
Acronyms:
CO carbon monoxide
NO_x nitrogen oxide
PM particulate matter
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
ROG reactive organic gas
SO_x sulfur oxide
TOG total organic gas

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 2007). 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 2010). A summary of the 2008 statewide emissions inventory is included in Table 5.5-2.

Table 5.5-2
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 2010.

Acronyms:
GWP Global Warming Potential
MMT CO2e million metric tons of CO2 equivalent

5.6 Sensitive Receptors

Some locations are considered more sensitive to adverse effects from air pollution than others. These locations are termed *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 at least 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 in close proximity to the project footprint are shown in Figures 5.6-1 through 5.6-15[2,3].

Table 5.6-1 summarizes the distance between each sensitive receptor and HST station and HMF/MOWF sites. The Fresno Station has sensitive receptors within 1,000 feet (Figure 5.6-1)[4]. The Bakersfield Station has sensitive receptors within 1,000 feet (Figure 5.6-7). The Kings/Tulare Regional Station has sensitive receptors within 1,000 feet at both the East and West Alternative sites (Figure 5.6-8 and Figure 5.6-9). All HMF sites have sensitive receptors located in close proximity (Figure 5.6-2 through 5.6-6). Only the Fresno Works–Fresno and the Kern Council of Governments–Wasco HMF sites have multiple sensitive receptors at a close distance, whereas the other HMF sites (the Kings County–Hanford, the Kern Council of Governments–Shafter East, and the Kern Council of Governments–Shafter West sites) have isolated sensitive receptors near the site. Sensitive receptors around the HMF sites were analyzed at a distance of 1,300 feet from the site boundary based on the results of the health risk assessment (Appendix B). The maintenance-of-way facility (MOWF) would be co-located with the HMF, and the sensitive receptors analyzed will be the same as for the HMF. Table 5.6-2 summarizes the distance between each sensitive receptor and alternative.

Table 5.6-1
Sensitive Receptors near Fresno Station, Bakersfield Station and the HMF Site Alternatives

Sensitive Receptors	Distance (feet)							
						Kern Council of Governments		
	Fresno Station	Bakersfield Station	Kings/ Tulare Regional Station	Fresno Works–Fresno HMF Site[c]	Kings County–Hanford HMF Site[c]	Wasco HMF Site[c]	Shafter East HMF Site[c]	Shafter West HMF Site[c]
Fulton Special Education[a]	711	—	—	—	—	—	—	—
Our Lady of Guadalupe[a]	—	1400	—	—	—	—	—	—
Blanton Education Center[a]	—	902	—	—	—	—	—	—
Masten Towers[b]	904	—	—	—	—	—	—	—
Closest residence	155	36	129	47	100	150	110	790

Notes:
[a] Receptor type: Youth cultural and educational facility
[b] Receptor type: Health-care facility
[c] The MOWF is co-located with the HMF.
HMF = heavy maintenance facility
MOWF = maintenance-of-way facility

[2] Sensitive receptors were identified using the Geographic Names Information System (GNIS) to identify both schools and hospitals (GNIS 2011). Residences were identified using parcel and zoning information.

[3] Figures 5.6-10 through 5.6-13 show hospitals, nursing homes, and schools near sections of the High Speed Rail track. Residences located near sections of the track have not been shown, but have been considered in the analyses.

[4] The Fresno Academy for Civic and Entrepreneurial Leadership will be relocated before the start of the Fresno Station construction.

Table 5.6-2
Sensitive Receptors within 1,000 Feet of the HST Alternatives

Sensitive Receptors	Distance (feet)			
	BNSF Alternative	Hanford West Bypass Alternative 1	Bakersfield South Alternative	Bakersfield Hybrid Alternative
Planned Parenthood[c]	—	—	21	—
Procare Hospice Bakersfield[c]	83	—	—	—
Bethel Christian[a]	—	—	93	—
Interim Healthcare-Bakersfield[c]	—	—	98	—
Shafter Healthcare[b]	104	—	—	—
Bakersfield Brimhall Dialysis[c]	167	—	—	—
Bessie E. Owens Intermediate[a]	230	—	—	—
Mercy Hospital-Bakersfield[c]	—	—	—	290
Mercy-Memorial Home Health[c]	—	—	313	—
Mercy Hospice[c]	—	—	313	—
Warriors for Christ Academy[a]	—	—	—	387
Golden Living Center-Shafter[c]	392	—	—	—
Mercy Hospital SNF[b]	470	—	—	—
Truxtun Manor[b]	517	—	—	—
Our Lady of Guadalupe[a]	—	—	586	—
Blanton Education Center[a]	—	—	—	613
Kern Crest Manor[b]	619	—	—	—
Bakersfield High[a]	621	—	—	—
Franklin Elementary[a]	—	—	—	622
Kings County Health Clinic[c]	704	—	—	—
Joy Carino Kimpo Women's Health Center[c]	756	—	—	—
College of the Sequoias[a]	—	788	—	—
Gifted Arms Home Healthcare Services	—	—	—	930
Marian Homes for the Elderly[b]	933	—	—	—
Masten Towers[b]	948	—	—	—
Sierra Pacific High[a]	—	952	—	—

[a] Receptor type: Youth cultural and educational facility
[b] Receptor type: Health-care facility
[c] Receptor type: Hospital

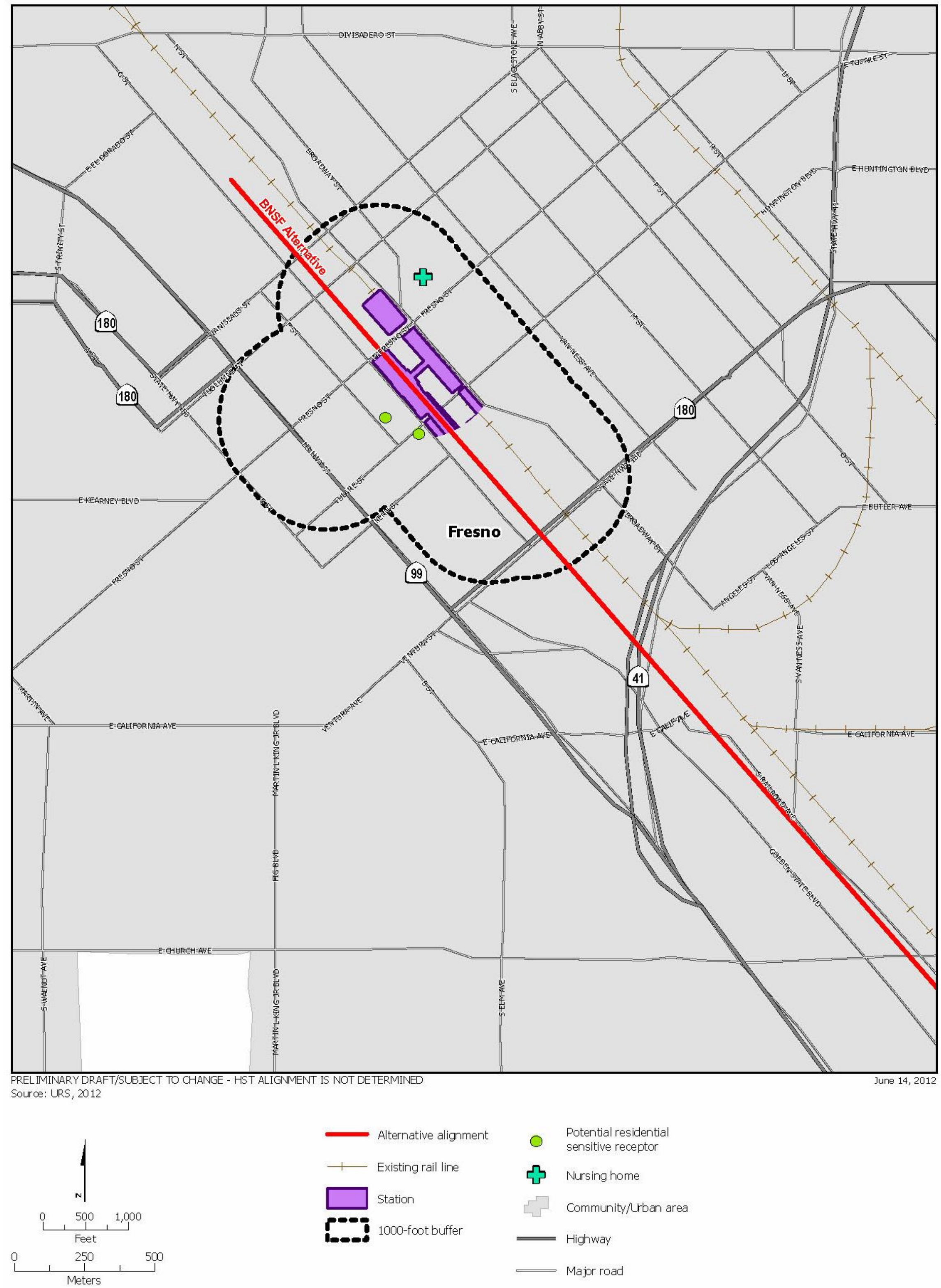


Figure 5.6-1
Location of sensitive receptors near Fresno Station

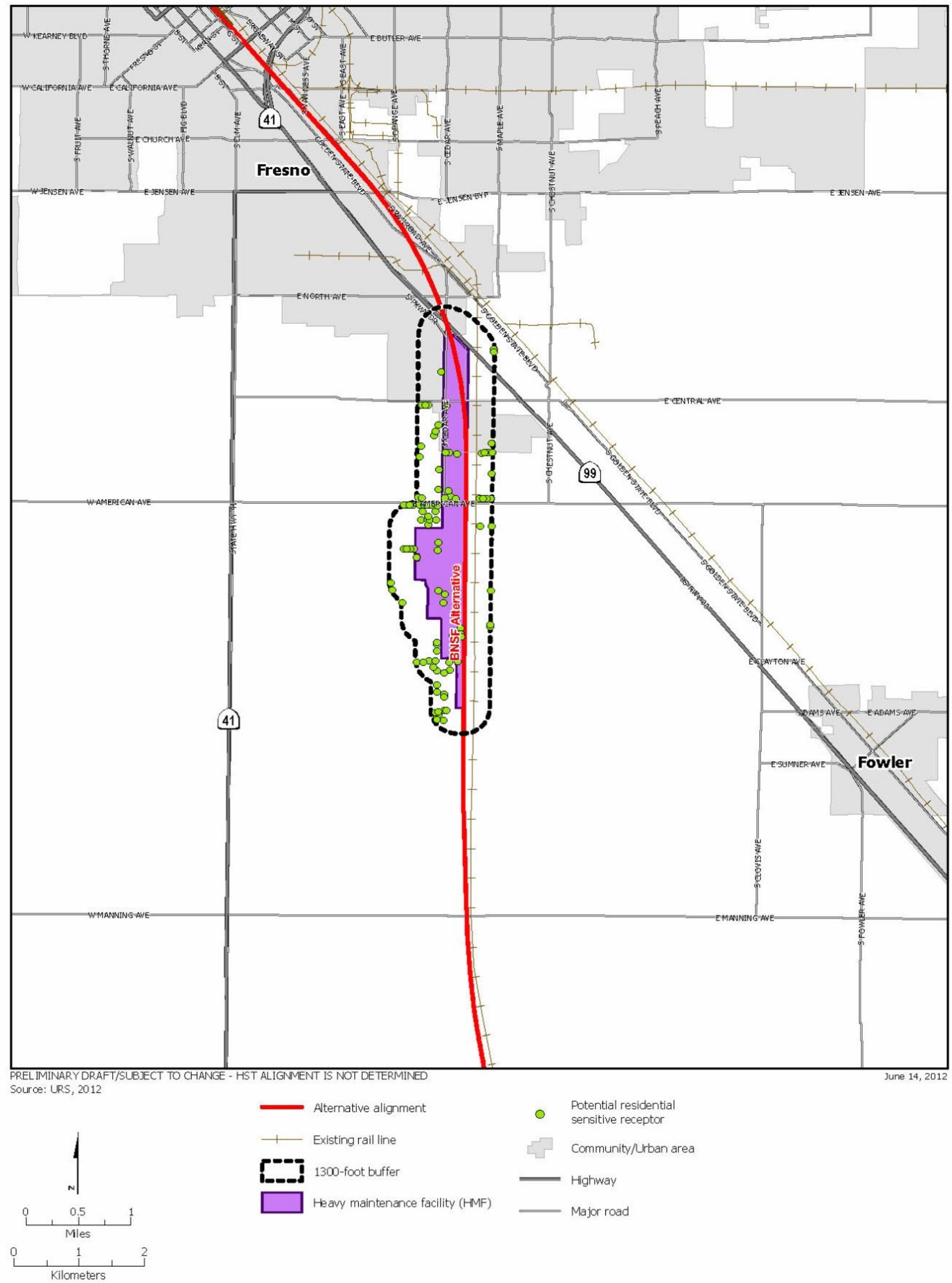


Figure 5.6-2
Location of potential sensitive receptors near Fresno Works–Fresno HMF site footprint

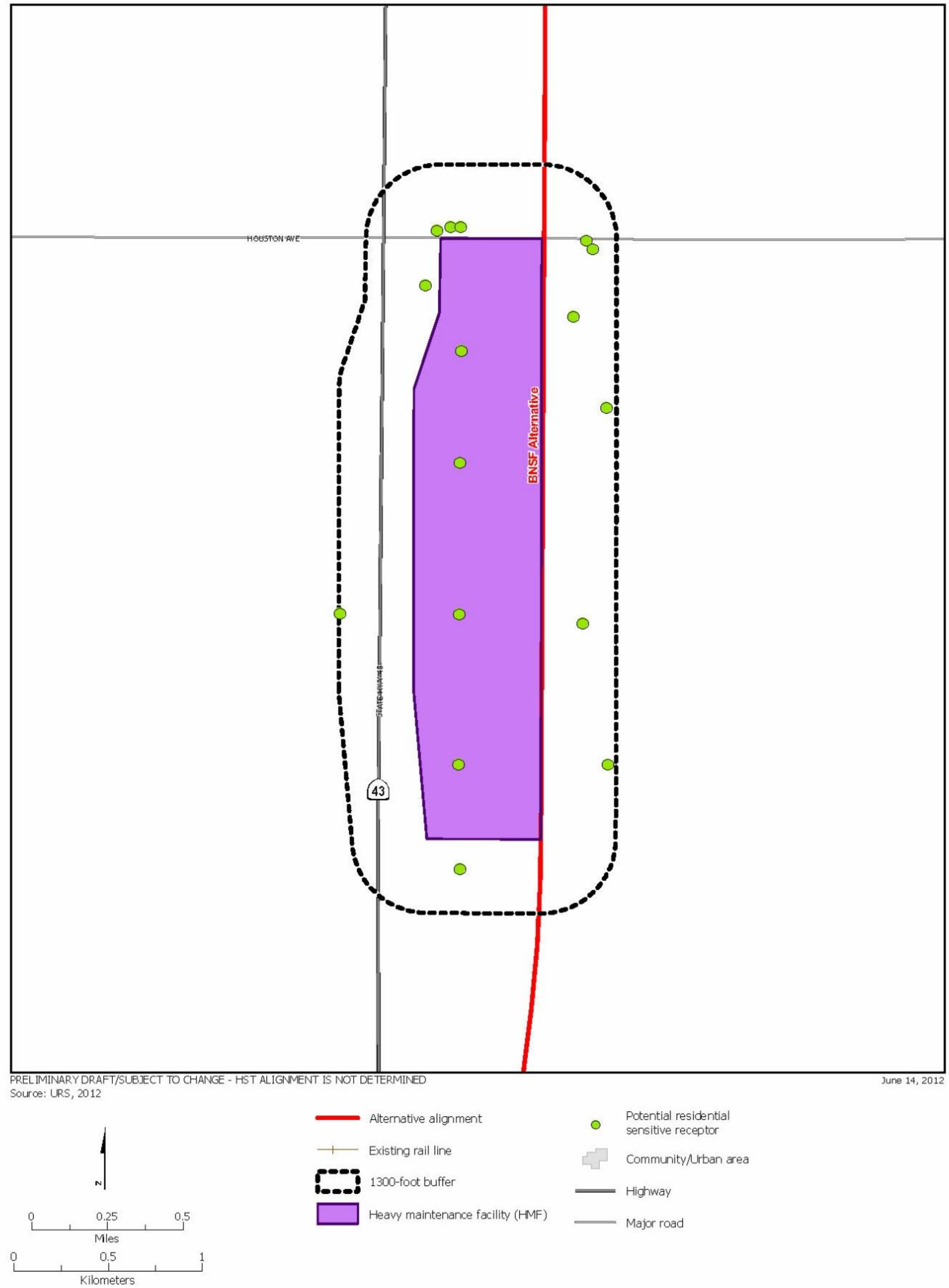


Figure 5.6-3
Location of potential sensitive receptors near Kings County–Hanford HMF site footprint

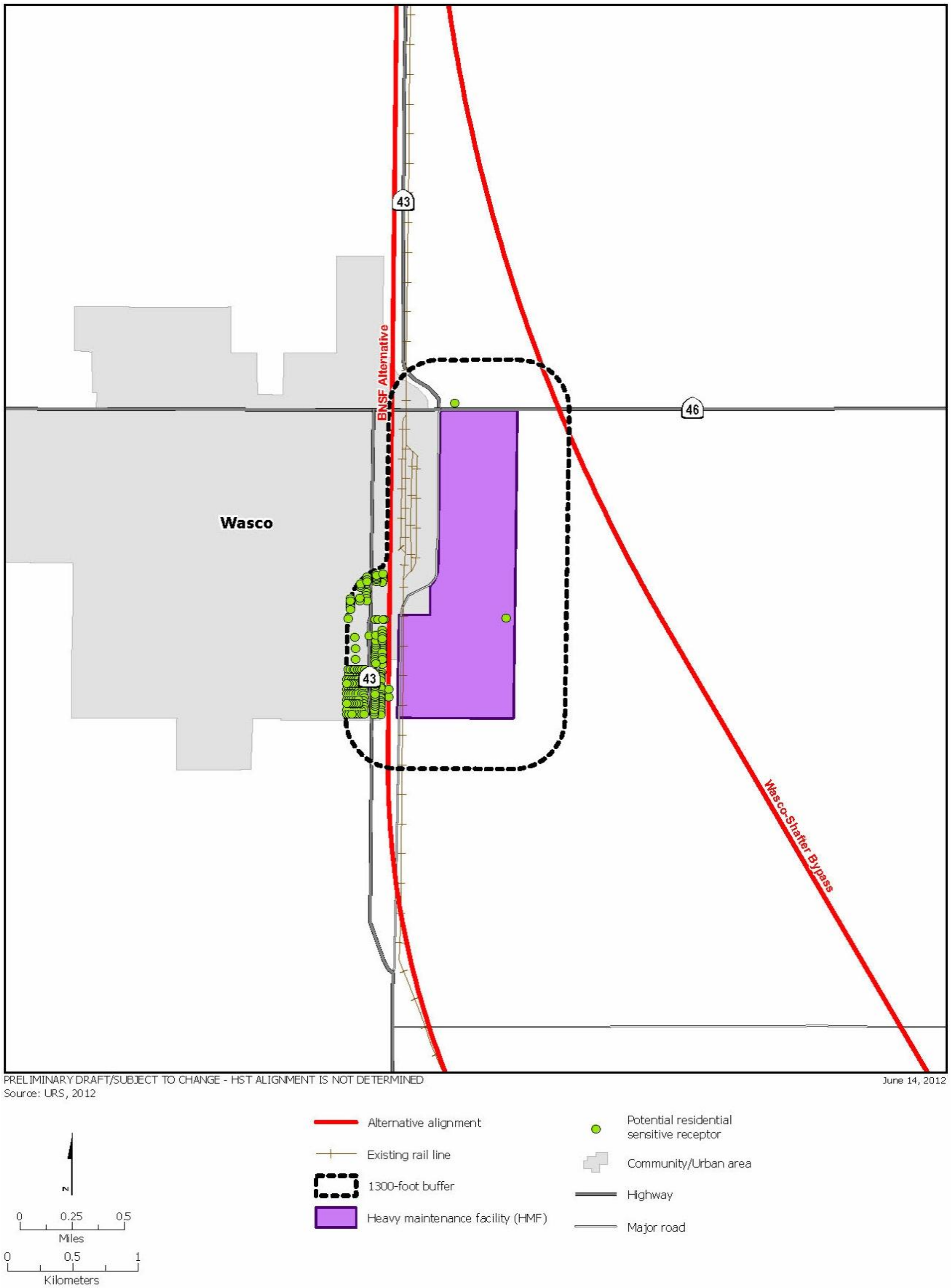


Figure 5.6-4
Location of potential sensitive receptors near Kern Council of Governments–Wasco HMF site footprint

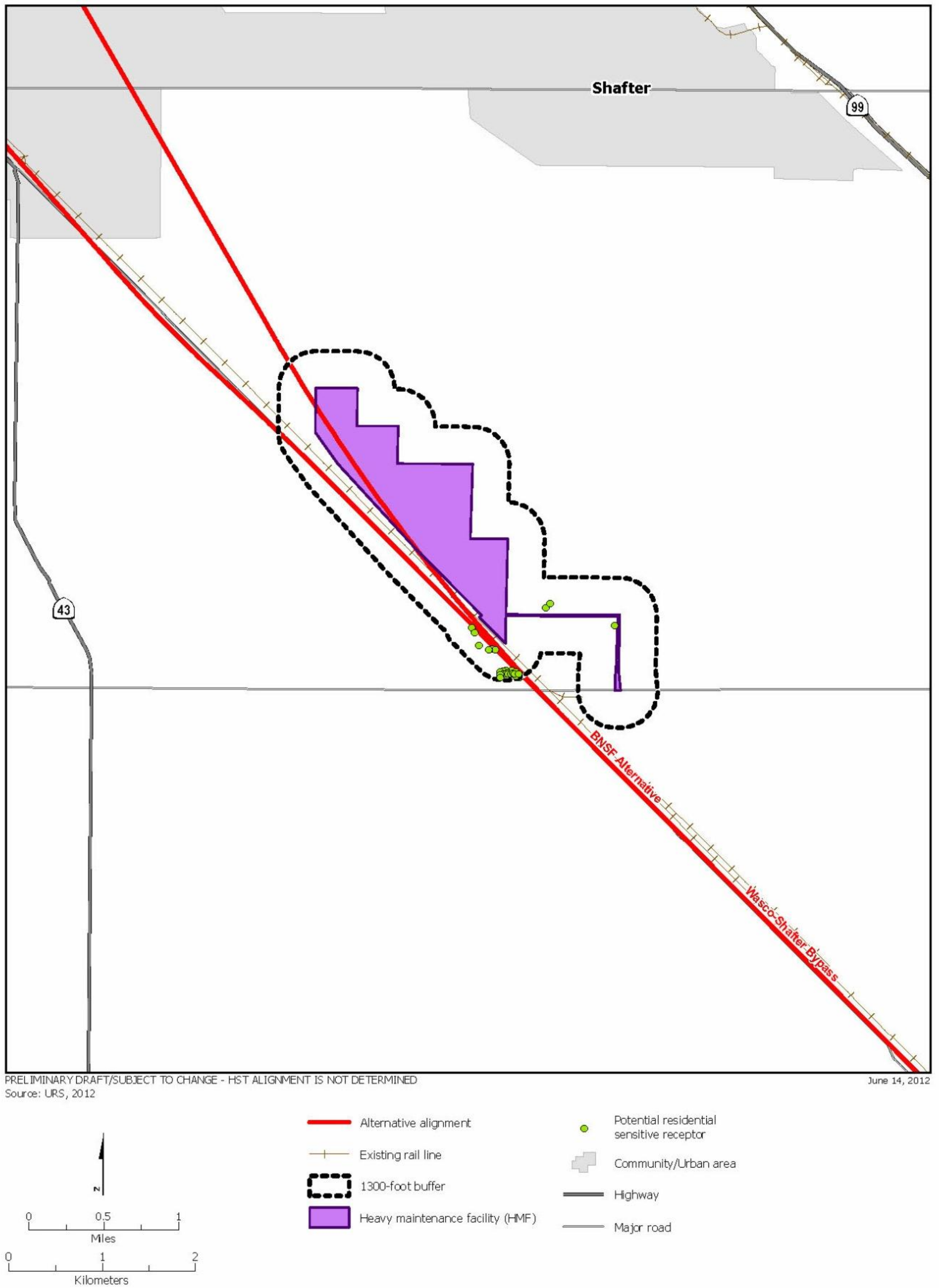


Figure 5.6-5
Location of potential sensitive receptors near Kern Council of Governments–Shafter East HMF site footprint

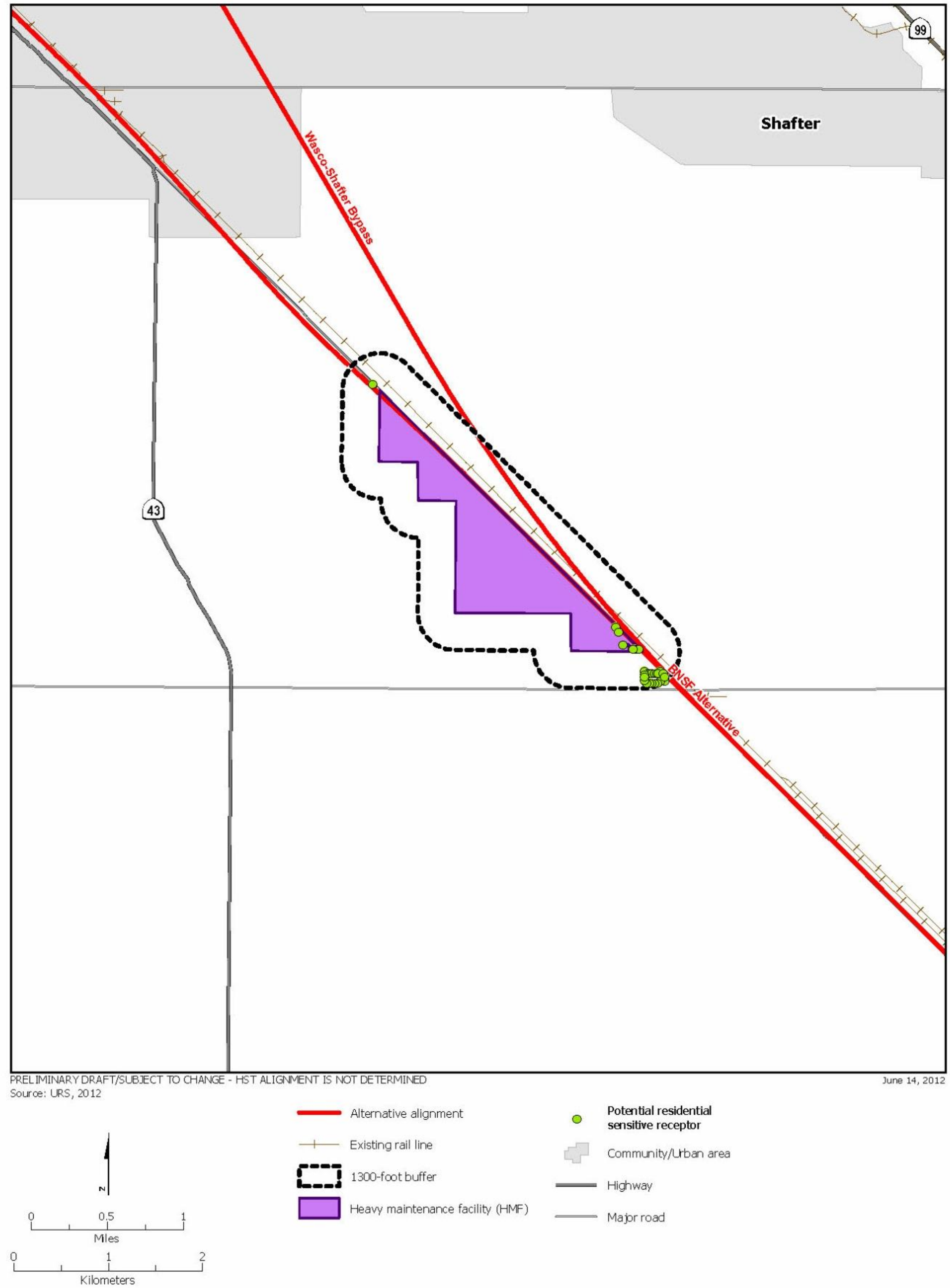


Figure 5.6-6
Location of potential sensitive receptors near Kern Council of Governments–Shafter West HMF site footprint

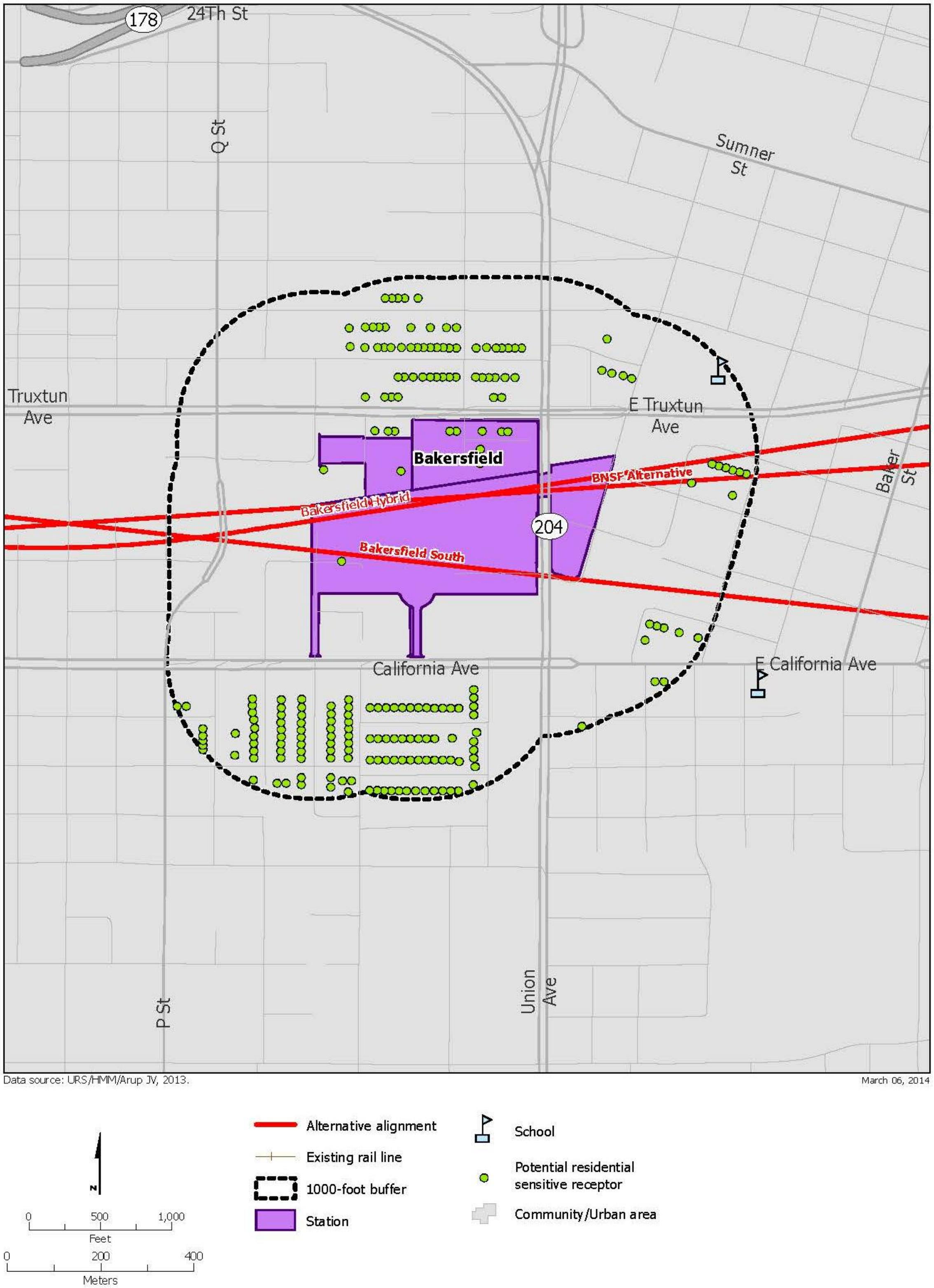


Figure 5.6-7
Location of potential sensitive receptors near Bakersfield Station

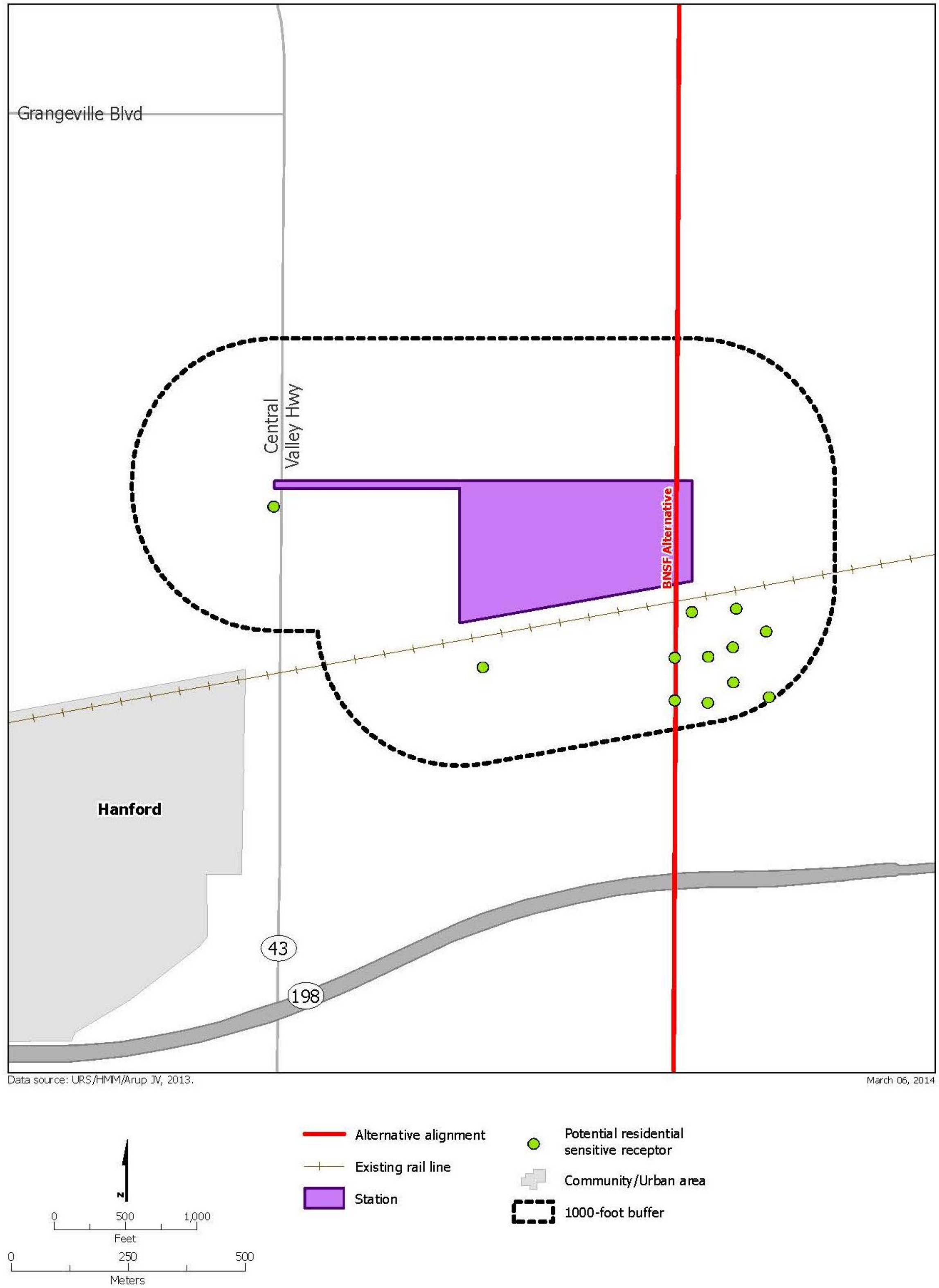


Figure 5.6-8
Location of potential sensitive receptors near Kings/Tulare Regional Station-East Alternative

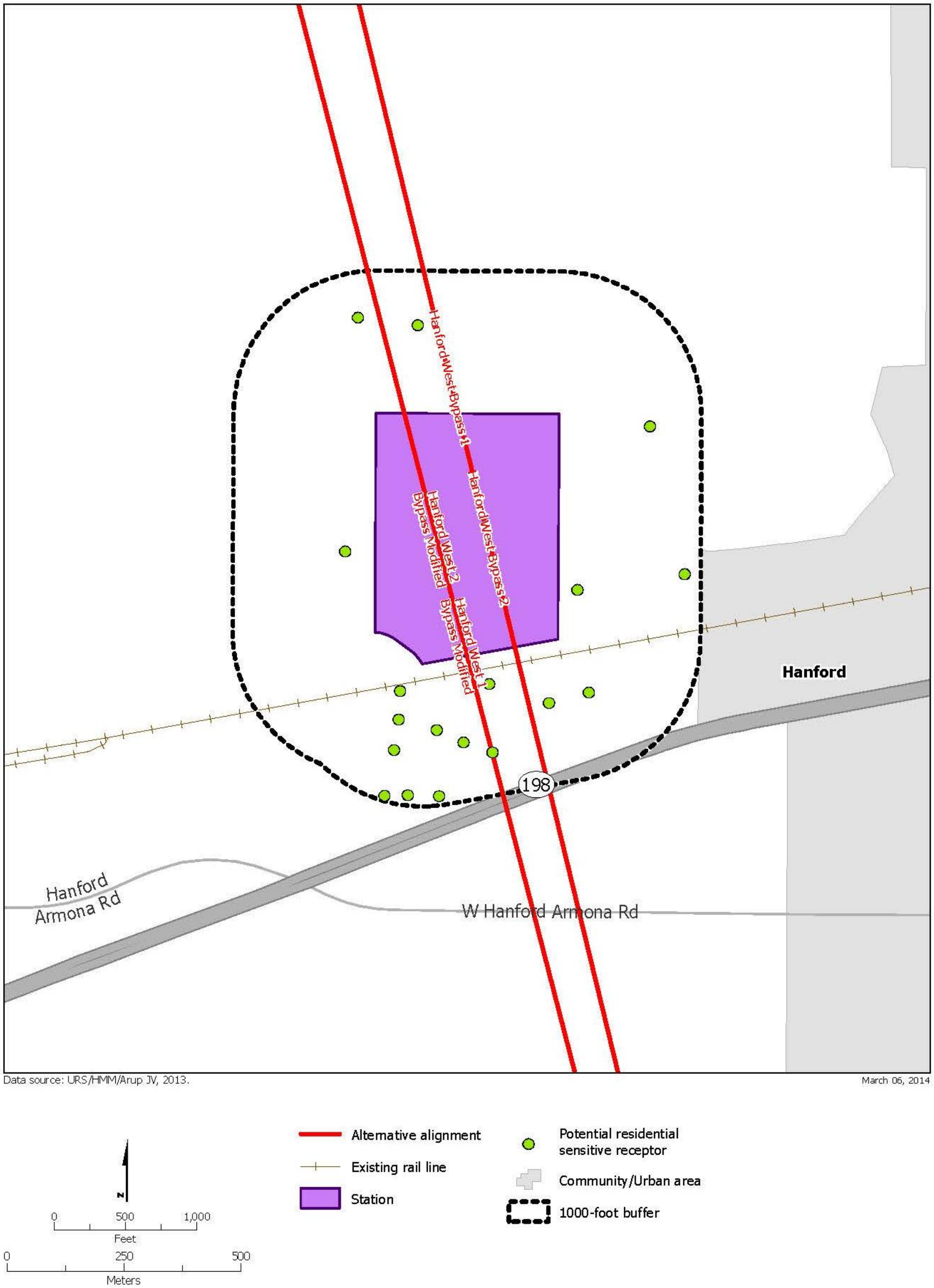


Figure 5.6-9
Location of potential sensitive receptors near Kings/Tulare Regional Station-West Alternative

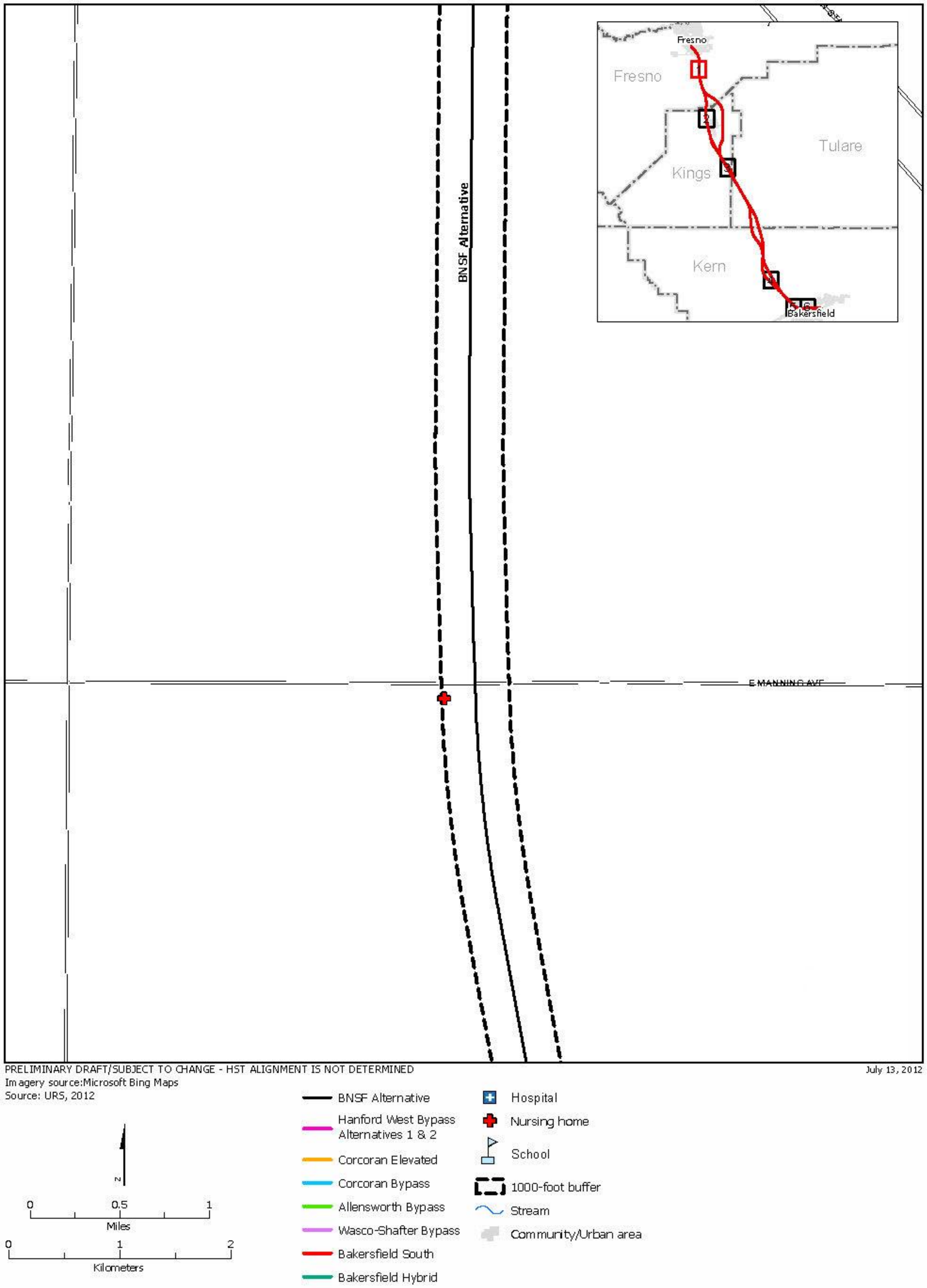


Figure 5.6-10
Location of potential sensitive receptors near alternatives in Fresno County

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

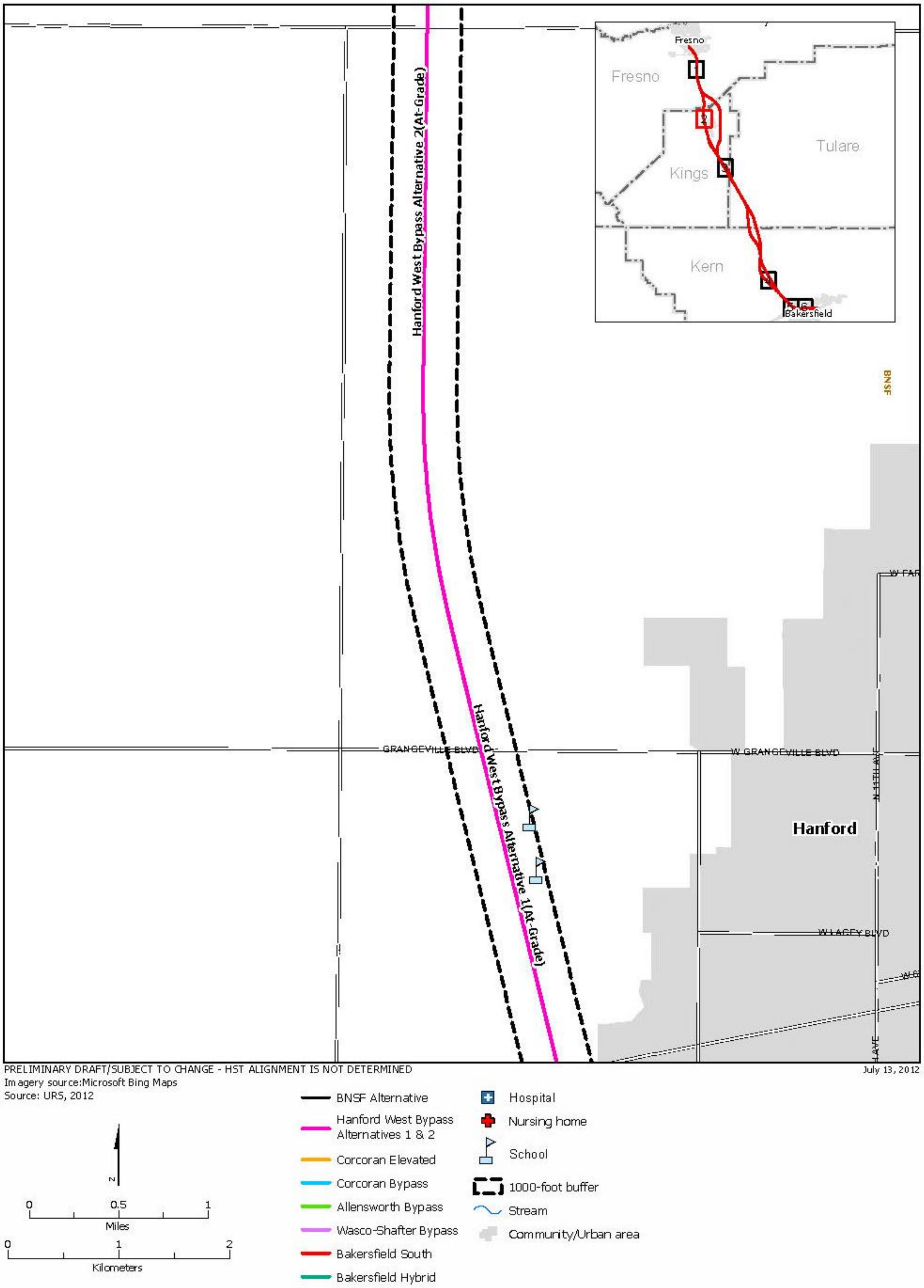


Figure 5.6-11
Location of potential sensitive receptors near alternatives near Hanford

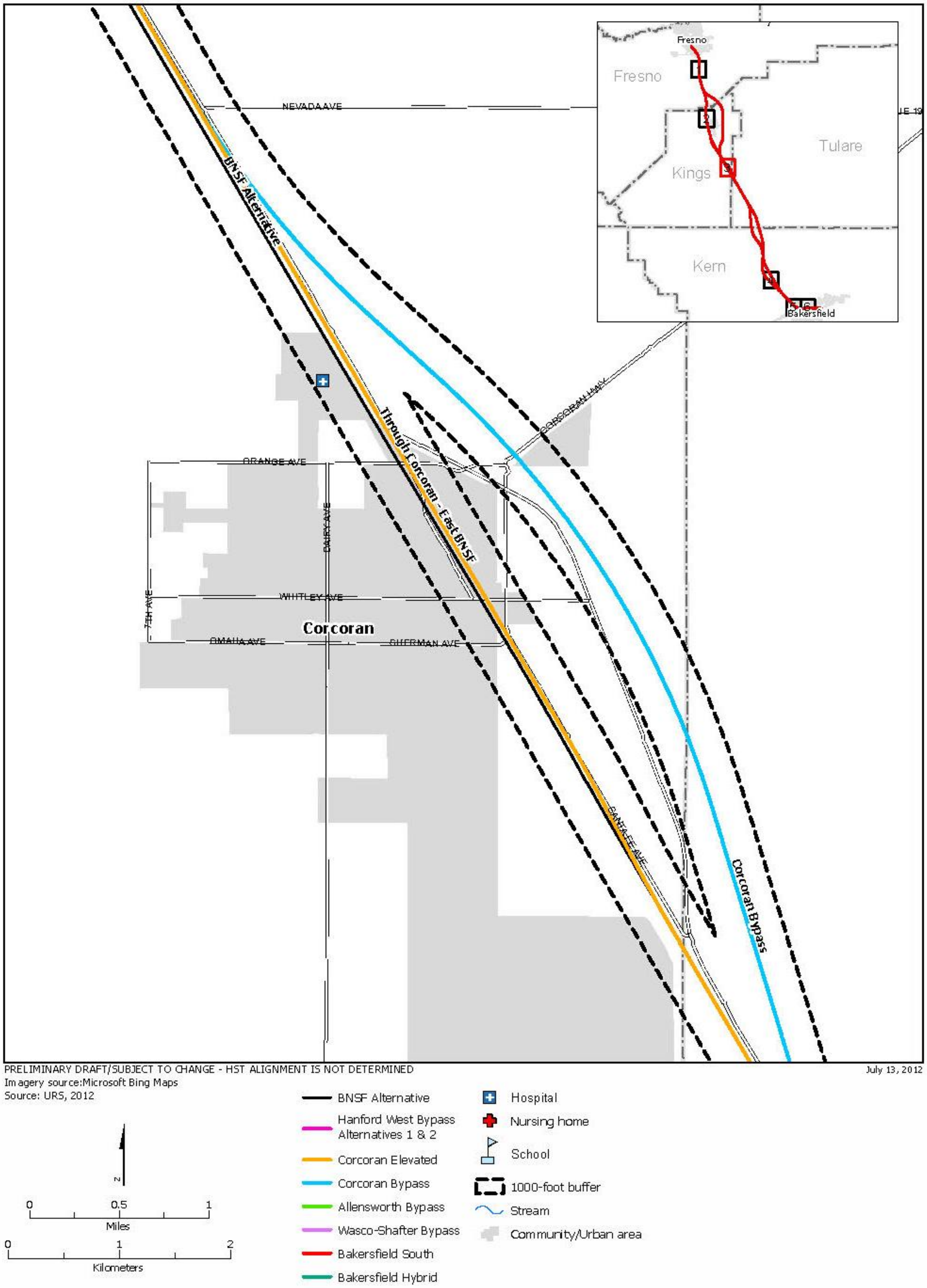


Figure 5.6-12
Location of potential sensitive receptors near alternatives near Corcoran

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

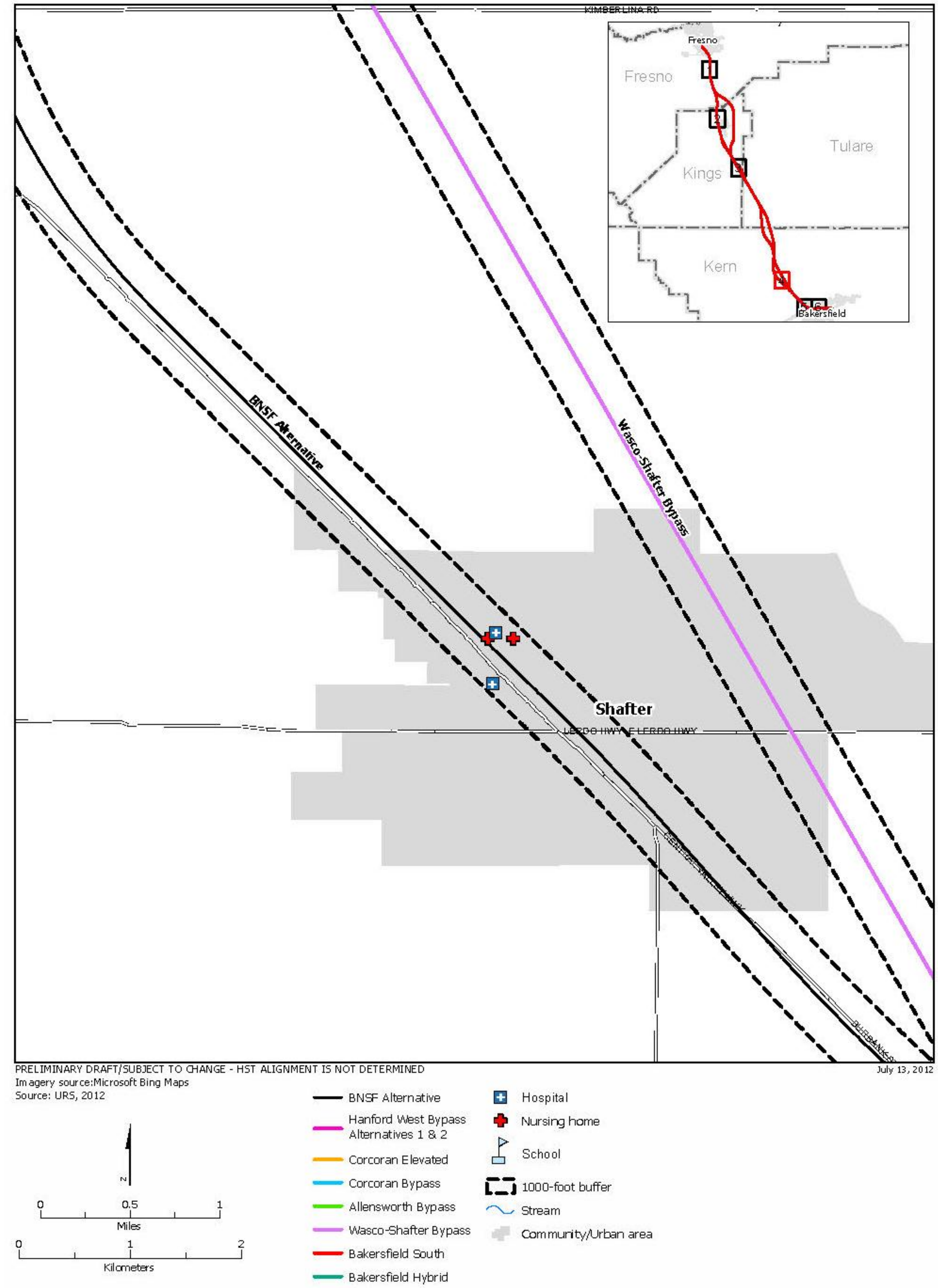


Figure 5.6-13
Location of potential sensitive receptors near alternatives near Shafter

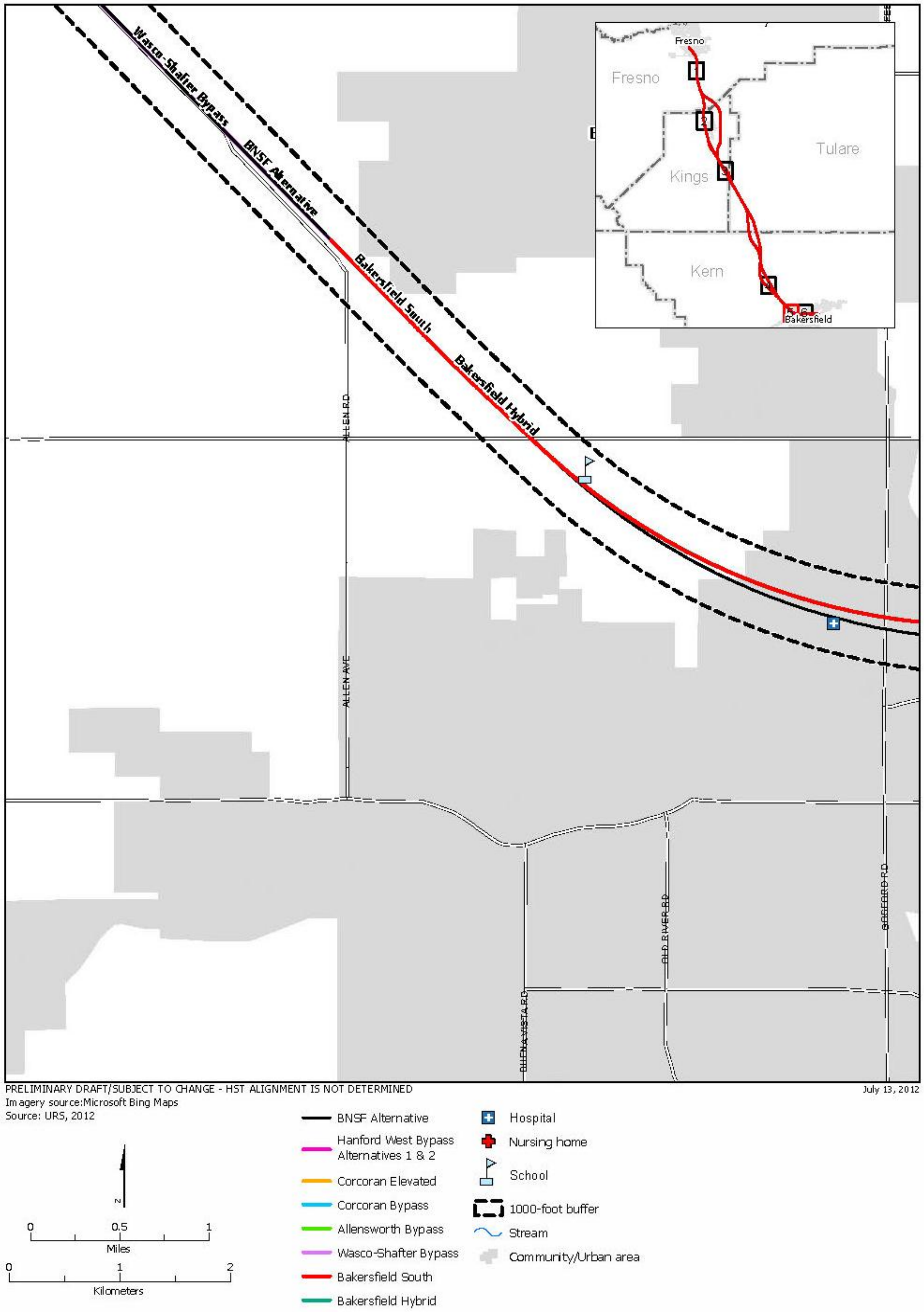


Figure 5.6-14
Location of potential sensitive receptors near alternatives in Kern County

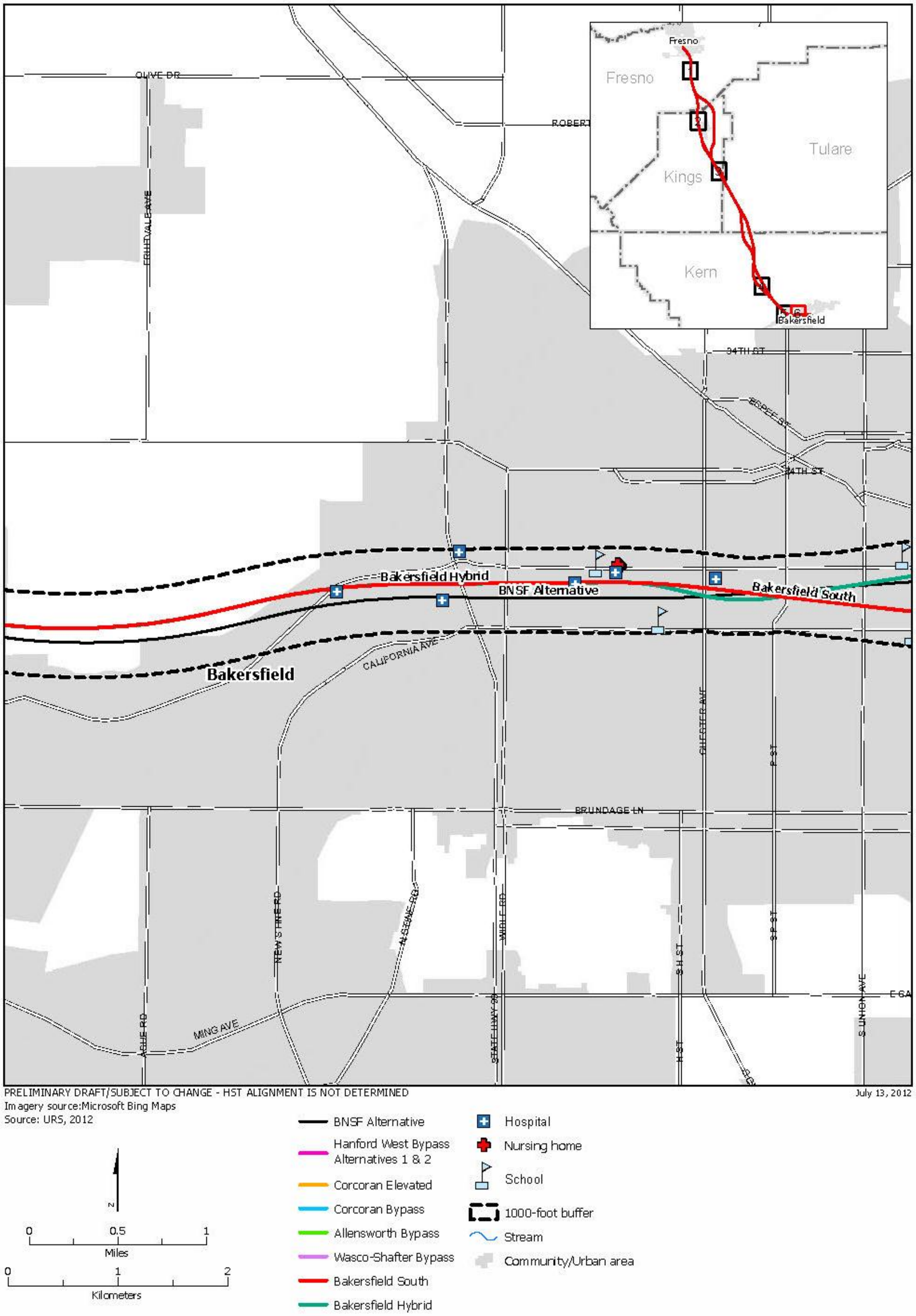


Figure 5.6-15
Location of potential sensitive receptors near alternatives near Bakersfield

Chapter 6.0
Analysis Methodology

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 Section 15125[a]).

Because the HST project would not commence service 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 that are programmed to be constructed by 2035. To ignore the possibility 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 without calculating 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 conditions and against background (i.e., No Project) conditions as they are expected to be in 2035. This approach complies with CEQA (see *Neighbors for Smart Rail v. Exposition Metro Line Construction Authority, et al.* [2013] 57 Cal. 4th 439, 454.)). 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[5]. Emission factors were estimated using the CARB emission factor program, EMission FACtors 2011 (EMFAC2011). Parameters were set in the program for each individual county to reflect conditions within each county, and statewide parameters to reflect travel through each county.

[5] VMT data is based on information from Cambridge Systematics, Inc. (2012) Transportation Technical Report.

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 overall pollutant burdens generated by on-road vehicles, estimated VMT were multiplied by applicable pollutant's emission factors, which are based on speed, vehicle mix, and analysis year.

6.1.2 Airport Emissions

The Federal Aviation Administration's (FAA's) Emissions and Dispersion Modeling System (EDMS) Version 5.1.3 (FAA 2010) was used to estimate airport emissions. EDMS estimates the emissions generated from specified numbers 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 were 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 using the results of 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 USEPA eGRID electrical generation data. The energy estimates used in this analysis for the propulsion of the HST include the use of regenerative brake power.

The HST system will be powered by the state's electric grid. Because no dedicated generating facilities are proposed for this project, no specific source facilities can be identified. Emission changes from power generation can therefore be predicted only 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. 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 Fresno to Bakersfield Section HST stations and the HMF and co-located MOWF 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. Sections 6.2.1, 6.2.2, and 6.2.3 discuss the methodology used to estimate operational air emissions from the train stations, the HMF and co-located MOWF, and local mobile sources, respectively. Project information used for the operation emission estimates is presented in Appendix B. Detailed emission calculations are also provided in Appendix B.

6.2.1 HST Stations

Emissions associated with the operation of the Fresno and Bakersfield HST stations as well as the potential Kings/Tulare Regional HST station would primarily result from space heating and facility landscaping, energy consumption for facility lighting, indirect emissions associated with water use and solid waste disposal, emergency generator testing, CO emissions from vehicle activity at the parking structures (refer to Section 6.3.2), and employee and passenger traffic (refer to Section 6.2.3).[6] Emissions from deliveries to the HST stations are considered negligible.

Emissions of criteria pollutants and GHGs were estimated for operation of Fresno and Bakersfield HST stations as well as the potential Kings/Tulare Regional Station for the design year of 2035.

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 (Rimpo and Associates 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 B.

6.2.1.2 Indirect Electricity

The Fresno and Bakersfield HST stations, as well as the potential Kings/Tulare Regional Station 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 the 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 (USEPA 2011b). 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 the year 2007.

6.2.1.3 Indirect Water

The Fresno and Bakersfield HST stations, as well as the Kings/Tulare Regional Station, would generate indirect GHG emissions from purchased water consumed for facility restrooms, drinking fountains, landscaping, and other miscellaneous uses.

Indirect GHG emissions from purchased water consumed by the HST stations were calculated based on the station estimated water usage (see Public Utilities Section of FEIR/SEIS) and electricity associated with sourcing, treatment, and distribution of water (CEC 2006), and emission factors from eGRID (USEPA 2011b). The water consumption rates of 15.33, 16.79, and 18.07 million gallons per year were used at the Fresno, Bakersfield, and Kings/Tulare stations, respectively. Waste water was estimated as 8.43, 9.23, and 9.86 million gallons per year for the Fresno, Bakersfield, and Kings/Tulare stations, respectively.

---

[6] Emissions from these indirect operational sources were not quantified in the Revised DEIR/Supplemental DEIS. These sources have been added to the analyses performed in support of the FEIR/EIS to more conservatively evaluate the net benefits from project operations.

6.2.1.4 Indirect Solid Waste

The Fresno and Bakersfield HST stations as well as the Kings/Tulare Regional Station would generate indirect GHG emissions from solid waste disposal. Indirect emissions from solid waste disposed by the HST stations were calculated based on a rate of 1.13, 1.3, and 0.48 tons per day for the Fresno, Bakersfield, and Kings/Tulare stations, respectively. To estimate the amount of degradable organic carbon content of the waste, the solid waste was assumed to have the characteristics of general municipal solid waste. The emissions associated with decomposition of the solid waste in a landfill was estimated assuming a land fill gas capture system with combustion with a 75% capture efficiency and 98% destruction efficiency. This is consistent with the method used in the California Emission Estimator Model (CalEEMod) (SCAQMD 2011).

6.2.1.5 Emergency Generator

The Fresno and Bakersfield HST stations, as well as the Kings/Tulare Regional Station, would have emergency generators that would be used in the event of a power outage. It was assumed that the emergency generators would be Tier 4, 800 kW generators. It was assumed that the emergency generators would operate up to 200 hours for testing per year. Using the Tier 4 emission standards, the criteria pollutants and GHG emissions are quantified. Since emergency generators are subject to SJVAPCD permitting requirements, a health risk assessment was not conducted because this will be done at the time of permitting, with permit conditions provided to ensure that sensitive receptors are not exposed to excess concentrations of TACs. This is consistent with SJVAPCD CEQA guidance regarding permitted sources.

6.2.2 Heavy Maintenance Facility

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 train 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 locomotive activities associated with maintenance of way operations
- Spray booth painting operations
- Diesel equipment[7]
- Diesel trucks

6.2.2.1 HMF Locations

Five locations are being considered for the HMF site: the Fresno Works–Fresno, Kings County–Hanford, Kern Council of Governments–Wasco, Kern Council of Governments–Shafter East, and Kern Council of Governments–Shafter West sites. The HMF site may have a co-located MOWF. 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/MOWF operations have the potential to significantly affect nearby sensitive receptors.

[7] The diesel equipment includes non-road diesel engines such as internal combustion engines (not including motor vehicle engines) and stationary engines.

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

6.2.2.2 HMF Pollutants of Concern

Both criteria and non-criteria TACs were considered in the health risk analysis. The criteria pollutants considered are:

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

The TACs considered are the contaminants identified according to the California OEHHA's, *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (OEHHA 2003), which 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 HMF operations because of the type of activities that would occur at these facilities. OEHHA has identified DPM as a TAC based on its potential to cause cancer and other adverse health problems, including respiratory illnesses and an increased risk of heart disease. Also, a number of other toxic pollutants of different toxicities that are either carcinogenic or non-carcinogenic 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/MOWF operations were estimated. CO, SO_2, and GHGs are not expected to cause localized air quality impacts due to the relatively low CO and SO_2 background concentrations and the global nature of GHG impacts. VOC emissions would be evaluated in terms of speciated toxics in the analysis. Therefore, the CO, VOCs, SO_2, and GHGs from HMF/MOWF operations are only included in the regional air quality impact discussion.

6.2.2.3 HMF/MOWF Emission Factors and Rates

Emission 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 DPM emissions, however, are made up of $PM_{2.5}$, 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 USEPA 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 fuel (ULSD). This assumption is reasonable because 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, USEPA 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; after June 2012, this limit will become 15 ppm. In 2006, California 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 ULSD fuel since July 2002.

- Locomotive emission rates were also estimated based on locomotive type and on assumptions regarding notch setting, activity times, and duration.

- The assumption that all switch locomotives would be diesel-powered might be conservative, because some or all of these vehicles may be electrically powered (or duel-fueled) and therefore have no (or less) onsite generated emissions.
- CO_2 emissions from moving and idling locomotives were estimated using a standard diesel fuel density, carbon content, and consumption rate per brake-horsepower (hp)-hour (USEPA 2009c).
- It was conservatively assumed that all the NO_x released from the diesel engines (which are generally composed of only a small percentage 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.
- SO_2 emissions from moving and idling locomotives were estimated using a standard diesel-fuel density, a sulfur content of ULSD (which was assumed to be 15 ppm), and a consumption rate per brake-hp-hour (USEPA 2009c).
- For other diesel equipment, USEPA's Tier 4 emission standards for non-road diesel engines were used (69 FR 38957-39273 [June 29, 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 2011, for 200-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}), $PM_{2.5}$, and NO_2, VOC, CO, SO_2, and CO_2 emissions were estimated using EMFAC2011 emissions factors for heavy-heavy duty trucks running at 10 miles per hour for the year 2017, which is a conservative assumption because the HMF will only be operational by 2021.
- VOCs from paint booth emissions were estimated using conservative volatility rates (i.e., using the high end of the percent VOC content allowed by state and district regulations) and paint usage projections.
- VOCs from paint booth emissions were also estimated and based on paint booths being equipped with conventional filters with 90% control efficiency even though equipment with higher-control efficiencies is available.
- Speciated TAC emissions from paint booth operations were estimated using CARB's "Organic Speciation Profile for Surface Coating Operations," found in *Organic Chemical Profiles for Source Categories* (CARB 2011c).
- Emissions of metal compounds, which are bonded to DPM from diesel combustion, were calculated by using CARB's "PM Speciation Profile for Diesel Vehicle Exhaust," found in *PM Speciation Profile for Source Categories* (CARB 2011d).
- Emissions of organic compounds from diesel combustion were estimated using CARB's "Organic Speciation Profile for Diesel Light and Heavy Equipment," found in *Organic Chemical Profiles for Source Categories* (CARB 2011c).

- Emission rates for diesel combustion equipment were estimated based on the following HMF/MOWF operating scenario, which was supplied by the project design engineers:
- Two switch locomotives (for MOWF operations) and six pieces of diesel-fueled equipment would operate at the HMF.
- Two MOWF locomotives, which are assumed to be 2,000 hp each, would idle for 2 hours and move around the HMF site for 2 hours over a 24-hour period, and the locomotives would go through all notches (gears) when moving.
- The diesel equipment, which is assumed to be 200 hp each, would operate for 8 hours over a 24-hour period.
- Twenty diesel trucks would operate on the site for 8 hours over each 24-hour time period.

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

Additional mass emissions were estimated for indirect GHG emissions associated with indirect water use and solid waste disposal.[8] The water use was estimated to be 16.94 million gallons per year and wastewater was 5.69 million gallons per year. The solid waste disposed was estimated to be 1.3 tons per employee per year. The GHG emissions were estimated from the water use and solid waste disposed, using the same methodology described in sections 6.2.1.3 and 6.2.1.4.

6.2.2.4 Detailed Analysis for HMF

A detailed dispersion modeling analysis was conducted to estimate the potential impacts of HMF/MOWF emissions on nearby sensitive land uses and on local ambient criteria pollutant concentrations. The USEPA AERMOD model (USEPA 2004) was used to simulate physical conditions and predict pollutant concentrations at specific distances from the boundaries of an 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 layout was used to evaluate the HMF/MOWF operational impacts. Pollutant concentrations were estimated approximately at the site boundary and at approximately 500, 1,000, 1,300, 2,000, 3,000, and 5,000 feet from the site boundary. Receptors were located around the property boundary in increments of approximately 82 feet, 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 any location 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 approximately 400-acre HMF site. Five years of meteorological data (2005 through 2009) from Merced County Airport, as compiled by the San Joaquin Valley Air Pollution Control District, were used. An emissions release height was estimated to be 14.8 feet to approximate the stack heights of the locomotive engines, diesel trucks, and spray booth stack(s).

Criteria pollutant concentrations were compared to the applicable NAAQS and CAAQS. Maximum DPM and applicable TAC concentrations were used to estimate cumulative cancer risks and the

[8] Emissions from these indirect operational sources were not quantified in the Revised DEIR/Supplemental DEIS. These sources have been added to the analyses performed in support of the FEIR/EIS to more conservatively evaluate the net benefits from project operations.

overall noncancer chronic and acute hazard indices associated with HMF/MOWF operations following procedures developed by OEHHA (OEHHA 2003). The cancer risk calculation procedure developed by the California OEHHA was used to estimate increased cancer risks resulting from the HMF/MOWF's DPM and TAC emissions. Details of the risk analysis are provided in Appendix F.

6.2.2.5 Health Risk Methodology

Maximum estimated dispersion modeling concentrations of DPM and other representative TACs were used to calculate the cancer risks, chronic noncancer risks, and acute noncancer risk associated with HMF/MOWF operations. The 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 USEPA's Human Health Risk Assessment Protocol (HHRAP [USEPA 2005c]) methodology and equations.

- Acute Hazard Risk: Acute hazard index analyses (HIA) are based on HHRAP methodology and equations (USEPA 2005c).

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 Fresno Works–Fresno and Kern Council of Governments–Wasco HMF sites are near a large population and sensitive receptors; therefore, these sites were 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 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 EMFAC2011 with an SJVAB fleet mix. Employee commute and passenger emission factors were estimated using EMCAC2011 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 EMFAC2011 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 and FRA 2012a). The projected employee counts for each facility are listed in Table 6.2-1.

Table 6.2-1
Employee Counts

Facility	2035 Employee Count
Fresno Station[a]	44
Kings/Tulare Regional Station (potential)[a]	17
Bakersfield Station[a]	48
HMF	1,500
MOWF	400

Notes:
[a] The Fresno, Kings/Tulare Regional, and Bakersfield station employee counts were not available. As a result, employee counts for the Downtown Merced Station ratios based on daily boarding were used for the Fresno, Kings/Tulare Regional, and Bakersfield stations.

Acronyms:
HMF heavy maintenance facility
MOWF maintenance-of-way facility

6.2.3.2 Truck Deliveries

Truck deliveries for the HST stations would be minimal. For the HMF/MOWF deliveries, it was assumed that there would be an average of 20 deliveries to the site per day and that 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 Fresno, Kings/Tulare Regional, and Bakersfield 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 Fresno, Kings/Tulare Regional, and Bakersfield stations daily are listed in Table 6.2-2 by their mode of transportation.

Table 6.2-2
Daily Passenger Trips

Mode of Transportation	2035 Fresno Station Passenger Trips	2035 Kings/Tulare Regional Station Passenger Trips	2035 Bakersfield Station Passenger Trips
By shuttle/bus	700	300	900
By car	5,800	2,200	5,900
By biking/walking	400	200	500
Total	**6,900**	**2,700**	**7,300**
Source: Parsons Brinkerhoff/Project Management Team 2010.			

For travel by shuttle/bus, emissions were calculated using the urban buses (UBUS-All) emission factors. It was assumed that each bus would hold 40 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 40. 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 (FTA 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 CAlifornia LINE Source Dispersion Model, Version 4 (CALINE4) (Caltrans 1997) 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. The CO modeling results for 2009 and 2035 are presented in Appendix C.

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, the No Project Alternative, and the 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 over the existing condition and the No Project Alternative with any of the HST alternatives. Using this criterion, intersections were ranked according to LOS, increased delay, and total traffic volume of the HST alternative relative to these factors for the existing condition and the No Project Alternative. The three intersections with the worst LOS, delay, and/or traffic volume were included in the CO hot-spot modeling for the Revised DEIR/Supplemental DEIS. To support the FEIR/EIS, an additional intersection in Corcoran was modeled.

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 5.9 feet.

Receptors for the intersection analysis were located 9.8 feet from the roadway so they were not within the mixing zone of the travel lanes and were spaced at 9.8, 82, and 164 feet from the intersection for both the 1-hour and 8-hour analyses (USEPA 1992). 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

To support the Revised DEIR/Supplemental DEIS, vehicular emissions were estimated using EMFAC2007, which is a mobile source emission estimate program that provides current and future estimates of emissions from highway motor vehicles. EMFAC2007 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. The EMFAC2007 output files are provided in Appendix C.

To support the FEIR/EIS, a revised analysis of the highest volume intersection (Oak Street/Truxtun Avenue in Bakersfield) was performed. The revised analysis of the Oak Street/Truxtun Avenue intersection used the previously prepared dispersion model results (from the Revised DEIR/Supplemental DEIS) and applied updated vehicle emissions that were calculated with EMFAC2011 and updated traffic volumes from the final traffic report.

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 constitute the various models attempt to describe as closely as possible a complex physical phenomenon. 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 follow 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, therefore, 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 2.2 mph was used to predict CO concentrations during peak traffic periods.

- **Temperature and Profile of the Atmosphere**. An ambient temperature was chosen based on the CO protocol recommendation for the study area, a "mixing" height (the height in the atmosphere to which pollutants rise) of 3,280.8 feet; neutral atmospheric stability (stability class G) conditions will be 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 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 USEPA's Guidelines. These data were found to be the most representative of the conditions existing in the project 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 with the conservative assumptions used for the single hour.
- A persistence factor of 0.7 was used in this analysis, 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 this value to account for CO entering the area from other sources upwind of the receptors. CO background levels were obtained 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 First Street monitoring station for the Fresno Station, the Fresno–Drummond monitoring station for the potential Kings/Tulare Regional Station, and the Bakersfield Golden State Highway monitoring station for the Bakersfield Station were used.

The use of these monitors is conservative because, while they are the closest monitors to the general study area and have a neighborhood spatial scale, they are influenced by traffic-related emissions. The second-highest monitored value was used as a background concentration. 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 years 2007 to 2009 was 3.1 ppm for the Fresno First Street monitoring station, 3.50 ppm at the Fresno–Drummond monitoring station, and 2.8 ppm for the Bakersfield Golden State Highway monitoring station. The second-highest 8-hour average was 2.34 ppm for the Fresno First Street monitoring station, 2.14 ppm for the Fresno–Drummond monitoring station, and 2.13 ppm for the Bakersfield Golden State Highway 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 (Dowling Associates, Inc. 2008) and Synchro6 (Trafficware Ltd. 2004) signal-timing traffic model 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 effects 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 Fresno, Kings/Tulare Regional, and Bakersfield 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 station parking structures used the same methodology as was used in the intersections CO modeling. Receptors were located 9.84 feet from the parking structure at each corner and at the entrance of the structure. To estimate CO emissions, all station parking structures were evaluated based on the total number of parking spaces. The emission factors were based on the assumed travel speed of 10 mph. As a conservative estimate, emissions were estimated based on the total capacity of the parking structures.

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

Although the HST portion of the project is subject to the general conformity guidelines and not the transportation conformity guidelines, the project area is classified as a nonattainment area for $PM_{2.5}$ and a federal maintenance area for PM_{10}, so a hot-spot analysis following USEPA's 2010 *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (USEPA 2010b) was conducted. The analysis focused on potential air quality concerns under NEPA from project effects on roads and followed the recommended practice in USEPA's Final Rule regarding the localized or "hot-spot" analysis of $PM_{2.5}$ and PM_{10} (40 CFR Part 93, issued March 10, 2006).

USEPA specifies in 40 CFR Part 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. USEPA 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 Part 93.123(b)(1), are the following:

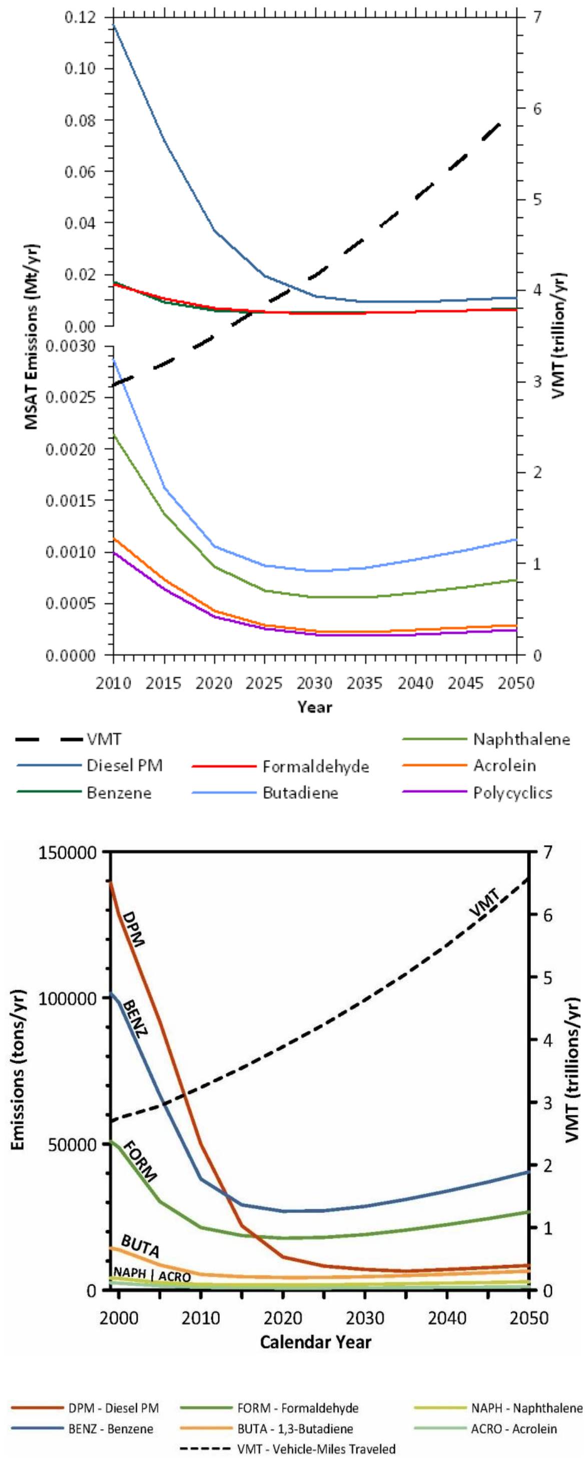
- New or expanded highway projects that have a significant number of or significant increase in diesel vehicles.
- Projects affecting intersections that are at LOS D, E, or F with a significant number of diesel vehicles or those that will degrade to LOS D, E, or F because of increased traffic volumes from the 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 USEPA regulate 188 air toxics, also known as HAPs. USEPA 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 (USEPA 2011e). In addition, USEPA 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 (USEPA 1999). These seven compounds are acrolein, benzene, 1,3-butadiene, DPM plus diesel-exhaust organic gases, formaldehyde, naphthalene, and POM.

Under the 2007 rule, USEPA 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 would likely be lower than present levels as a result of the USEPA’s national control programs that are projected to reduce MSAT emissions by 83% from 2010 to 2050, even if VMT increases by 102%, as shown in Figure 6.5-1.



Source: FHWA 2012.
Notes:
[a] Trends for specific locations may be different, depending on locally derived information representing vehicle miles traveled, vehicle speeds, vehicle mix, fuels, emission-control programs, meteorology, and other factors.

Figure 6.5-1
Projected national MSAT emission trends (2010–2050) for vehicles operating on roadways using USEPA's MOVES2010b model

On February 3, 2006, the Federal Highway Administration (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 Mobile Source Air Toxic Analysis in NEPA Documents* (FHWA 2009), and was most recently updated on December 6, 2012 (FHWA 2012). FHWA's guidance advises on when and how to analyze MSATs in the NEPA process for highway projects. This guidance is interim because MSAT science is still evolving. As the science progresses, FHWA is expected to 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 tier categories:

- No analysis for projects without any 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.

This 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 a study conducted by the FHWA titled *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives* (FHWA 2010).

6.6 Asbestos

Asbestos minerals occur in rocks 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 in other areas of California. Naturally occurring asbestos (NOA) takes the form of long, thin, flexible, separable fibers. Natural weathering or human disturbance can break NOA down to microscopic fibers, 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. USEPA is addressing concerns about potential effects of NOA in a number of areas in California.

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

6.7 Greenhouse Gases 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 will also affect electricity demand throughout the state. These elements will 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.

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

6.7.1 On-Road Vehicles Emissions

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 EMFAC2011, using parameters set within the program for each individual county to reflect travel within each county and using 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 (Year 2035).
- Future Dedicated HST (Year 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.

6.7.2 Airport Emissions

Plane emissions were calculated by using the fuel consumption factors and emission factors from CARB's 2000-2009 *Greenhouse Gas Emissions Inventory Technical Support Document* and the accompanying appendix. The emission factor includes both landing-take-off (LTO) and cruise operations (formula: plane emissions per flight = fuel consumption * emission factor; plane emissions = flights removed * plane emissions per flight). 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 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. The electrical demand estimates used in this analysis for the propulsion of the HST include the use of regenerative brake power.

The HST System will be powered by the state's electric grid. Because no dedicated generating facilities are proposed for this project, no specific source facilities can be identified. GHG emission changes from power generation were therefore predicted on a statewide level. An average GHG emission factor of 650 lbs of CO_2e for each megawatt hour required was provided by CARB (Authority 2013). This factor represents the estimated emission rate for new electrical loads on the system. 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 when compared to emissions estimated for this analysis.

6.8 Construction Phase

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

- At-grade rail segments
- Elevated rail segments
- Retained fill rail segments
- Electrical substations
- Train stations

- HMF and MOWF
- Roadways and roadway overpasses

These major construction activities would account for the vast majority of earthwork, the largest amount of diesel-powered off-road construction equipment, and the majority of material to be hauled along public streets compared with the 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. Regional and localized emissions from minor construction activities, such as mobilization and demobilization, were quantified and would contribute to fewer emissions than the major construction activities listed above. The estimated construction emissions from these major as well as minor 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 architectural coating, were used if project-specific information was not available. Project information used for the construction emission estimates and details of the construction emission calculations are provided in Appendix A.

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, and industrial buildings at the HMF/MOWF and HST stations, including parking garages and platform facilities, were calculated using emission factors from CARB's OFFROAD 2011 and 2007 models (CARB 2011e). The OFFROAD 2011 model provides the latest emission factors for construction off-road equipment, and accounts for lower fleet population and growth factors as a result of the economic recession and updated load factors based on feedback from engine manufacturers. For emission rates not available in OFFROAD 2011, rates from OFFROAD2007 were conservatively applied. The use of emission rates from the OFFROAD models reflects the recommendation of CARB to capture the latest off-road construction assumptions. OFFROAD 2011 default load factors (the ratio of average equipment horsepower utilized to maximum equipment horsepower) and useful life parameters were used for emission estimates. Mobile source emission burdens from worker vehicle trips and truck trips were calculated using VMT estimates and appropriate emission factors from EMFAC2011. Fugitive dust emissions from dirt and aggregate handling were calculated using emission factors derived from equations from USEPA's AP-42 (USEPA 2006b).

Construction exhaust emissions from equipment, fugitive dust emissions from earthmoving activities, and emissions from worker vehicle trips, deliveries, and material hauling were calculated and compiled in a spreadsheet tool specific to the HST project for each year of construction. It should be noted that the values reported in the FEIR/ EIS are different from values report in the earlier Revised DEIR/Supplemental DEIS because of refinements to the construction schedule, proposed equipment, and demolition quantities.

The analysis in support of the FEIR/EIS uses the calculation methodology that was introduced in the Revised DEIR/Supplemental DEIS. The method used in the Revised DEIR/Supplemental DEIS was different than the methodology used in the earlier Draft EIR/EIS. The values reported in the earlier Draft EIR/EIS were based on results from the URBEMIS2007 model (Rimpo and Associates 2007). The Fresno to Bakersfield Section Revised DEIR/Supplemental DEIS used an alternative approach that provides more flexibility for modeling the complexity associated with the proposed HST construction activities than the URBEMIS and California Emission Estimator Model (CALEEMOD) (SCAQMD 2011) models allowed for. It also allows incorporation of the OFFROAD 2011 emission rates. This revised approach was developed in consultation with the SJVAPCD. The analysis for the FEIR/EIS also uses the alternative approach that was used in the Revised DEIR/Supplemental DEIS.

Mobile source emission burdens from worker trips and truck trips were calculated using VMT estimates and appropriate emission factors from EMFAC2011.

6.8.2 General Assumptions and Methodologies

6.8.2.1 Assumptions and Methodologies

Project-specific data, including construction equipment lists and the construction schedule, were used for construction associated with the alignment/guideway. Calculations were performed for each year of construction.

Major activities were grouped into the following categories:

- Mobilization—assumed to occur at 4 main staging areas.
- Site preparation including demolition, land clearing, and grubbing.
- Earthmoving.
- Roadway crossings.
- Elevated structures.
- Track laying – elevated, at-grade, and retained fill.
- Traction power supply station.
- Switching station.
- Paralleling station.
- HMF, including demolition, building, and track construction.
- Fresno Station.
- Kings/Tulare Regional Station
- Bakersfield Station.
- Hauling emissions, including truck and rail.
- Demobilization

6.8.2.2 Statewide EIR/EIS Programmatic Control Measures

The project design incorporates the following design elements from the 2005 Statewide Program EIR/EIS mitigation strategies to reduce air quality impacts associated with construction and operation of the HST System. Because the 2005 Statewide Program EIR/EIS includes these measures, they are not considered mitigation but are calculated as part of the project construction emissions before 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 the following:

- Replacing ground cover in disturbed areas (PM, 5%).
- Watering exposed surfaces three times daily (PM, 61%).
- 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%).
- Use of low-VOC paint (VOC, 10%).
- Washing all trucks and equipment before exiting construction sites.
- Suspending dust-generating activities when wind speeds are above 25 mph.

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 2005 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 2008) listed above.

6.8.3 Construction Activities

6.8.3.1 Mobilization

For the purposes of this analysis, mobilization is assumed to take approximately 4 months, beginning in April 2014 and ending in July 2014[9]. Emissions associated with mobilization were calculated using OFFROAD 2011 emission factors. Fugitive dust from mobilization includes worker trips and construction equipment exhaust. Four main site areas were assumed for the Fresno to Bakersfield Section of the HST alignment.

6.8.3.2 Site Preparation

Demolition

Demolition of existing structures along the HST alignment and HST stations would occur in2014 Demolition emissions were calculated using OFFROAD 2011 emissions factors. 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. Table 6.8-1 summarizes the land use areas of the demolition activities for each year of demolition.

Table 6.8-1
Area of Demolition Activities

Year	Total Area (square feet)
2014	7,046,653

Land Grubbing

Land grubbing refers to the site preparation activities for the HST alignment construction. Emissions from land grubbing were estimated using the OFFROAD 2011 emission factors as well as a site-specific equipment list. Land grubbing was assumed to take place at four staging areas in 2014. Fugitive dust from land-grubbing activities includes that from worker trips, construction equipment exhaust, and truck-hauling exhaust.

6.8.3.3 Earthmoving

The earthmoving activities include grading, trenching, and cut/fill activities for the alignment construction. Earthmoving would occur at four locations from November 2014 to November 2016. The emissions associated with the earthmoving activities were estimated using OFFROAD 2011 emission factors as well as a site-specific equipment list. Fugitive dust from land-grubbing activities includes that from worker trips, construction equipment exhaust, and truck-hauling exhaust.

[9] Construction is conservatively estimated to occur in 2014, although it is likely that construction may not start until 2015. Using 2014 as the first year of construction represents worst case assumptions because it assumes a slightly older mix of construction equipment and trucks, and emission factors are anticipated to decrease over time as newer and cleaner vehicles enter the fleet.

6.8.3.4 HST Alignment Construction

The HST alignment construction is expected to occur from 2014 to 2017, and includes the following construction phases and operation of a concrete batch plant:

- Constructing structures for the elevated rail.
- Laying elevated rail and 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) for the BNSF Alternative and the HMF track were considered in this analysis. The length of the alignment for alternatives that deviate from the BNSF Alternative is comparable to the length of the equivalent section of the BNSF Alternative. Therefore, construction emissions from construction of the BNSF Alternative are expected to be similar to the construction emissions for the other alternatives. The BNSF Alternative is the only alignment analyzed for construction emissions and all alternatives are assumed to have the same construction emissions as the BNSF Alternative (refer to Section 7.10.1.2 for discussion of the comparable length of the other alternatives and the corresponding length of the BNSF Alternative).

Table 6.8-2 summarizes the lengths of at-grade rail and elevated rail (including retained-fill rail) for each alignment alternative. The emissions of each alternative/operation were taken as the sum of the at-grade, elevated, and retained-fill emissions.

Table 6.8-2
HST Alternative Alignment Lengths

Alternative	Total Length (miles)[a]	At-Grade Length (miles)[a]	Elevated Length, including Retained Fill (miles)[a]
BNSF Alternative	114	87	30
HMF access guideway[b]	9	—	—
MOWF access guideway[c]	1	—	—

Source: Parsons Brinckerhoff/Project Management Team 2009.

Notes:
[a] Values are rounded to the nearest significant digit.

[b] The total length of the HMF access guideway was based on 36 different track sections at the HMF at a length of 1,312 feet (0.24 mile) for a total length of 47,232 feet (about 9 miles).

[c] The total length of the MOWF facility access guideway was based on 6 different track sections at the MOWF at a length of 656 feet (0.12 mile) for a total length of 3,936 feet (about 0.75 mile).

Acronyms:
HMF heavy maintenance facility
HST high-speed train
MOWF maintenance-of-way facility

Concrete Batch Plants

Concrete would be required for construction of bridges used to support the elevated sections of the alignment, for construction of the station platform, and for construction of the retaining wall used to support the retained-fill sections of the alignment. To provide enough concrete onsite, it is estimated that three batch plants would operate in the project area during construction of the alignment sections. Because the locations of the concrete batch plants are unknown, fugitive dust emissions associated with the plants were estimated based on the total amount of concrete required and on emission factors from Chapter 11.12 of AP-42 (USEPA 2006a). Emissions from on-road truck trips associated with transporting material to and from the concrete batch plants were included in material-hauling emissions calculations.

Material Hauling

Emissions from the exhaust of trucks used to haul material (including concrete slabs) to the construction site were calculated using heavy-duty truck emission factors from EMFAC2011 and anticipated travel distances of haul trucks within the San Joaquin Valley Air Basin (SJVAB). Ballast materials could potentially be hauled by rail within the air basin. Locomotive emission factors from the USEPA document, *Emission Factors for Locomotives* (USEPA 2009c), and the travel distance by rail to the project site were used to estimate rail emissions.

Ballast materials could potentially be 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 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 USEPA guidance (USEPA 2009c) were used to estimate the locomotive emissions. Other construction materials would likely be delivered from supply facilities within the SJVAB.

Five potential quarries that provide ballast material were identified. Of these, three quarries, including Napa Quarry, Lake Herman Quarry, and San Rafael Rock Quarry, were included in the evaluation because of their proximity to the project construction site. These three quarries are all 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.

This analysis was based on the assumption that ballast would be transferred 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.

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 included. Paving activities were not considered because surface parking lots are not expected to be part of the construction; only parking structures with emissions captured during the building construction phase were included.

Construction of the Fresno HST station would begin in June 2017 and be completed by April 2020. Construction of the Bakersfield HST station would begin in June 2018 and be completed by

April 2021. Construction of the Kings/Tulare Station would begin in June 2020 and be completed by April 2023. OFFROAD 2011 was used to estimate emissions from construction phases of the HST stations.

6.8.3.6 Maintenance-of-Way Facility Construction

Emissions associated with construction of the MOWF are expected as a result of mass site grading, asphalt paving, building construction, and architectural coatings. Emissions would also result from construction of the at-grade MOWF Access Guideway rail.

Construction of the MOWF would begin in May 2017 and be completed by the end of 2018. OFFROAD 2011 was used to estimate emissions from construction of the MOWF. Fugitive dust from construction of the MOWF includes that from worker trips, construction equipment exhaust, and truck-hauling exhaust. Emissions from track construction were estimated using the same approach described for the HST alignment construction. The length of track related to MOWF operations is presented in Table 6.8-2.

6.8.3.7 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. OFFROAD 2011 was used to estimate emissions from constructing the HMF. Construction of the HMF facility would occur from approximately May 2017 to November 2018. Construction of the HMF track would occur from June 2018 to November 2018. Fugitive dust from construction of the HMF includes that from worker trips, construction equipment exhaust, and truck-hauling exhaust.

6.8.3.8 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.

A total of 17 power distribution station sites were analyzed for construction emissions using OFFROAD 2011 emission factors. The analysis assumed that station sites 1 through 15 would be constructed from November 2017 to May 2018, and the remaining two sites (16 and 17) would be constructed between November 2018 and May 2019. Fugitive dust from construction of the power distribution stations includes that from worker trips, construction equipment exhaust, and truck-hauling exhaust.

6.8.3.9 Roadway Crossing Construction

The HST alternatives would include construction easement, easement for columns within a state facility, or modification of overcrossings or interchanges. Based on Project-specific data, four staging areas for roadway construction were analyzed. Construction of roadway crossings would occur simultaneously at all staging areas from November 2014 to November 2016. Fugitive dust from construction of the roadway crossings includes that from worker trips, construction equipment exhaust, and truck-hauling exhaust.

6.8.3.10 Demobilization

Demobilization would occur at four different locations from November 2016 to January 2017 (Sites 1 and 2) and January 2017 to April 2017 (Sites 3 and 4). Emissions associated with demobilization were calculated using OFFROAD 2011. Fugitive dust from demobilization includes that from worker trips and construction equipment exhaust.

6.8.3.11 Localized Modeling for Construction Health Risks and Localized Impacts

According to the OEHHA guidance, cancer risk is defined as the predicted risk of cancer (unitless) over a lifetime based on a long-term (70-year) continuous exposure, and is usually expressed as chances per million persons exposed (OEHHA 2012). The construction of the Fresno to Bakersfield Section of the HST has the potential to exceed or contribute to exceedances of the ambient air quality standards and to cause adverse health impacts on nearby sensitive receptors. Construction of the HST guideway/alignment and HST stations would take place over several years, and sensitive receptors at schools, child care centers, health care facilities, and residences could potentially be exposed to cancer risks. A detailed air dispersion modeling analysis and health risk assessment were conducted to determine if these impacts would be significant.

An air dispersion modeling analysis using USEPA's AERMOD (version 12345) was conducted to simulate physical conditions and predict pollutant concentrations at locations near the fence line of construction sites. Construction sites for the guideway/alignment, HST stations, heavy maintenance facility/maintenance-of-way facility, and concrete batch plants were each evaluated for potential localized air quality impacts. For these construction sites, representative construction work areas were modeled, as it is not practical to model the entire length of the alignment or all possible construction alternatives, configurations, and locations for these project components. Pollutant concentrations were estimated near the site boundary and surrounding area. Regulatory default options and the rural dispersion algorithm of AERMOD were used in the analysis. The modeled concentrations were compared with the applicable NAAQS, CAAQS, and health-related guidelines to determine the level of impacts.

Local meteorological data was used in the air dispersion modeling analysis. For the analysis of HST station construction, the nearest available meteorological data set was used. The Fresno Station analysis used the Fresno County Airport meteorological data, the Bakersfield Station analysis used the Bakersfield Airport meteorological data, and the Kings/Tulare Station analysis used the Hanford Airport meteorological data set. The analysis of the guideway/alignment construction used the Fresno County Airport meteorological data as a proxy[10] to determine the potential localized impacts of construction emissions. Five years of meteorological data (2005 through 2009), or the largest number of complete years available from the Fresno County Airport, Bakersfield Airport, and Hanford Airport, as compiled by the SJVAPCD, were used.

TAC concentrations at the maximally exposed individual (MEI) sensitive receptor location were used to estimate cancer risks and the overall noncancer chronic and acute hazard index associated with construction emissions, using procedures developed by OEHHA (OEHHA 2009 and OEHHA 2012). Details of the risk analysis are in Appendix H. Increased incremental cancer risks were compared to the SJVAPCD CEQA threshold of 10 in a million to assess the level of impacts. Chronic and acute hazard indices were compared to the SJVAPCD CEQA threshold of 1 to assess the level of impacts.

The analysis of these localized impacts from construction activities in support of the FEIR/EIS contains additional and updated assessments to those already included in the Revised DEIR/Supplemental DEIS. This was done as a response to comments regarding local air quality impacts from construction. These analyses have been expanded and revised to include both qualitative and quantitative information on potential localized impacts from construction

[10] The Fresno Airport meteorological data represents worst case meteorological conditions as recommended by SJVAPCD in Guidance for Air Dispersion Modeling (SJVAPCD 2007c) and is used when the location is not specific.

emissions in the SJVAB to provide the public with additional information about the potential project impacts.

- The Revised DEIR/Supplemental DEIS qualitatively analyzed the health risks from construction of the HST alignment, HMF and MOWF, and concrete batch plants. In response to comments, the analysis for the FEIR/EIS includes quantitative analyses to evaluate the localized impacts of these construction activities. The quantitative analyses evaluated impacts from criteria pollutant emissions and determined the project's potential to cause or contribute to exceedances of ambient air quality standards. The quantitative analysis also evaluated impacts from TAC emissions and determined the project's potential to cause adverse health impacts on nearby sensitive receptors, including schools, child care centers, health care facilities, and residences.
- The Revised DEIR/Supplemental DEIS quantitatively analyzed the health impacts to schools from construction of the HST stations. In response to comments, the analysis for the FEIR/EIS includes several updates to the previous analysis. Site specific footprints and local meteorological data were incorporated into the air dispersion modeling for this FEIR/EIS analysis, whereas generalized site data that was used for the analysis in the Revised DEIR/Supplemental DEIS. Updates to construction activity, schedule, and emissions have also been incorporated into the analysis for the FEIR/EIS.[11] These updates reflect expected phased construction activities and equipment usage, which are more accurate for the expected HST station construction. Consistent with the FEIR/EIS analysis for construction of the HST alignment, HMF and MOWF, and concrete batch plants, the FEIR/EIS analysis for construction of the HST stations analyzed localized impacts from criteria pollutant emissions and impacts from TAC emissions. The quantitative analyses evaluated criteria pollutant emissions and determined the project's potential to cause or contribute to exceedances of ambient air quality standards. The quantitative analysis also evaluated impacts from TAC emissions and determined the project's potential to cause adverse health impacts on nearby sensitive receptors, including schools, child care centers, health care facilities, and residences.

6.8.4 Construction Impact Analysis

Air quality impacts of HST project construction were 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.

6.8.4.1 Federal

Pursuant to NEPA regulations (40 CFR 1500–1508), project effects are evaluated based on the criteria of context and intensity. Context means the affected environment in which a proposed project occurs. Intensity refers to the severity of the effect, which is examined in terms of the type, quality, and sensitivity of the resource involved, location and extent of the effect, duration of the effect (short or long term), and other considerations of context. Beneficial effects are identified and described. When there is no measurable effect, impact is found not to occur. The intensity of the 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

[11] Refinements included phased construction activities within each major construction task. For example, the analysis in the Revised DEIR/Supplemental DEIS assumed that all equipment used in station construction would be operated for the entirety of the station construction period. Refined construction estimates accounted for phased construction activities, and assigned equipment usage to their proper tasks rather than grossly assuming that they would be active over the entire construction period.

is possible that a significant adverse effect may still exist when, on balance, the impact is negligible or even beneficial.

Per NEPA regulations, regional project emissions are compared with the general conformity *de minimis* (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, project emissions may not cause new violations or exacerbate an existing violation of NAAQS. Table 6.8-3 presents the *de minimis* thresholds applicable to the project.

Table 6.8-3
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

Source: SJVAPCD 2013a; USEPA 2013b.

Notes:
[a] Thresholds from 40 C.F.R. Parts 51 and 93.
[b] Ozone reclassifications were made by USEPA on May 5, 2010.
[c] Only the urban portions of Fresno County and Kern County are maintenance areas 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.

Acronyms:
CO carbon monoxide
GC General Conformity
N/A not applicable
NO_2 nitrogen dioxide
NO_x nitrogen oxide
Pb lead
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
SO_2 sulfur dioxide
SO_x sulfur oxide
tpy ton(s) per year
VOC volatile organic compound

If the project pollutant emissions are below the corresponding GC thresholds and expected to cause pollutant emissions that do not exceed other applicable emissions, air quality, or health risk thresholds (such as those in SJVAPCD CEQA guidelines), the intensity of the impact is considered negligible. Air quality impacts of moderate intensity are defined as pollutant emissions below corresponding GC thresholds, but having the potential to exceed other applicable emissions, air quality, or health risk thresholds. Impacts of substantial intensity are defined as pollutant emissions that are greater than the corresponding GC threshold and have the potential to exceed other applicable emissions, air quality, or health risk thresholds.

6.8.4.2 State

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 (see discussion immediately below under "Local").
- 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.

Quantitative emission thresholds that can be used to evaluate the significance level of impacts have been developed by SJVAPCD and are discussed in the following section.

6.8.4.3 Local

The *Guide for Assessing and Mitigating Air Quality Impacts* (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 6.8-4, 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 unless localized air-dispersion modeling can demonstrate that the emissions would not cause or contribute substantially to an existing or projected air quality violation of an ambient air quality standard.

For CO, NO_2, and SO_2, the threshold is the ambient air quality standard for each respective pollutant. The increase in pollutant concentration associated with the project emissions is added to the background concentration to estimate the ambient air pollutant concentration for comparison with the threshold.

Pre-project concentrations of PM_{10} and $PM_{2.5}$ in the San Joaquin Valley Air Basin exceed their respective ambient air quality standards. Therefore, SJVAPCD recommends comparing the incremental increase in PM_{10} and $PM_{2.5}$ concentrations to the applicable significant impact level (SIL) for PM_{10} and $PM_{2.5}$. For construction, the SJVAPCD recommended SILs 10.4 $\mu g/m^3$ for the 24-hour average concentration and 2.08 $\mu g/m^3$ for the annual average concentration. SJVAPCD recommends that these SILs be used to evaluate construction PM_{10} and $PM_{2.5}$ emissions (Villalvazo 2014). For operations, the SJVAPCD recommended SILs are 5 $\mu g/m^3$ for the 24-hour average concentration and 1 $\mu g/m^3$ for the annual average concentration. These operational SILs are used to evaluate operational PM_{10} and $PM_{2.5}$ emissions. Therefore, an incremental increase that does not exceed these SILs would not be considered to substantially contribute to further exceedances of the ambient air quality standards.

Additionally, as per the SJVAPCD GAMAQI, if a project is individually significant, it is also considered cumulatively significant; therefore, the thresholds listed in Table 6.8-4 are also the cumulative significance thresholds for the project.

Table 6.8-4
SJVAPCD CEQA Construction and Operational Thresholds of Significance

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

Sources: SJVAPCD 2002; Willis 2010, personal communication; Barber 2010, personal communication.

Acronyms:
CEQA California Environmental Quality Act
NO_x nitrogen oxide
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
ROG reactive organic gas
SJVAPCD San Joaquin Valley Air Pollution Control District
tpy ton(s) per year

SJVAPCD does not have a quantitative SO_2 mass emission threshold, and SO_2 is not expected to be a pollutant of concern given the low background concentrations of the area and the limited amount of SO_2 emissions associated with the proposed project. Air dispersion modeling of SO_2 emissions was used to determine if the increased concentration would exceed the ambient air quality standard. Impacts from SO_2 emissions would be of negligible intensity and less than significant if the air dispersion analysis demonstrated that the SO_2 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.

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

Chapter 7.0
Impact Analysis

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 7.1-1 summarizes estimated statewide emission burden changes resulting from the project in 2035. Results for both the 50% and 83% fare scenarios are presented in the table – with the larger reductions in roadway and plane emissions and the larger increases in energy emissions occurring with the 50% scenario (i.e., when more riders would use the HST). 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 versus existing plus project analysis, the project is also predicted to have a beneficial effect on (i.e., reduce) statewide emissions of all applicable pollutants, as compared to the existing conditions (Table 7.1-2).

Table 7.1-1
2035 Estimated Statewide Emission Burden Changes due to the HST Project vs. No Project (under the 50% and 83% fare scenarios)

Project Element	VOC (tons/yr)	CO (tons/yr)	NO_x (tons/yr)	SO_2 (tons/yr)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
Roadways	-420 to -280	-10,295.42 to -6,864	-958 to -638	-54 to -36	-586 to -391	-245 to -163
Planes	-124 to -83	-1,677 to -1,124	-1,324 to -887	-159 to -106	-24 to -16	-24 to -16
Energy (power plants)	61 to 40	616 to 411	468 to 312	52 to 35	88 to 59	81 to 54
Total	-483 to -323	-11,356 to -7,576	-1,814 to -1,214	-160 to -107	-522 to -348	-188 to -125

Note**:** Totals may not add up exactly due to rounding.
The values in the table represent the ranges of emission burden change based on the range of HST ticket price of 50% to 83% of airfare.

Operational emissions in this analysis for the FEIR/EIS reflect refined energy usage estimates for the HST which resulted in lower energy requirements, and also reflect updated speed correlations between the No Build and Build 50% scenarios.

Acronyms:
CO carbon monoxide
HC hydrocarbon
HST high-speed train
NO_x nitrogen oxide
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
SO_2 sulfur dioxide

Table 7.1-2
2009 Estimated Statewide Emission Burden Changes due to the HST Project vs. No Project (under the 50% and 83% Fare Scenarios)

Project Element	VOC (tons/year)	CO (tons/year)	NO_x (tons/year)	SO_2 (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
Roadways	-1,458 to -970	-31,267 to -20,813	-3,444 to -2,292	-39 to -26	-444 to -296	-195 to -130
Planes	-72 to -48	-973 to -652	-768 to -514	-92 to -62	-14 to -9	-14 to -9
Energy (power plants)	61 to 40	616 to 411	468 to 312	52 to 35	88 to 59	81 to 54
Total	-1,469 to -978	-31,624 to -21,053	-3,744 to -2,495	-79 to -53	-370 to -246	-127 to -85

Note**:** Totals may not add up exactly due to rounding.

The values in the table represent the ranges of emission burden change based on the range of HST ticket price of 50% to 83% of airfare.

Operational emissions in this analysis for the FEIR/EIS reflect refined energy usage estimates for the HST which resulted in lower energy requirements, and also reflect updated speed correlations between the No Build and Build 50% scenarios.

7.1.1 On-Road Vehicles

As shown in Table 7.1-3, the HST is predicted to reduce daily roadway VMT because travelers would use the HST rather than drive. 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 EMFAC2011, 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 7.1-3, the proposed project is predicted to reduce regional emissions, as compared to the No Project Alternative. This is demonstrated on both a county and statewide level.

In the existing conditions versus existing plus project analysis, it is also estimated that the project would reduce daily VMT and associated emissions because travelers would choose to use the HST rather than drive (Table 7.1-4).

Table 7.1-3
2035 On-Road Vehicle Emission Changes due to the HST
under the 50% to 83% Fare Scenarios

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}	$PM_{2.5}$
Fresno	27,368,000	24,364,000 to 25,366,000	--37.54 to -25.02	--949.29 to -632.65	-91.15 to -60.75	-5.13 to -3.42	-55.98 to -37.31	-23.21 to -15.47
Kern	39,240,000	35,149,000 to 36,513,000	-51.29 to -34.19	-1,306.33 to -870.78	-123.51 to -82.33	-6.98 to -4.65	-76.32 to -50.88	-31.69 to -21.12
Kings	3,137,000	2,663,000 to 2,821,000	-6.21 to -4.14	-142.38 to -94.92	-14.53 to -9.68	-0.81 to - 0.54	-8.81 to -5.88	-3.64 to -2.43
Tulare	10,112,000	9,649,000 to 9,803,000	--5.89 to -3.93	-141.86 to -94.68	-14.16 to -9.45	-0.79 to -0.53	-8.61 to -5.75	-3.56 to -2.38
Regional Total	79,857,000	71,825,000 to 74,503,000	-100.9 to -67.28	-2,539.9 to - 1,693.02	-243.4 to -162.21	-13.7 to - 9.14	-149.7 to - 99.81	-62.1 to -41.40
Statewide Total	1,254,608,000	1,223,333,000 to 1,233,758,000	-420 to -280	-10,295.42 to -6,864	-958 to -638	-54 to -36	-586 to - 391	-245 to - 163

Note**:** The values in the table represent the ranges of emission burden change based on the range of HST ticket price of 50% to 83% of airfare.

Acronyms:
CA California
CO carbon monoxide
HST high-speed train
NO_x nitrogen oxide
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
SO_2 sulfur dioxide
VMT vehicle miles traveled
VOC volatile organic compound

Table 7.1-4
2009 On-Road Vehicle Emission Changes due to the HST
under the 50% to 83% Fare Scenarios

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}	$PM_{2.5}$
Fresno	17,311,000	15,300,000 to 15,970,000	-119.47 to -79.67	-2,697.42 to -1,798.78	-310.40 to 206.99	-3.45 to -2.30	-39.00 to -26.01	-16.89 to -11.26
Kern	22,379,000	19,750,000 to 20,620,000	-157.16 to -105.17	-3,536.12 to -2,366.31	-400.50 to -268.01	-4.51 to -3.02	-51.09 to -34.18	-22.17 to -14.83
Kings	2,151,000	1,800,000 to 1,920,000	-21.56 to -14.18	-475.17 to -312.51	-57.74 to -37.97	-0.60 to -0.40	-6.79 to -4.47	-2.93 to -1.93
Tulare	6,046,000	5,770,000 to 5,860,000	-16.45 to -11.09	-369.42 to -249.04	-43.99 to -29.66	-0.47 to -0.32	-5.34 to -3.60	-2.30 to -1.55
Regional Total	47,887,000	42,620,000 to 44,370,000	-314.64 to -210.11	-7,078.12 to -4,726.64	-812.63 to -542.62	-9.03 to -6.03	-102.22 to -68.25	-44.29 to -29.57
Statewide Total	948,510,000	925,860,000 to 933,420,000	-1,458 to -970	-31,267 to -20,813	-3,444 to -2,292	-39 to -26	-444 to -296	-195 to -130

Note**:** The values in the table represent the ranges of emission burden change based on the range of HST ticket price of 50% to 83% of airfare.

Acronyms:
CA California
CO carbon monoxide
HST high-speed train
NO_x nitrogen oxide
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
SO_2 sulfur dioxide
VMT vehicle miles traveled
VOC volatile organic compound

As a result of the HST project, some vehicles may need to travel additional distances to cross the HST track on new roadway overpasses. On average, roadway overpasses would be provided approximately every 2 miles along the track. It is estimated that the proposed project would result in no more than 1 mile of out-of-direction travel for vehicles to cross the HST tracks. The width of the roadway overpasses would accommodate both farm equipment and school buses traveling in opposite lanes. Because of the frequency of roadway overpasses, additional distances traveled by vehicles to cross the HST tracks are expected to be negligible relative to regional VMT reductions; therefore, this is not discussed further in the analysis.

7.1.2 Train Movement

The HST project would use electric multiple unit (EMU) trains, with the power distributed through the overhead contact system. Direct emissions from combustion of fossil fuels and associated emissions from the 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 per second (0.62 feet per second) 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 USEPA methodology for estimating emissions from wind erosion (USEPA 2006b), HST operations would generate approximately 29 tons per year (tpy) of PM_{10} and 4.3 tpy of $PM_{2.5}$. Details of the analysis and calculations are included in Appendix D.

Fresno, Kern, Kings, and Tulare counties, as well as the San Joaquin Valley region in general, have higher rates of asthma in adults and children. Because the HST is electrically powered, it is not expected to generate direct combustion emissions along its route that would cause substantial health concerns, such as asthma or other respiratory diseases. In addition, a detailed analysis of wind-induced fugitive dust emissions from HST travel is discussed in Appendix D. Based on this analysis, fugitive dust emissions from HST travel are not expected to result in substantial amounts of dust to cause health concerns.

7.1.3 Airport Emissions

The HST project could affect travel at four regional airports in the study area: Fresno Yosemite International Airport, Hanford Municipal Airport, Visalia Municipal Airport, and Meadow Fields Airport. The Statewide Program EIR/EIS (Authority and FRA 2005) demonstrated that the long-distance, city-to-city aircraft takeoffs and landings within the Fresno to Bakersfield 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 7.1-5, the HST is predicted to reduce the number of plane flights because travelers would use the HST rather than fly 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 also included. Average plane emissions were calculated based on the profile of aircraft currently servicing the San Francisco to Los Angeles Corridor. The number of air trips removed because of the HST was estimated in the travel demand modeling analysis conducted for the project. In the existing and existing plus project analysis, it is estimated that the project will reduce the number of statewide air trips by over 200 flights per day statewide, resulting in an reduction of emissions from planes, when compared with the existing scenario, because travelers would choose to use the HST rather than to fly (Table 7.1-6).

As shown in Tables 7.1-5 and 7.1-6, the proposed project is predicted either to have no measurable effect or to slightly reduce regional emissions in 2035 and 2009 when compared with the No Project Alternative.

Table 7.1-5
2035 Aircraft Emission Changes due to HST
under the 50% to 83% Fare Scenarios

Origin	No. of Flights Removed (per day)	Change in Emission Burdens due to HST (tons/year)					
		VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
San Joaquin	-7 to -5	-2.3 to -1.5	-30.6 to -20.5	-24.2 to -16.2	-2.9 to 1.9	-0.4 to -0.3	-0.4 to -0.3
Statewide Total	-387 to -259	-124 to -83	-1,677 to -1,124,	-1,324 to -887	-159 to -106	-24 to -16	-24 to -16

Note**:** Totals may not add up exactly due to rounding.

The values in the table represent the ranges of emission burden change based on the range of HST ticket price of 50% to 83% of airfare

Acronyms:
CO carbon monoxide
HST high-speed train
LA Los Angeles
NO_x nitrogen oxide
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
SO_2 sulfur dioxide
VOC volatile organic compound

Table 7.1-6
2009 Aircraft Emission Changes due to the HST
under the 50% to 83% Fare Scenarios

Origin	No. of Flights Removed (per day)	Change in Emission Burdens due to HST (tons/year)					
		VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
San Joaquin	-4 to -3	-1.3 to -0.9	-17.8 to -11.9	-14.0 to -9.4	-1.7 to -1.1	-0.3 to -0.2	-0.3 to -0.2
Statewide Total	-224 to -150	-72 to -48	-973 to -652	-768 to -514	-92 to -62	-14 to -9	-14 to -9

Note**:** Totals may not add up exactly due to rounding.

The values in the table represent the ranges of emission burden change based on the range of HST ticket price of 50% to 83% of airfare.
Acronyms:
CO carbon monoxide
HST high-speed train
LA Los Angeles
NO_x nitrogen oxide
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
SO_2 sulfur dioxide
VOC volatile organic compound

7.1.4 Indirect Power Plant Emissions

The HST is expected to increase electrical requirements when compared with the No Project Alternative and existing conditions. Statewide, the electrical demands due to propulsion of the trains and the operation of the trains at terminal stations and in storage depots and maintenance facilities were conservatively estimated to be 13.17 gigawatt-hours (GWh) per day (including transmission losses of approximately 4%) for the 50% fare scenario, and 8.78 GWh per day (including transmission losses of approximately 4%) for the 83% fare scenario. To derive the portion of electricity usage required by the Fresno to Bakersfield Section, the alignment distance for the BNSF 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 and the California Energy Commission's electrical generation data. As shown in Table 7.1-7, the project is expected to increase emissions. This change is predicted to occur in both existing conditions and the 2035 build scenario.

The HST System would be powered by the state's electrical grid, and therefore no single generation source for the electrical power requirements can be positively identified. Emission changes from power generation can therefore be predicted on a statewide level only. The estimated emission changes shown in Table 7.1-7 are considered to be conservative because they are based on the state's current electrical profile. 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 when compared with 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.

Table 7.1-7
Power Plant Emission Changes due to the HST
under the 50% and 83% Fare Scenarios

Electricity required (GWh per day)	Change in Emissions due to HST (tons/year)					
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
13.17 to 8.78 (Statewide)	61 to 40	616 to 411	468 to 312	52 to 35	88 to 59	81 to 54
1.84 to 1.22 (Regional)	8.5 to 5.7	86.3 to 57.6	65.5 to 43.7	7.3 to 4.9	12.4 to 8.3	11.4 to 8.0

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 values in the table represent the ranges of emission burden change based on the range of HST ticket price of 50% to 83% of airfare.

Acronyms:
CO carbon monoxide
GWh gigawatt-hour(s)
HST high-speed train
NO_x nitrogen oxide
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
SO_2 sulfur dioxide
VOC volatile organic compound

7.2 Local Operational Emission Sources

Operation of the Fresno, Kings/Tulare Regional, and Bakersfield stations, the HMF, and the MOWF would produce criteria pollutant 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 Fresno, Kings/Tulare Regional, and Bakersfield stations and associated mobile sources would produce criteria pollutant and GHG emissions.

Emissions associated with the operation of the Fresno, Kings/Tulare Regional, and Bakersfield 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 are considered to be negligible. URBEMIS2007 was used to estimate these emissions from each station, based on the square footage of the stations. EMFAC2011 was used to estimate emissions from mobile sources. The unmitigated criteria pollutant and GHG emissions were estimated for the design year (2035) and are included in Table 7.2-1.

Table 7.2-1
HST Station Operational Emissions

Project Component	Emissions (tons/year)						
	VOCs	CO[a]	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Operational Year 2035							
Fresno Station	0.90	60.21	6.03	0.33	4.44	1.89	32,919
Kings/Tulare Regional Station	0.42	24.73	2.87	0.13	1.69	0.72	12,744
Bakersfield Station	0.90	59.23	6.26	0.34	4.53	1.93	33,472

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

Acronyms:
CO carbon monoxide
CO_2 carbon dioxide
HST high-speed train
NO_x nitrogen oxide
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
SO_2 sulfur dioxide
VOC volatile organic compound

7.2.2 Maintenance Facilities

7.2.2.1 Maintenance-of-Way Facility

Maintenance-of-way facilities provide for equipment, materials, and replacement parts storage, and for support quarters and staging areas for the HST System subdivision maintenance personnel. 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. Emissions from MOWF onsite activities are considered in conjunction with the emissions from HMF onsite activities, since the facilities will be co-located. Emissions from MOWF offsite mobile activities are presented in Table 7.2-2.

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 MOWF 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.

Table 7.2-2
Maintenance Facility Operational Emissions

Project Component	Emissions (tons/year)[a]						
	VOCs	CO[b]	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Operational Year 2035							
HMF onsite emissions[a]	0.56	9.0	3.5	0.47	0.13	0.12	19,498
HMF offsite mobile source emissions	0.24	12	1.8	0.07	1.02	0.44	7,030
MOWF offsite mobile source emissions	0.06	4	0.4	0.02	0.30	0.13	2,193

[a] HMF onsite emissions include emissions from locomotives and diesel trucks associated with MOWF activities.
[b] The operational emissions do not include CO emissions from traffic congestion in the parking structures.

Acronyms:
CO carbon monoxide
CO_2 carbon dioxide
HMF heavy maintenance facility
MOWF maintenance-of-way facility
NO_x nitrogen oxide
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
SO_2 sulfur dioxide
VOC volatile organic compound

<u>HMF Sources with Minimal Air Emissions</u>

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:

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

- 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 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 an engineer at Hatch Mott MacDonald (HMM), the cranes and lifts will likely be electric because this is what occurs at other maintenance facilities for HSTs around the world (Earle 2010, personal communication). As a result, there would 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 PTO. The potential types of emissions and their sources are discussed for the following 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 diesel engines at the HMF include internal combustion engines and other stationary engines with an engine size of 200 hp. At this time, there is no site-specific information for these stationary sources; however, these sources would require a PTO before the facility could be constructed. Criteria pollutant emissions, such as NO_x, VOCs, PM_{10}, and $PM_{2.5}$ would be expected from these stationary sources.

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 NOx emissions would be fuel consumption by onsite mobile sources at the HMF. There would be two switch locomotives (for maintenance-of-way operations) and 20 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 at the maintenance facilities were quantified.

Table 7.2-2 lists the emissions associated with the HMF and MOWF. Details for the assumptions and the emissions associated with each source are provided in Appendix B.

HMF Air Dispersion Modeling Results

Criteria Pollutants

In general, emissions of criteria pollutants from HMF would not cause exceedances of NO_2 NAAQS, CAAQS, or federal and state health guidelines at the property line of the HMF (Table 7.2-3). The PM_{10} and $PM_{2.5}$ concentration increases due to the HMF operation would be minimal, and would not exceed the SJVAPCD recommended significant impact levels.

Note that the analysis in the Revised DEIR/Supplemental DEIS previously concluded that localized PM_{10} and $PM_{2.5}$ impacts would be significant because current background concentrations in the SJVAPCD already exceed the ambient air quality standards, and any minimal increases in concentration would exacerbate these exceedances. This effectively set a significance threshold of zero, which was extremely conservative. This conservative zero threshold was used because no other threshold was known at the time. Since the Revised DEIR/Supplemental DEIS, the significance thresholds recommended by SJVAPCD became known (Villalvazo 2014). Accordingly, in this FEIR/EIS analysis, the incremental increases in PM_{10} and $PM_{2.5}$ concentration from project emissions were compared to the SJVAPCD recommended significant impact levels (see Section 3.3.4.11). Because the incremental increase in PM_{10} and $PM_{2.5}$ concentrations would not exceed these levels, localized PM_{10} and $PM_{2.5}$ impacts would be less than significant.

Table 7.2-3
Total Estimated Concentrations of Criteria Pollutants at HMF Property Line

Pollutant	Averaging Time Period	CAAQS (µg/m³)	NAAQS (µg/m³)	Estimated Concen-trations (µg/m³)	Background Concen-trations (µg/m³)	Total Estimated Concen-trations (µg/m³)	Exceed CAAQS?	Exceed NAAQS?
NO_2	1-hour	339	188	12.24	81.8	94.0	No	No
	Annual	57	100	0.86	30.1	31.0	No	No
PM_{10}	24-hr	50	150	0.10	99.5	99.6	Yes	No
	Annual	20	—	0.03	40.5	40.5	Yes	—
$PM_{2.5}$	24-hr	—	35	0.06	81.6	81.7	—	Yes
	Annual	12	15	0.02	15.23	15.3	Yes	Yes

Acronyms:
µg/m³ micrograms per cubic meter
CAAQS California Ambient Air Quality Standards
NAAQS National Ambient Air Quality Standards
NO_2 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

Three of the five HMF sites are in rural areas away from sensitive receptors, but the Fresno Works–Fresno and the Kern Council of Governments–Wasco HMF sites are closer to dense populations of 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 Fresno Works–Fresno and Kern Council of Governments–Wasco HMF sites were evaluated in the CO hot-spot analysis. The intersections modeled were found to have CO concentrations less than NAAQS and CAAQS (refer to Section 7.4.1).

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 estimated for pollutants listed are those for which the noncancer reference dose concentration (RfC) guideline values are available from USEPA's Integrated Risk Information System (IRIS), Prioritized Chronic Dose-Response Values for Screening Risk Assessments (USEPA 2007) and the Reference Exposure Limit (REL) values from the Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments (OEHHA 2003), OEHHA (2012) Air Toxics Hot Spots Program Risk Assessment Guidelines, Technical Support Document for Exposure Assessment and Stochastic Analysis, OEHHA/ARB-Approved Health Values for Use in Hot Spot Facility Risk Assessments. The total maximum chronic noncancer hazard index at the HMF property line is estimated to be less than 1—using both USEPA and OEHHA health risk values. As such, potential chronic noncancer risks associated with HMF operations are not considered to be significant. The detailed analysis and chronic noncancer risk results are provided in Appendix F.

Acute Risk: Acute Risk estimated for pollutants listed are those for which acute inhalation exposure criteria values are available from the Prioritized Chronic Dose-Response Values for Screening Risk Assessments (USEPA 2007) and acute REL values from OEHHA Air Toxics Hot Spots Program Risk Assessment Guidelines (OEHHA 2003), OEHHA (2012) Air Toxics Hot Spots Program Risk Assessment Guidelines, Technical Support Document for Exposure Assessment and Stochastic Analysis, 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 USEPA and OEHHA health risk values. As such, potential acute health risks associated with HMF operations are not considered to be significant. The detailed analysis and acute risk results are provided in Appendix F.

Cancer Risk: Maximum cancer risks were estimated at various distances from the HMF boundary until the point at which the 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 be below applicable significant thresholds. The maximum cancer risks at various distances from HMF boundary were then computed using procedures recommended by SJVAPCD and OEHHA, which assume continuous exposure over a 70-year lifetime for residents. The calculations at various distances from the facility boundary were performed for DPM and other applicable carcinogenic pollutants (Table 7.2-4). As shown, incremental cancer would decrease to below the 10 in a million (10×10^{-6}) CEQA significance threshold 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. All five HMF sites, the Fresno Works–Fresno, Kings County–Hanford, Kern Council of Governments–Wasco, Kern Council of Governments–Shafter East, and Kern Council of Governments–Shafter West, may have sensitive receptors located within 1,300 feet,

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

where the cancer risk would exceed 10 in a million. Therefore, there might be impacts from HMF site operations at all five HMF sites.

Detailed risk analyses are presented in Appendix F.

Table 7.2-4
Incremental Cancer Risk Values at Different Distances from HMF

Pollutant[a]	500 ft		1,000 ft		1,300 ft		2,000 ft		3,000 ft		5,000 ft	
	Estimated Conc. (µg/m3)	**Cancer Risk (per million)**	**Estimat-ed Conc. (µg/m3)**	**Cancer Risk (per million)**	**Estimat-ed Conc. (µg/m3)**	**Cancer Risk (per million)**	**Estimat-ed Conc. (µg/m3)**	**Cancer Risk (per million)**	**Estimat-ed Conc. (µg/m3)**	**Cancer Risk (per million)**	**Estimat-ed Conc. (µg/m3)**	**Cancer Risk (per million)**
DPM	0.01455	15.21364	0.01046	10.93768	0.00902	9.42593	0.00685	7.15936	0.00506	5.28588	0.00316	3.30786
Benzene	0.00049	0.04645	0.00035	0.03340	0.00030	0.02878	0.00023	0.02186	0.00017	0.01614	0.00011	0.01010
Acetaldehyde	0.00050	0.00476	0.00036	0.00342	0.00031	0.00295	0.00024	0.00224	0.00017	0.00165	0.00011	0.00104
1,3-Butadiene	0.00001	0.00738	0.00001	0.00531	0.00001	0.00457	0.00001	0.00347	0.00000	0.00256	0.00000	0.00161
Formaldehyde	0.00100	0.02000	0.00072	0.01438	0.00062	0.01239	0.00047	0.00941	0.00035	0.00695	0.00022	0.00435
Methylene chloride	0.00155	0.00516	0.00111	0.00371	0.00096	0.00320	0.00073	0.00243	0.00054	0.00179	0.00034	0.00112
Total incremental cancer risk		15.3		11.0		9.5		7.2		5.3		3.3

Note:
[a] Based on the estimated 5-years average (2005–2009) annual ground-level concentrations.

Acronyms and Abbreviations:
Conc. = concentrations
DPM = diesel particulate matter
HMF = heavy maintenance facility
µg/m^3 = micrograms per cubic meter

7.3 Total Operational Emissions

Tables 7.3-1 and 7.3-2 show a summary of the total emission changes due to HST operation for both the 50% and 83% fare scenarios, 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 ozone 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 7.3-1
Summary of Regional Emissions Changes due to HST Operation in Design Year – 2035 (tpy)
Project vs. No Project 2035 (under the 50% to 83% Fare Scenarios)

Activities	VOCs	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Indirect Emissions						
Changes in VMT emissions	-100.9 to -67.28	-2,539.9 to -1,693.02	-243.4 to -162.21	-13.7 to -9.14	-149.7 to -99.81	-62.1 to -41.40
Changes in airplane emissions	-2.3 to -1.5	-31 to -21	-24 to -16	-2.9 to -1.9	-0.44 to -0.29	-0.43 to -0.29
Changes in power plant emissions	8.5 to 5.7	86.3 to 57.6	65.5 to 43.7	7.3 to 4.9	12.4 to 8.3	11.4 to 8.0
Direct Emissions						
HST station operations	2.2	144	15.2	0.8	10.7	4.5
HMF onsite emissions[a]	0.56	9.0	3.5	0.47	0.13	0.12
HMF offsite emissions	0.24	12	1.8	0.07	1.02	0.44
MOWF offsite emissions	0.06	4	0.4	0.02	0.30	0.13
Fugitive dust from train operations	N/A	N/A	N/A	N/A	29	4.3
Total[b]	-92 to-60	-2,315 to -1,486	-181 to -114	-7.9 to -4.8	-97 to -51	-42 to -24

Notes:
[a] HMF onsite emissions include emissions from locomotives and diesel trucks associated with MOWF activities.
[b] The total includes the indirect and direct emissions.
The values in the table represent the emission changes based on the range of HST ticket price of 50% to 83% of airfare.

Acronyms:
CO carbon monoxide
HMF heavy maintenance facility
HST high-speed train
MOWF maintenance-of-way facility
N/A not applicable
NO_x nitrogen oxide
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
SO_2 sulfur dioxide
VMT vehicle miles traveled
VOC volatile organic compound

Table 7.3-2
Summary of Regional Emissions Changes due to HST Operation in Design Year – 2009 (tpy)
Project vs. No Project 2009 (under the 50% to 83% fare scenarios)

Activities	VOCs	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Indirect Emissions						
Changes in VMT emissions	-314.64 to -210.11	-7,078.12 to -4,726.64	-812.63 to -542.62	-9.03 to -6.03	-102.22 to -68.25	-44.29 to -29.57
Changes in airplane emissions	-1.3 to -0.9	-18 to -12	-14 to -9	-1.7 to -1.1	-0.25 to -0.17	-0.25 to -0.17
Changes in power plant emissions	8.5 to 5.7	86.3 to 57.6	65.5 to 43.7	7.3 to 4.9	12.4 to 8.3	11.4 to 8.0
Direct Emissions						
HST station operations	33.4	900	101.3	0.8	11.3	5.1
HMF onsite emissions[a]	0.56	9.0	3.5	0.47	0.13	0.12
HMF offsite emissions	2.93	77	11.9	0.07	1.10	0.51
MOWF offsite emissions	0.83	23	2.6	0.02	0.32	0.14
Fugitive dust from train operations	N/A	N/A	N/A	N/A	29	4.3
Total[b]	-270 to-168	-6,000 to -3,672	-642 to -389	-2.04 to -0.88	-48.2 to -18.3	-23.0 to -11.6

Notes:
[a] HMF onsite emissions include emissions from locomotives and diesel trucks associated with MOWF activities.
[b] The total includes the indirect and direct emissions.

The values in the table represent the emission changes based on the range of HST ticket price of 50% to 83% of airfare.

Acronyms:
CO carbon monoxide
HMF heavy maintenance facility
HST high-speed train
MOWF maintenance-of-way facility
N/A not applicable
NO_x nitrogen oxide
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
SO_2 sulfur dioxide
VMT vehicle miles traveled
VOC volatile organic compound

7.4 Microscale CO Analysis

A CO hot-spot analysis was performed for intersections that could potentially cause a localized CO hot spot and for 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

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

intersections along the alignment; instead, the analysis focused on locations near the HST stations and HMF and on locations that would experience a change in roadway structure or traffic conditions. Additionally, an intersection in Corcoran was analyzed due to comments received on the Revised DEIR/Supplemental DEIS.

CO concentrations were modeled at three intersections near the proposed Fresno, Kings/Tulare Regional, and Bakersfield stations and at two intersections near the proposed Fresno Works–Fresno and proposed Kern Council of Governments–Wasco HMF sites. CO concentrations were also modeled at a degraded intersection in Corcoran. Figures 7.4-1, 7.4-2, 7.4-3, 7.4-4, 7.4-5, and 7.4-6 show the locations of the intersections evaluated for CO hot spots near the Fresno Station and the Fresno Works–Fresno HMF site, the Kings/Tulare Regional Station (East and West Alternatives), the Corcoran area, the Kern Council of Governments–Wasco HMF site, and the Bakersfield Station, respectively.

Intersections modeled near the Fresno Station and the Bakersfield Station are signalized, as traffic volumes at the unsignalized intersections in the study area are less than those at signalized intersections. The intersections around the Kings/Tulare Regional Station, the Corcoran area, and the Fresno Works–Fresno and the Kern Council of Governments–Wasco HMF sites are unsignalized, because these areas did not have signalized intersections affected by the project. Table 7.4-1 summarizes the modeled CO concentrations at the intersections around the proposed Fresno, Kings/Tulare Regional, and Bakersfield stations and around the proposed Fresno Works–Fresno and proposed Kern Council of Governments–Wasco HMF sites, as well as the Corcoran analysis area.

The results presented in Table 7.4-1 include the HST alternatives as well as the natural growth and other transportation improvement projects in the region, as described in the *Fresno to Bakersfield Section: Transportation Analysis Technical Report* (Authority and FRA 2012b). 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 would 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, without accounting for natural growth and other transportation improvement projects in the region (i.e., existing conditions plus project) relative to existing conditions. The details of the CO hot-spot analysis that compares the HST alternatives with existing conditions are included in Appendices C and E.

The final traffic analysis resulted in changes to the number of trips associated with stations. This resulted in changes to the estimated peak hour volumes, delay times, and LOS at some intersections. These changes were evaluated by remodeling CO concentrations at the intersection that previously had the highest modeled CO concentrations, Oak Street/Truxtun Avenue in Bakersfield, which had concentrations 2 times below the thresholds. The remodeled Oak Street/Truxtun Avenue results are still 2 times below the threshold, which demonstrates that the changes in the traffic analysis and the updated EMFAC2011 emission factors would result in CO concentrations that would remain below the CAAQS and NAAQS for all intersections.. Therefore, intersections shown in Table 7.4-1 do not reflect revised traffic analysis values or updated EMFAC2011 emission factors, with the exception of the remodeled Oak Street/Truxtun Avenue intersection in Bakersfield.

Furthermore, many air districts in California have developed screening thresholds for CO hot spots based on air dispersion modeling with recent emission factors which have significantly decreased in the past three decades due to vehicle emission standards. For example, BAAQMD developed a screening threshold of 44,000 vehicles per hour unless intersections would have vertical and/or horizontal mixing substantially limited (e.g., tunnel, parking garage, bridge underpass, natural or urban street canyon, below-grade roadway) in which case a threshold of 24,000 vehicles per hour is used (BAAQMD 2010). Similarly, the Sacramento Metropolitan AQMD screening threshold is 31,600 vehicles per hour for intersections that do not have limited vertical and/or horizontal mixing (SMAQMD 2013). This is several times higher than the vehicles per hour for the worst intersections analyzed.

7.4.1.1 Existing Condition Plus Project vs. Existing Condition

In addition to the analysis for the Project versus No Project, a comparison was performed among the HST alternatives, without accounting for natural growth and other transportation improvement projects in the region (i.e., existing condition plus project) relative to existing conditions. According to this analysis, the project would not cause violations of CO NAAQS at affected intersections. Details of the CO hot-spot analysis of the HST alternatives compared to existing conditions are included in Appendix C.

Table 7-4-1 summarizes the modeled CO concentrations for the selected intersections for the existing conditions and existing plus project conditions. The CO hot-spot analysis results presented in the table include the modeled concentrations plus the background concentrations. The background CO concentrations are from monitored data representing existing conditions (2007-2009). As shown in Table 7.4-1, the intersections evaluated would have CO concentrations lower than the NAAQS and the CAAQS for both the existing conditions and the existing conditions plus project. Therefore, the localized CO emissions from the existing conditions plus project would not be expected to cause a violation of ambient air standards.

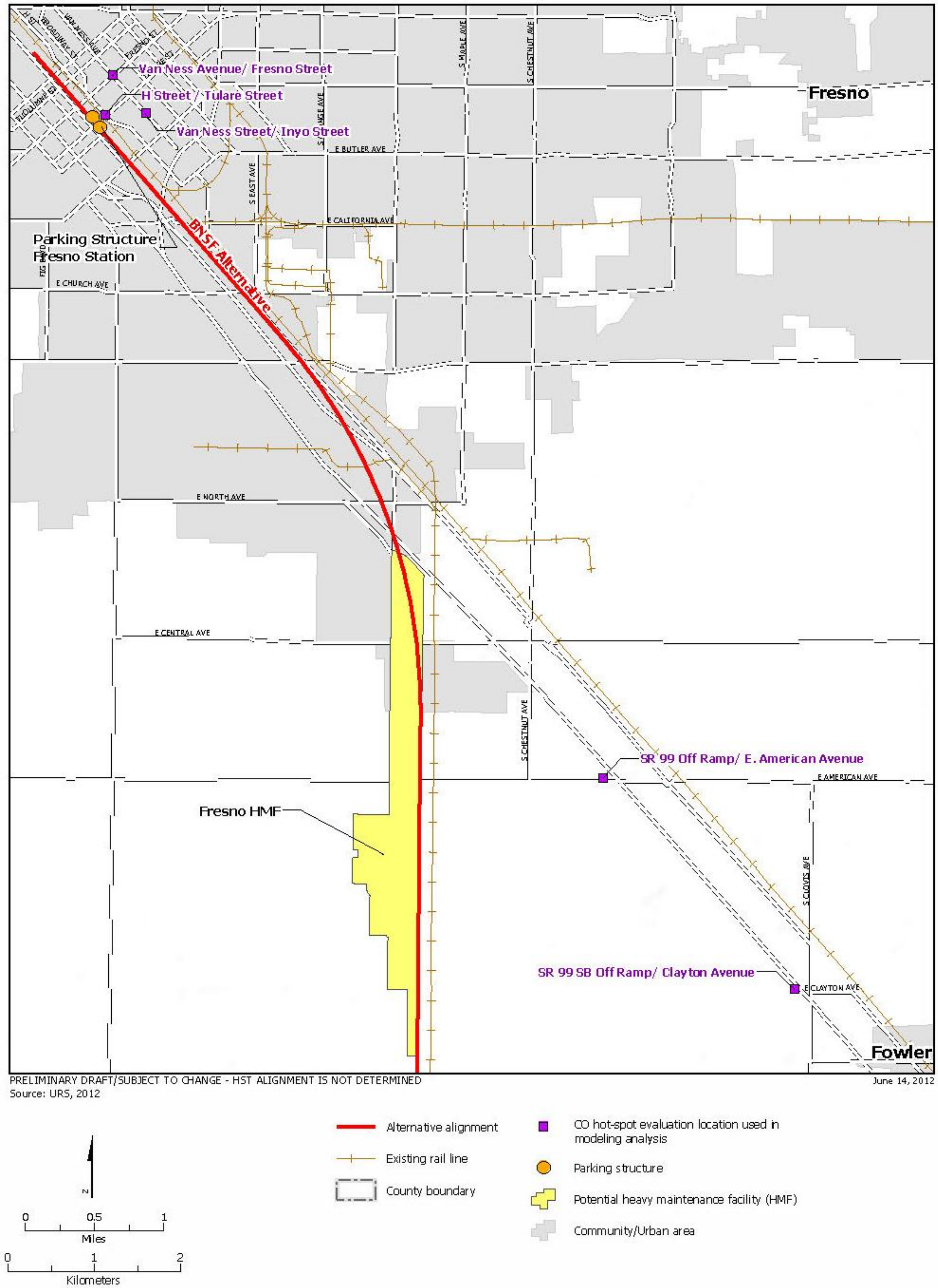


Figure 7.4-1
Intersections evaluated for CO hot spots: Fresno Station and Fresno Works–Fresno HMF site

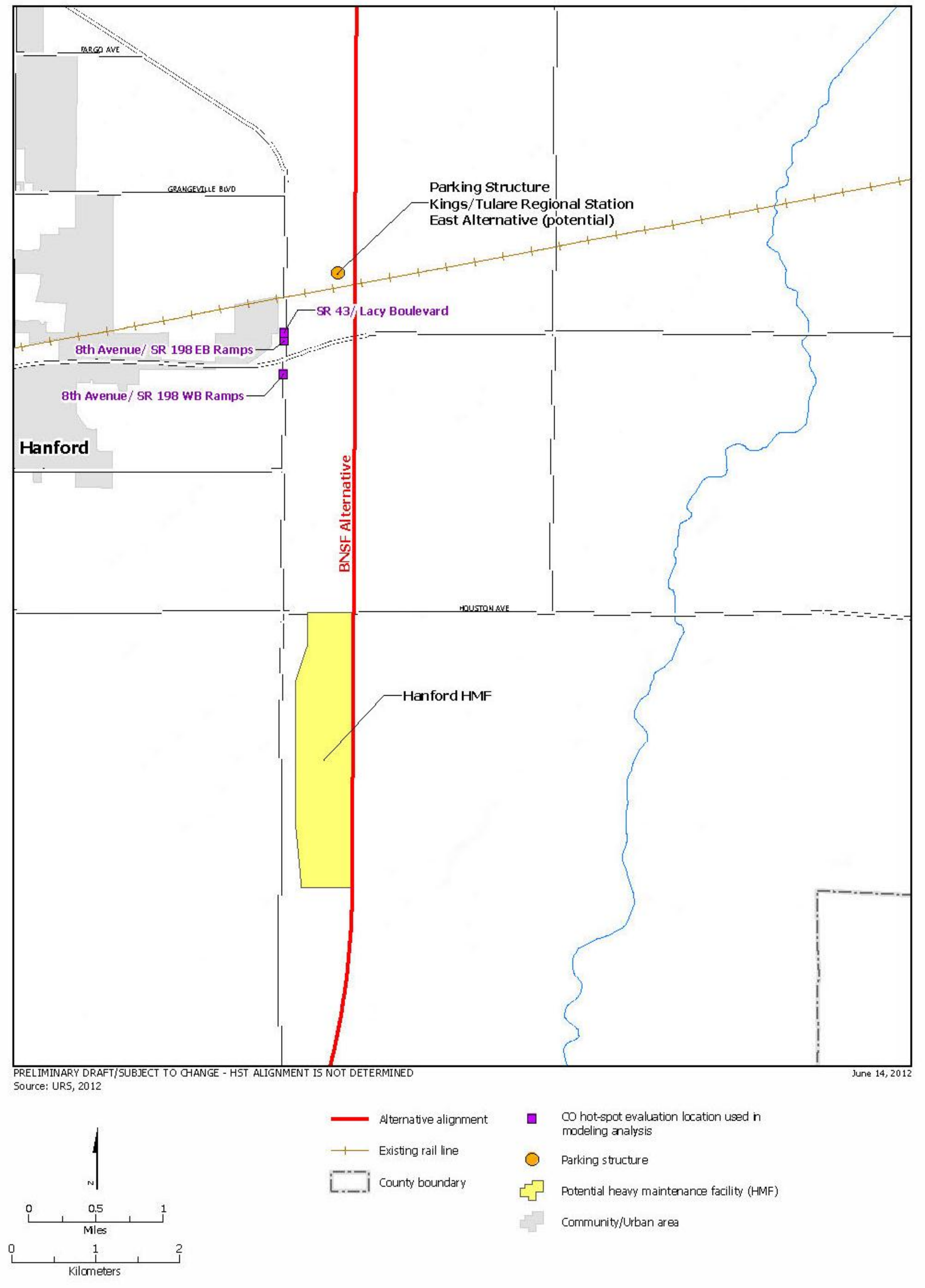


Figure 7.4-2
Intersections evaluated for CO hot spots: Kings/Tulare Regional Station (East alternative)

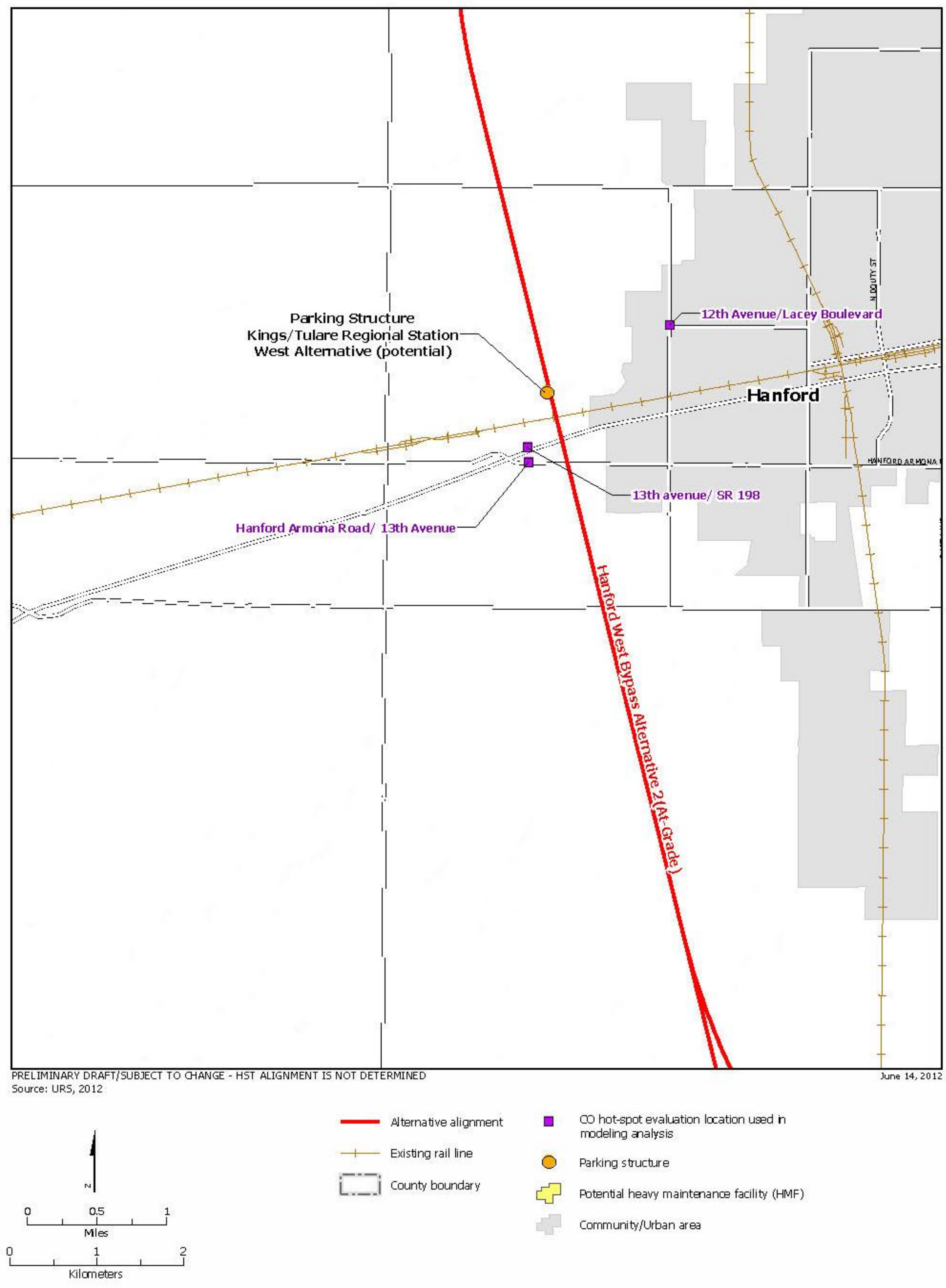


Figure 7.4-3
Intersections evaluated for CO hot spots: Kings/Tulare Regional Station (West alternative)

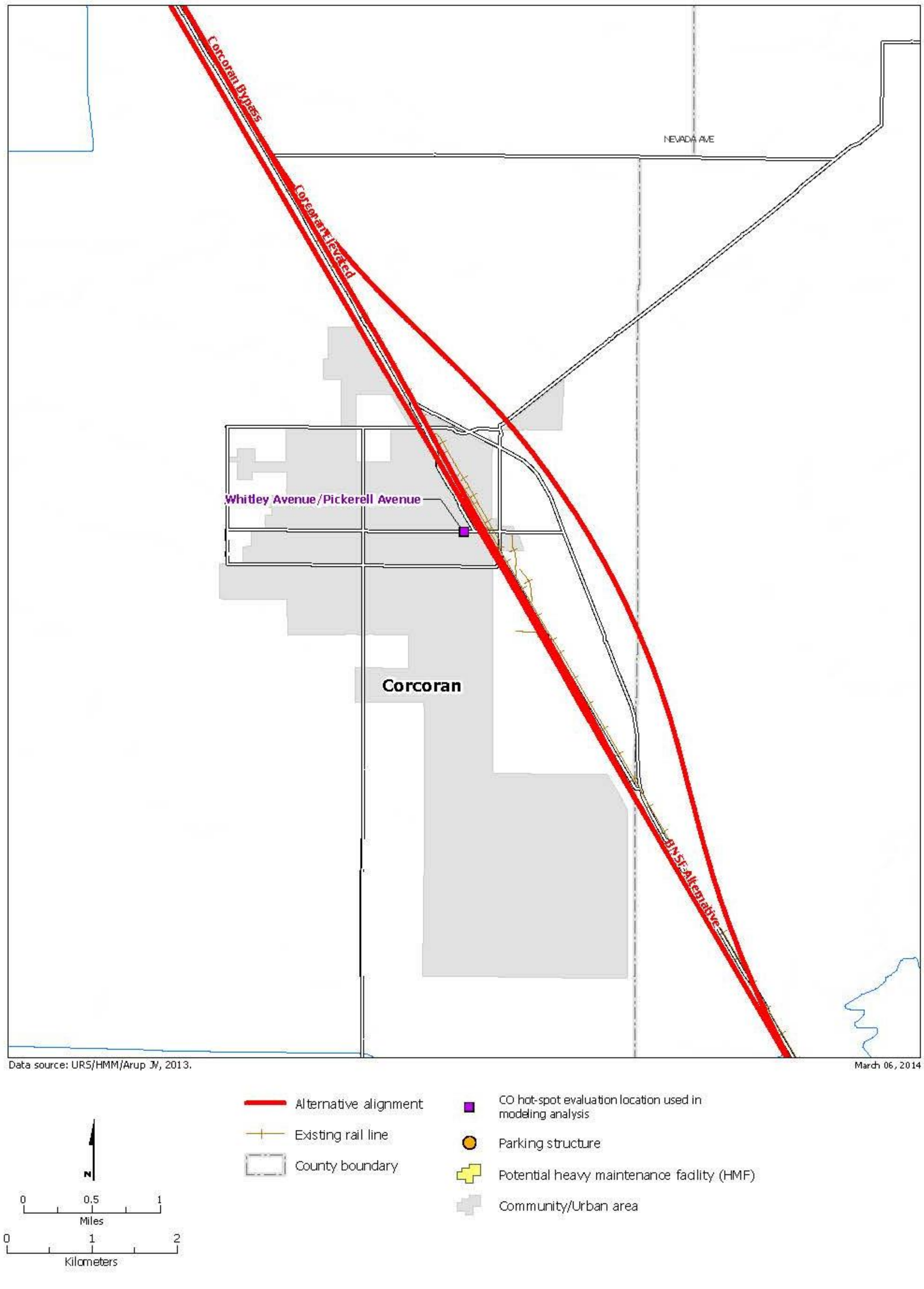


Figure 7.4-4
Intersections evaluated for CO hot spots: Corcoran

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

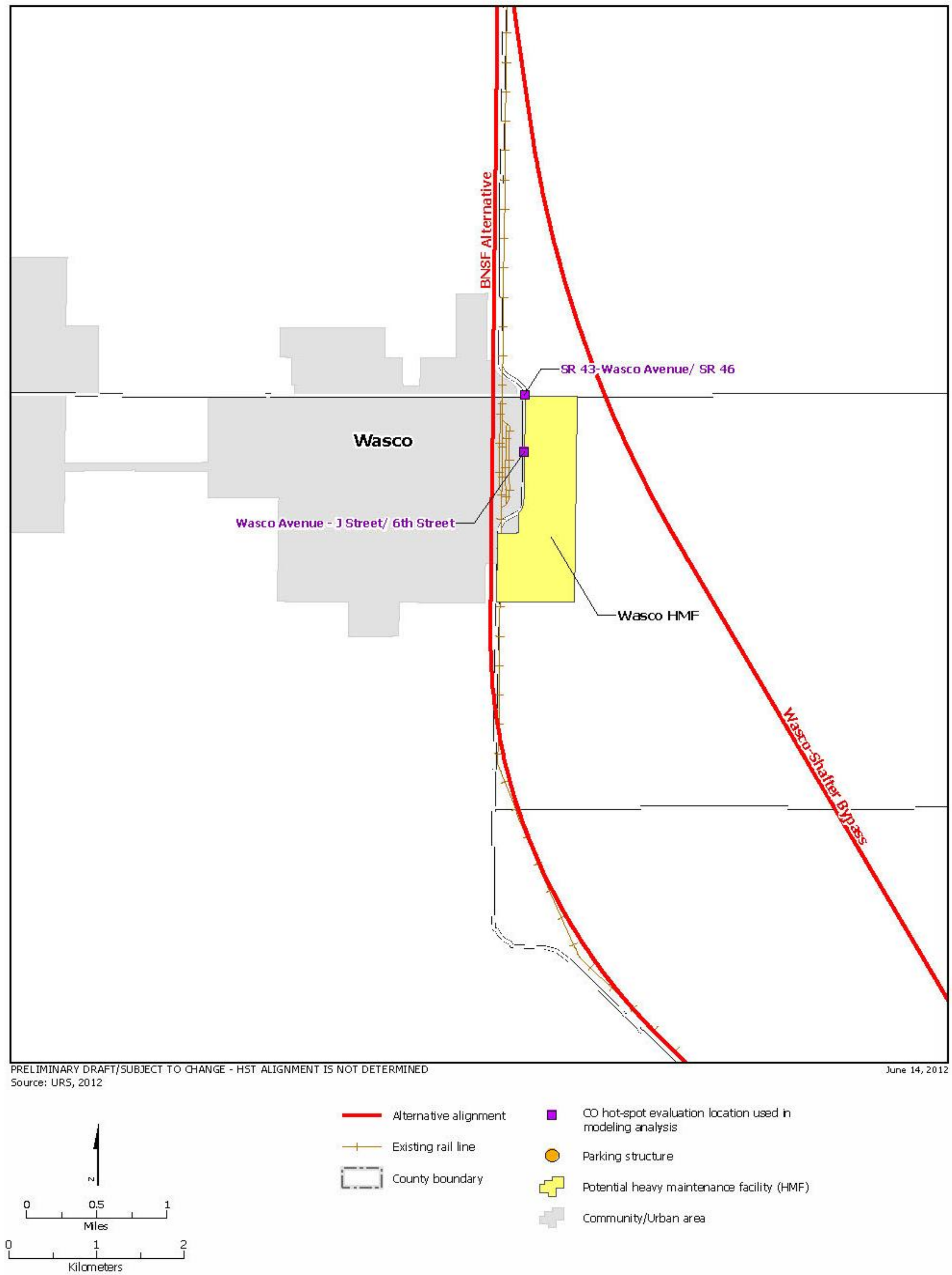


Figure 7.4-5
Intersections evaluated for CO hot spots: Kern Council of Governments-Wasco HMF Site

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

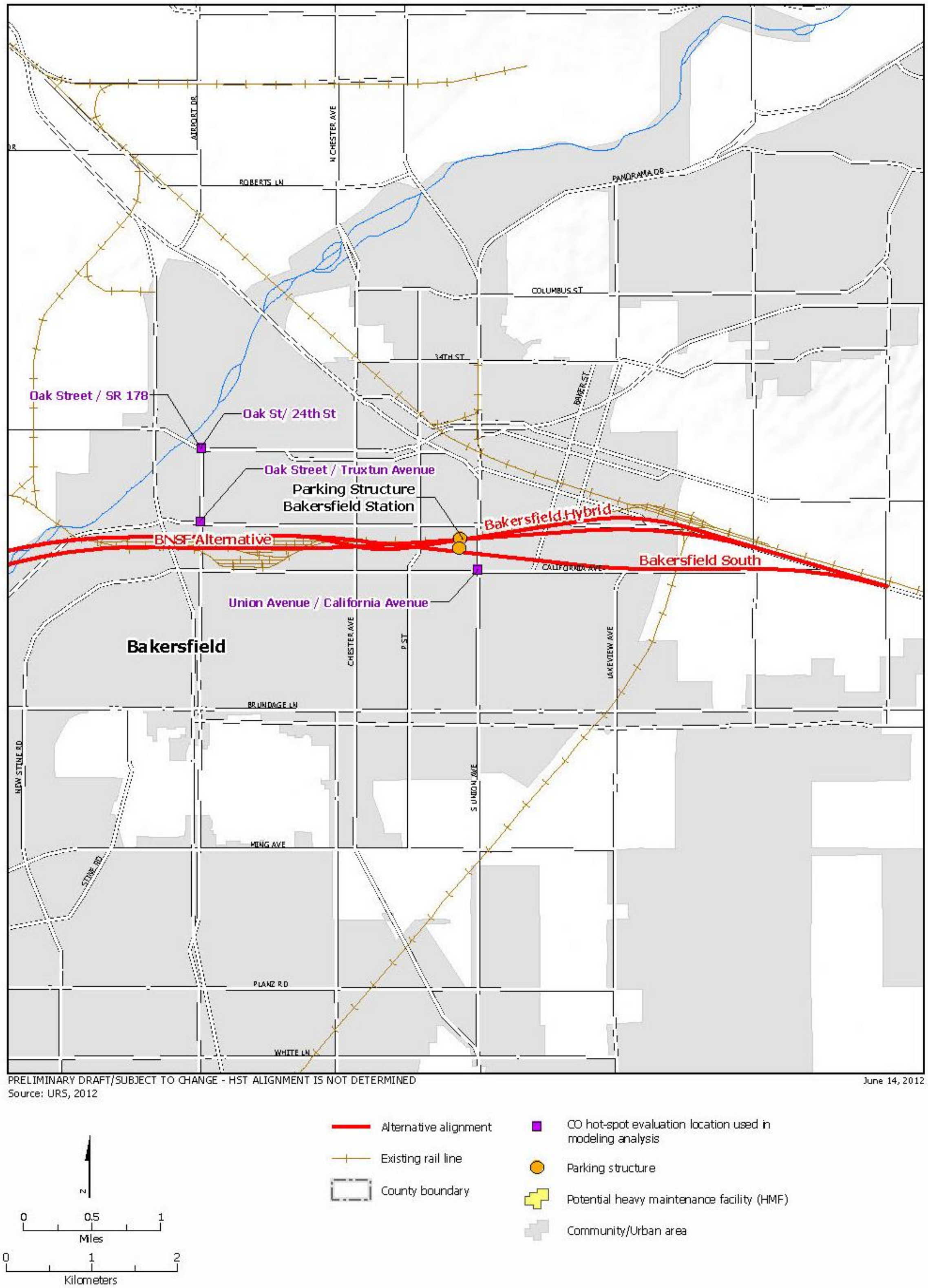


Figure 7.4-6
Intersections evaluated for CO hot spots Bakersfield Station

Table 7.4-1
Maximum Modeled CO Concentrations at Intersections near the Fresno, Kings/Tulare Regional, Bakersfield HST Stations and HMF Sites

Intersection	Existing Conditions[a]		Existing Plus Project[a]		2035 No Project/No Action[a]		2035 Project[a]	
	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[e]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[e]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[e]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[e]
Fresno HST Station Area[a]								
Van Ness St / Inyo St	3.5	2.6	3.5	2.6	3.3	2.5	3.3	2.5
H St / Tulare St	3.5	2.6	3.6	2.7	3.4	2.6	3.4	2.6
Van Ness Ave/ Fresno St	3.7	2.8	3.8	2.8	3.4	2.6	3.5	2.6
Tulare St / F St	3.2	2.4	3.2	2.4	3.2	2.4	3.2	2.4
Fresno St / F St	3.4	2.6	3.5	2.6	3.1	2.3	3.2	2.4
Kings/Tulare Regional HST Station Area (East and West Alternatives)[b]								
8th Ave / SR 99 WB Ramps	3.7	2.3	3.7	2.3	3.5	2.1	3.5	2.1
8th Ave / SR 198 EB Ramps	3.7	2.3	3.7	2.3	3.5	2.1	3.5	2.1
SR 43 / Lacey Blvd	3.8	2.4	3.8	2.4	3.5	2.1	3.5	2.1
12th Ave / Lacey Blvd	4.3	3.2	4.3	3.2	3.5	2.6	3.5	2.6
N 11th Ave / SR 198 EB Off-ramp / E 3rd St	4.1	3.0	4.1	3.0	3.4	2.6	3.4	2.6
S 10th Ave / E 3rd St	3.7	2.8	3.7	2.8	3.4	2.6	3.4	2.6

Table 7.4-1
Maximum Modeled CO Concentrations at Intersections near the Fresno, Kings/Tulare Regional, Bakersfield HST Stations and HMF Sites

Intersection	Existing Conditions[a]		Existing Plus Project[a]		2035 No Project/No Action[a]		2035 Project[a]	
	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[e]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[e]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[e]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[e]
Bakersfield HST Station Area[c]								
Union Ave / California Ave	4.2	3.1	4.2	3.1	3.3	2.5	3.3	2.5
Oak St / Truxtun Ave	5.1	3.7	5.1	3.7	3.5	2.6	3.5	2.6
Oak St / Truxtun Ave (with revised traffic data and EMFAC2011 emission factors)	6.2	4.5	6.2	4.5	3.8	2.8	3.8	2.8
Oak St / SR 178	4.8	3.5	4.8	3.5	3.5	2.6	3.5	2.6
Oak St/ 24th St	4.8	3.5	4.8	3.5	3.6	2.7	3.7	2.8
Fresno–Fresno Works HMF Area								
SR 99 Off-ramp / E American Ave	3.6	2.21	3.7	2.28	3.5	2.14	3.5	2.14
SR 99 SB Off-ramp / Clayton Ave	3.5	2.14	3.6	2.21	3.5	2.14	3.5	2.14
Kern Council of Governments–Wasco HMF Area								
SR 43–Wasco Ave / SR 46	2.9	2.20	2.9	2.20	2.8	2.13	2.8	2.13
Wasco Ave	2.8	2.13	2.8	2.13	2.8	2.13	2.8	2.13

Table 7.4-1
Maximum Modeled CO Concentrations at Intersections near the Fresno, Kings/Tulare Regional, Bakersfield HST Stations and HMF Sites

Intersection	Existing Conditions[a]		Existing Plus Project[a]		2035 No Project/No Action[a]		2035 Project[a]	
	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[e]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[e]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[e]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[e]
J St / 6th St								
Corcoran Area[d]								
Whitley Ave / Pickerell Ave	3.6	2.21	3.70	2.28	3.6	2.21	3.6	2.21
CAAQS	20	9	20	9	20	9	20	9
NAAQS	35	9	35	9	35	9	35	9

Notes:
[a] Concentrations include a predicted 1-hour background concentration of 3.1 ppm and an 8-hour background concentration of 2.34 ppm, representing the second-highest measured CO concentrations in years 2007–2009 for Fresno HST station.
[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 for Kings/Tulare HST station using Fresno-Drummond Station since there is no station in Hanford area.
[c] Concentrations include a predicted 1-hour background concentration of 2.8 ppm and an 8-hour background concentration of 2.13 ppm, representing the second-highest measured CO concentrations in years 2007–2009 for Bakersfield HST station.
[d] 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 for Corcoran using the Fresno-Drummond Station since there is no station in Corcoran.
[e] 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).

Acronyms:
CAAQS California Ambient Air Quality Standards
CO carbon monoxide
EB eastbound
HMF heavy maintenance facility
HST high-speed train
Max maximum
NAAQS National Ambient Air Quality Standards
ppm part(s) per million
SB southbound
SJVAB San Joaquin Valley Air Basin
SR state route
WB westbound

7.4.2 Parking Structures

Maximum 1-hour and 8-hour CO concentrations were estimated near the Fresno, Kings/Tulare Regional, and Bakersfield HST station parking structures using CALINE4 (Caltrans 1997). Emissions were estimated using 2035 vehicle counts and emission factors. As described previously in section 7.4.1, the final traffic report resulted in changes to the number of trips associated with stations, and updated emission factors from EMFAC2011 are available. As shown in section 7.4.1, these changes were evaluated by remodeling CO concentrations at the worst case intersection, Oak Street/Truxtun Avenue in Bakersfield. This remodeled intersection indicates that the changes in the traffic analysis and emission factors would result in CO concentrations that would remain below the CAAQS and NAAQS. The parking structure analysis from the Revised DEIR/Supplemental DEIS showed that modeled CO concentrations near HST station parking structures were all lower than the Oak Street/Truxtun Avenue intersection. On this basis, the CO concentrations near HST station parking structures are not anticipated to substantially change, and following CO analysis has not been revised with the final traffic report or EMFAC2011 emission factors.

7.4.2.1 Fresno Station Parking Structure

There are two station locations that are being considered for the Fresno HST station: the Fresno Station–Mariposa Alternative and the Fresno Station–Kern Alternative. The Fresno Station–Mariposa Alternative parking area would consist of up to three parking structures, each with five levels: the first parking structure would have a capacity of approximately 1,300 cars, the second parking structure would have a capacity of approximately 1,700 cars, and the third parking structure would have a capacity of approximately 1,100 cars. Surface parking lots would provide approximately 800 additional parking spaces. The Fresno Station–Kern Alternative parking area would also consist of up to three parking structures. Two of the three potential parking structures would each would have a capacity of approximately 1,500 cars. The third structure would have a capacity of approximately 1,100 cars. Surface parking lots would provide approximately 600 additional 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 7.4-2 presents the maximum CO concentrations associated with traffic leaving the 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.

7.4.2.2 Kings/Tulare Regional Station Parking Structure

The potential Kings/Tulare Regional Station would support a surface parking lot with approximately 1,600 spaces. The methodology used for the Kings/Tulare Regional HST station parking structures was the same as the methodology used for the Fresno HST station parking structures. Table 7.4-2 presents the maximum CO concentrations associated with traffic leaving the Kings/Tulare Regional Station parking structure. The parking structure's 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 Kings/Tulare Regional Station associated with the HST alternatives would not contribute to a violation of the CO standards.

7.4.2.3 Bakersfield Station Parking Structure

Two station locations are being considered for the Bakersfield Station: the Bakersfield Station–North Alternative and the Bakersfield Station–South Alternative. The Bakersfield Station–North

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

Alternative would consist of two parking structures: one with a planned capacity of approximately 1,500 cars and the other with a capacity of approximately 3,000 cars. The Bakersfield Station–South Alternative would support one six-level parking structure with a capacity of approximately 4,500 cars. The methodology used for the Bakersfield Station parking structures was the same as that used for the Fresno Station parking structures. Table 7.4-2 presents the maximum CO concentrations associated with traffic leaving the Bakersfield Station parking structures. The CO hot-spot analysis for the parking structures 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 Bakersfield Station associated with the HST alternatives would not contribute to a violation of the CO standards.

Table 7.4-2
Maximum Modeled 2035 CO Concentrations at Fresno, Kings/Tulare Regional, and Bakersfield Station Parking Facilities

Park-and-Ride Station	1-Hour Concentration (ppm)		8-Hour Concentration (ppm)	
	Maximum Modeled Increase[a]	Total Concentration[b]	Maximum Modeled Increase[a]	Total Concentration[b]
Fresno Station–Mariposa Alternative[c]	0.5	3.6	0.35	2.69
Fresno Station–Kern Alternative[c]	0.6	3.7	0.42	2.76
Kings/Tulare Regional Station[d]	0.2	3.7	0.14	2.28
Bakersfield Station–North Alternative[e]	0.5	3.3	0.35	2.48
Kings/Tulare Regional Station–West (at-grade)[d]	0.2	3.3	0.14	2.48
Kings/Tulare Regional Station–West (below-grade)[d]	0.0	3.1	0.0	2.34
Bakersfield Station–South Alternative[e]	0.6	3.4	0.42	2.55
Bakersfield Station–Hybrid Alterative	0.2	3.0	0.14	2.27

Notes:
[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 modeled concentrations by a persistence factor of 0.7 and adding the 8-hour background concentration.

[c] Background CO data taken from Fresno First Street monitoring station for all Fresno Station parking structures (Fresno Station–Mariposa Alternative and Fresno Station–Kern Alternative) were found to be 3.10 ppm for 1-hour CO concentration and 2.34 ppm for 8-hour CO concentration.

[d] Background CO data taken from Fresno Drummond monitoring station for the Kings/Tulare Regional Station parking structures were found to be 3.50 ppm for 1-hour CO concentration and 2.14 ppm for 8-hour CO concentration.

[e] Background CO data taken from Bakersfield Golden State Highway monitoring station for all the Bakersfield station parking structures (Bakersfield Station–North Alternative and Bakersfield Station–South Alternative) were found to be 2.80 ppm for 1-hour CO concentration and 2.13 ppm for 8-hour CO concentration.

Acronyms:
CO carbon monoxide
ppm part(s) per million

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 7 to 10% compared to the No Project Alternative and 2% compared to existing conditions based on the ticket price of 50% to 83% airfare, which would reduce PM_{10} and $PM_{2.5}$ emissions from regional vehicle travel proportionally. For purposes of identifying and evaluating potential impacts under NEPA and CEQA, a hot-spot analysis was prepared because the project area location is designated nonattainment for $PM_{2.5}$ and maintenance for PM_{10} and the project is subject to localized PM_{10} and $PM_{2.5}$ hot-spot analysis. In December 2010, USEPA released its *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (USEPA 2010b), which was used for this analysis. Although this analysis is normally associated with the transportation conformity rule, this project is subject to the GC rule and the decision to use this analytical structure notwithstanding, additional analysis or associated activities required to comply with transportation conformity will be carried out only if discrete project elements become subject to those requirements in the future. In accordance with this guidance, if a project meets one of the following criteria, it is considered a project of air quality concern and a quantitative $PM_{10}/PM_{2.5}$ analysis is required:

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

- Projects affecting intersections that are at LOS D, E, or F with a significant number of diesel vehicles or those that will degrade to LOS D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project. Generally, the HST project would not change the existing traffic mix at signalized intersections. Although the maintenance facilities would use diesel vehicles, no signalized intersections were identified with LOS D, E, or F for these locations (Authority and FRA 2012b). In some cases, the LOS of intersections near the HST stations would change from LOS E under the No Project Alternative to LOS F under the HST alternatives. However, the traffic volume increases at the affected intersections would be primarily from passenger cars and transit buses used for transporting people to or from the stations. Passenger cars would be gasoline-powered. By 2016, transit buses in Fresno would be natural-gas fueled (Shenson 2010, personal communication). Buses in Bakersfield operated by GET (Golden Empire Transit) currently operate compressed natural gas buses (GET 2010) and would likely continue to operate these buses in the future. Therefore, the HST alternatives would not measurably increase the number of diesel vehicles at these affected intersections.

- New or expanded bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location. 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 fuel. 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 were to be 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.

- 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 are located are not identified as sites of violation or of possible violation in the USEPA-approved 2003 SIP, the USEPA-approved PM_{10} Maintenance Plan and Request for Redesignation, or the adopted 2012 $PM_{2.5}$ Plan for San Joaquin Valley (SJVAPCD 2007b, SJVAPCD 2012b).

For the reasons above, that the proposed project would not be considered a project of air quality concern, as defined by 40 C.F.R. Part 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 C.F.R. 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 Fresno Works–Fresno and Kern Council of Governments–Wasco HMF sites, the other three HMF sites 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 (FHWA 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.

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

There would be no difference in MSAT emissions among the 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 when compared to the No Project Alternative because more people would use the HSTs instead of driving. According to USEPA's MOVES2010b model, emissions of all priority MSATs, except for DPM, decrease as speed increases (USEPA 2009d). Therefore, the HST alternatives would result in further decreased MSAT emissions due to the decline in traffic congestion.

Regardless of the HST alternatives, emissions will likely be lower than present levels in 2035 as a result of USEPA's national control programs, which are projected to reduce annual MSAT emissions by 72% 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 USEPA-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 Fresno Works–Fresno and Kern Council of Governments–Wasco HMF sites are near dense populations with sensitive receptors. For the Fresno Works–Fresno HMF site, the sensitive receptors are located east, southeast, and west of the HMF, so locating the in-yard locomotive and diesel mobile equipment in the northern portion of the footprint would limit the effect of MSATs on sensitive receptors near this HMF. For the Kern Council of Governments–Wasco HMF site, the sensitive receptors are located primarily to the east of the footprint, so locating the in-yard locomotive and diesel mobile equipment in the western portion of the footprint would limit the effect of MSATs on sensitive receptors near this HMF. 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 USEPA's vehicle and fuel regulations. The HST alternatives would decrease regional MSAT emissions compared with 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 assumptions and speculation rather than by insight into the actual health impacts directly attributable to MSAT exposure associated with the proposed action.

USEPA 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. USEPA continues to assess human health effects, exposures, and risks posed by air pollutants. USEPA maintains the Integrated Risk Information System (i.e., IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (USEPA 2011c). 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 researching and analyzing 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* (FHWA 2009). 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 [HEI 2007]) or in the future as vehicle emissions substantially decrease (http://pubs.healtheffects.org/view.php?id=306 [HEI 2009]).

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 prevents 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 affect emissions rates) over that time frame inasmuch as such information is unavailable. The results produced by USEPA's MOBILE6.2 model, California USEPA's EMFAC model, and USEPA's MOVES2010b model in forecasting MSAT emissions are inconsistent. For example, indications from the development

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

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 USEPA's guideline CAL3QHC model was conducted in a National Cooperative Highway Research Program (NCHRP) study (NCHRP 2002), 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 time frames than it is for forecasting individual exposure over an entire lifetime, especially given the fact 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 (HEI 2007). As a result, no national consensus exists on the air dose-response values assumed to protect the public health and welfare for MSAT compounds, particularly for DPM. USEPA (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 USEPA, 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 from 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 the USEPA to determine a "safe" or "acceptable" level of risk from 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 from source emissions. 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 USEPA's approach to addressing risk in its two-step decision framework. Information is incomplete or unavailable to establish that even the largest highway projects would result in levels of risk greater than are deemed to be safe or acceptable.

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 and improving access for emergency response, which are better suited for quantitative analysis.

7.8 Asbestos Impacts

The counties of Fresno, Kings, Tulare, and Kern, through which the Fresno to Bakersfield 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 2009).

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 2008b). Overall, the project operation would have a net beneficial impact on GHG.

Tables 7.9-1 and 7.9-2 summarize the statewide GHG emission changes (expressed in terms of CO_2) resulting from the project under both the 50% and 83% fare scenarios. As shown, the project is predicted to have a beneficial effect on statewide GHG emissions under both future (2035) and existing (2009) conditions. The analysis estimated the emission changes from reduced on-road VMT, reduced intrastate plane travel, and increased electrical demand.

As compared with existing conditions, the HST alternatives would also reduce GHG emissions because the alternatives would reduce VMT.

Table 7.9-1
2035 Estimated Statewide GHG Emission Changes due to the HST
under the 50% to 83% Fare Scenarios

Project Element	Change in CO_2 Emissions due to HST (MMT/year)
Roadways	-2.8 to -1.9
Planes	-1.1 to -0.7
Energy (Power Plants)	1.4 to 1.0
Total	**-2.5 to -1.7**

Note: Totals may not add up exactly due to rounding.
The values in the table represent the ranges emission changes based on the range of HST ticket price of 50% to 83% of airfare.
Acronyms:
CO_2 carbon dioxide
GHG greenhouse gas
HST high-speed train
MMT million metric tons

Table 7.9-2
2009 Estimated Statewide GHG Emission Changes due to the HST
under the 50% to 83% Fare Scenarios

Project Element	Change in CO_2 Emissions due to HST (MMT/year)
Roadways	-3.2 to -2.1
Planes	-0.6 to -0.4
Energy (Power Plants)	1.4 to 1.0
Total	**-2.4 to -1.6**

Note: Totals may not add up exactly due to rounding.
The values in the table represent the ranges emission changes based on the range of HST ticket price of 50% to 83% of airfare.
Acronyms:
CO_2 carbon dioxide
GHG greenhouse gas
HST high-speed train
MMT million metric tons

7.9.1 On-Road Vehicles

The HST alternatives would reduce daily roadway VMT because travelers would use the HST rather than drive (see Tables 7.9-3 and 7.9-4). 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 EMFAC2011, using parameters set 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 these tables, the proposed project is predicted to reduce GHG emissions when compared with the No Project Alternative. This is demonstrated on both a county and statewide level. In the existing, and existing plus project scenario, it is estimated that the project will reduce daily VMT in every county and statewide. As such, it is predicted to reduce roadway GHG emissions as compared with existing conditions because travelers would choose to use the HST rather than to drive.

Table 7.9-3
2035 On-Road Vehicles GHG Emission Changes due to the HST
under the 50% and 83% Fare Scenarios

County	No Build VMT Total Traffic	Build VMT Total Traffic	Change in CO_2 Emissions with HST (MMT/year)
Fresno	27,368,000	24,364,000 to 25,366,000	-0.25 to -0.17
Kern	39,240,000	35,149,000 to 36,513,000	-0.34 to -0.23
Kings	3,137,000	2,663,000 to 2,821,000	-0.04 to -0.03
Tulare	10,112,000	9,649,000 to 9,803,000	-0.04 to -0.03
Statewide Total	1,254,604,000	1,223,331,000 to 1,233,755,000	-2.8 to -1.9

Note: Totals may not add up exactly because of rounding.

The values in the table represent the ranges emission changes based on the range of HST ticket prices of 50% to 83% of airfare.

Acronyms:
CA California
CO_2 carbon dioxide
GHG greenhouse gas
HST high-speed train
MMT million metric tons
VMT vehicle miles traveled

Table 7.9-4
2009 On-Road Vehicles GHG Emission Changes due to the HST
under the 50% and 83% Fare Scenarios

County	No Build VMT Total Traffic	Build VMT Total Traffic	Change in CO_2 Emissions with HST (MMT/year)
Fresno	22,500,000	20,030,000 to 20,850,000	-0.26 to -0.17
Kern	21,500,000	19,260,000 to 20,010,000	-0.34 to -0.23
Kings	3,650,000	3,100,000 to 3,280,000	-0.04 to -0.03
Tulare	9,900,000	9,450,000 to 9,600,000	-0.03 to -0.02
Statewide Total	888,400,000	866,260,000 to 873,640,000	-3.2 to -2.1

Note: Totals may not add up exactly because of rounding.

The values in the table represent the ranges emission changes based on the range of HST ticket prices of 50% to 83% of airfare.

Acronyms:
CA California
CO_2 carbon dioxide
GHG greenhouse gas
HST high-speed train
MMT million metric tons
VMT vehicle miles traveled

7.9.2 Airport Emissions

As shown in Tables 7.9-5 and 7.9-6, the HST is predicted to reduce the number of plane flights because travelers would use the HST rather than fly to their destination. Therefore, the proposed project would either have no measurable effect or may reduce regional emissions due to the HST compared with the No Project Alternative. Plane emissions were calculated by using the fuel consumption factors and emission factors from CARB's 2000-2009 *Greenhouse Gas Emissions Inventory Technical Support Document* and the accompanying appendix. The emission factor includes both landing-take-off (LTO) and cruise operations. 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 because of the HST was estimated in the travel-demand modeling analysis conducted for the project.

As shown in Tables 7.9-5 and 7.9-6, the proposed project is predicted either to have no measurable effect or to slightly reduce regional emissions due to the HST, when compared to the No Project Alternative, under both future (2035) and existing (2009) condition.

Table 7.9-5
2035 Aircraft GHG Emission Changes (in terms of CO_2) due to the HST
under the 50% and 83% Fare Scenarios

Origin	No. of Flights Removed	Change in CO_2 Emissions due to HST (MMT/year)
San Joaquin	-7 to -5	-0.02 to -0.014
Statewide Total	-387 to -259	-1.10 to -0.74

Note: Totals may not add up exactly because of rounding.
The values in the table represent the ranges emission changes based on the range of HST ticket prices of 50% to 83% of airfare.
Acronyms:
CO_2 carbon dioxide
HST high-speed train
LA Los Angeles
MMT million metric tons
No. number
SF San Francisco
SJ San Joaquin

Table 7.9-6
2009 Aircraft GHG Emission Changes (in terms of CO_2) due to the HST
under the 50% and 83% Fare Scenarios

Origin	No. of Flights Removed	Change in CO_2 Emissions due to HST (MMT/year)
San Joaquin	-4 to -3	-0.01 to -0.01
Statewide Total	-224 to -150	-0.64 to -0.43

Note: Totals may not add up exactly because of rounding.
The values in the table represent the ranges emission changes based on the range of HST ticket prices of 50% to 83% of airfare.
Acronyms:
CO_2 carbon dioxide
HST high-speed train
LA Los Angeles
MMT million metric tons
No. number
SF San Francisco
SJ San Joaquin

7.9.3 Power Plant Emissions

The HST would increase electrical requirements when compared to the No Project Alternative. The electrical demands from propulsion of the trains and the operation of the trains at terminal stations and in storage depots and maintenance facilities were conservatively estimated to be 13.17 GWh per day statewide under the 50% fare scenario and 8.78 GWh per day statewide under the 83% fare scenario in both 2035 and 2009. As shown in Table 7.9-7, the project's electrical requirements would increase statewide and regional indirect GHG emissions.

To derive the portion of electricity usage required by the Fresno to Bakersfield Section of the HST, the alignment distance for the BNSF Alternative was divided by the total HST distance of 830 miles. The result was multiplied by the calculated CO_2 emissions for the entire HST.

The state's electrical grid would power the HST System and therefore no single generation source for the electrical power requirements can be identified. 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.

Table 7.9-7
2035 Power Plant Emission Changes due to the HST
under the 50% and 83% Fare Scenarios

Electricity required (GWh per day)	Change in CO_2 Emissions due to HST (MMT/year)
13.17 to 8.78 (Statewide)	1.4 to 1.0
1.84 to 1.22 (Regional)	0.20 to 0.13

The values in the table represent the emission changes based on the range of HST ticket price for 50% to 83% of airfare.

Acronyms:
CO_2 carbon dioxide
GWh gigawatt-hour(s)
HST high-speed train
MMT million metric tons

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 and from offsite mobile sources used for employee commutes and vendor trips to maintenance facilities and the HST stations. No direct GHG emissions would result from the 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 7.9-8 shows a summary of the GHG emissions from HST stations and HMF operation.

Table 7.9-8
2035 HST Stations and Maintenance Facilities GHG Emissions

Emission Source	CO_2 Emissions (MMT/year)
Fresno Station	0.03
Kings/Tulare Regional Station	0.01
Bakersfield Station	0.03
Train dust wake	—
MOWF	0.002
HMF	0.02
Total	0.1

Acronyms:
CO_2 carbon dioxide
GHG greenhouse gas
HMF heavy maintenance facility
HST high-speed train
MMT million metric tons
MOWF maintenance-of-way facility

7.9.5 Regional GHG Emission from Project Operation

A summary of the project's effects on 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 Tables 7.9-9 and 7.9-10. As shown, the proposed project would reduce regional GHG emissions compared with the No Project Alternative.

Table 7.9-9
2035 HST Alternative Regional GHG Emissions
under the 50% and 83% Fare Scenarios

Emission Sources	CO_2 Emissions (MMT/year)
Regional VMT	-0.67 to -0.45
Regional Airports (Fresno-Yosemite International, Hanford Municipal Airport, Visalia Municipal Airport, and Meadow Fields Airport)	-0.02 to -0.014
Indirect Regional Power	0.196 to 0.133
HST, MOWF, and HMF Station Operation	0.098
Net Regional Difference	-0.40 to -0.23

Note: Emission factors for CO_2 do not account for improvements in technology.
The values in the table represent the emission changes based on the range of HST ticket price of 50% to 83% of airfare.

Acronyms:
CO_2 carbon dioxide
GHG greenhouse gas
HMF heavy maintenance facility
HST high-speed train
MMT million metric tons
MOWF maintenance-of-way facility
VMT vehicle miles traveled

Table 7.9-10
2009 HST Alternative Regional GHG Emissions
under the 50% and 83% Fare Scenarios

Emission Sources	CO_2 Emissions (MMT/year)
Regional VMT	-0.68 to -0.45
Regional Airports (Fresno-Yosemite International, Hanford Municipal Airport, Visalia Municipal Airport, and Meadow Fields Airport)	-0.01 to -0.01
Indirect Regional Power	0.196 to 0.133
HST, MOWF, and HMF Station Operation	0.098
Net Regional Difference	-0.40 to -0.23

Note: Emission factors for CO_2 do not account for improvements in technology.
The values in the table represent the emission changes based on the range of HST ticket price of 50% to 83% of airfare.

Acronyms:
CO_2 carbon dioxide
GHG greenhouse gas
HMF heavy maintenance facility
HST high-speed train
MMT million metric tons
MOWF maintenance-of-way facility
VMT vehicle miles traveled

7.10 Construction Impacts

7.10.1 Summary

7.10.1.1 Construction Emissions

Construction activities associated with the HST alternatives would result in criteria pollutant and GHG emissions. Construction emissions for the BNSF Alternative are quantified and analyzed in this section. The length of the alignment for alternatives that deviate from the BNSF Alternative is comparable to the length of the equivalent section of the BNSF Alternative. Therefore, construction emissions from construction of the BNSF Alternative are expected to be similar to the construction emissions of the other alternatives. 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 summarized according to 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.

No future natural growth or other non-HST-related improvements are 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.

The summary of the HST construction emissions for the BNSF Alternative over the entire construction period is shown in Table 7.10-1.

Table 7.10-1
HST Construction Emissions–Total (tons)

Alternative	Emissions[a]					
	VOCs	CO	NO_x	SO_2	PM_{10}[b]	$PM_{2.5}$[b]
BNSF Alternative	103	757	1,818	3	218	103

Notes:
[a] Emissions include HST construction as well as roadway projects that are not included in RTPs.
[b] The PM_{10} and $PM_{2.5}$ emissions consist of the exhaust and fugitive dust emissions.
Acronyms:
CO carbon monoxide
NO_x nitrogen oxide
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
SO_2 sulfur dioxide
VOC volatile organic compound

7.10.1.2 Construction Impacts Summary

Construction Impacts within the SJVAB

Details of emissions from the BNSF Alternative from all construction phases of the HST, the regional roadway realignment, and the HMF are presented in the following section. The lengths of the alignments for the alternatives that deviate from the BNSF Alternative are comparable to the lengths of the equivalent sections of the BNSF Alternative. Therefore, construction emissions from the construction of the BNSF Alternative are expected to be similar to the construction emissions of the other alternatives. Based on the alignment length, the number of structures demolished, and the number of road crossings, it is estimated that construction emissions from the other alternatives would differ from the BNSF alternative by less than 3%. Details are provided in Appendix A.

Details of emissions from the BNSF Alternative are presented in the following table (Table 7.10-2). Emissions presented for each alternative include emissions from all construction phases of the HST, the regional roadway realignment, and the HMF.

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

Table 7.10-2
Programmatic Construction Emissions: BNSF Alternative (tons/year)[a]

Activities	VOC	CO			NO_x	SO_2	PM_{10}[d]	$PM_{2.5}$[d]
		Total	Fresno[e]	Bakersfield[e]				
SJVAPCD annual CEQA significance thresholds[b]	10	N/A	N/A	N/A	10	N/A	15	15
Annual general conformity *de minimis* levels applicable to the SJVAB[c]	10	N/A	100	100	10	100	100	100
Year 2014								
Emissions (tons/year)	16.86	104.03	27.67	26.95	380.80	0.63	42.66	13.40
Exceeds SJVAPCD CEQA thresholds?	Yes	N/A	N/A	N/A	Yes	N/A	Yes	No
Exceeds GC threshold?	Yes	N/A	No	No	Yes	No	No	No
Year 2015								
Emissions (tons/year)	36.69	289.42	72.31	62.12	617.99	1.17	67.63	30.85
Exceeds SJVAPCD CEQA thresholds?	Yes	N/A	N/A	N/A	Yes	N/A	Yes	Yes
Exceeds GC threshold?	Yes	N/A	No	No	Yes	No	No	No
Year 2016								
Emissions (tons/year)	32.27	256.37	65.63	57.37	500.73	0.88	60.47	27.22
Exceeds SJVAPCD CEQA thresholds?	Yes	N/A	N/A	N/A	Yes	N/A	Yes	Yes
Exceeds GC threshold?	Yes	N/A	No	No	Yes	No	No	No
Year 2017								
Emissions (tons/year)	8.51	48.99	12.17	15.31	161.43	0.22	15.79	12.03
Exceeds SJVAPCD CEQA thresholds?	No	N/A	N/A	N/A	Yes	N/A	Yes	No
Exceeds GC threshold?	No	N/A	No	No	Yes	No	No	No

Table 7.10-2
Programmatic Construction Emissions: BNSF Alternative (tons/year)[a]

Activities	VOC	CO			NO_x	SO_2	PM_{10}[d]	$PM_{2.5}$[d]
		Total	Fresno[e]	Bakersfield[e]				
Year 2018								
Emissions (tons/year)	3.89	30.27	3.92	3.74	70.89	0.24	14.9	9.67
Exceeds SJVAPCD CEQA thresholds?	No	N/A	N/A	N/A	Yes	N/A	No	No
Exceeds GC threshold?	No	N/A	No	No	Yes	No	No	No
Year 2019								
Emissions (tons/year)	0.42	4.07	1.31	1.70	4.17	.01	8.63	6.94
Exceeds SJVAPCD CEQA thresholds?	No	N/A	N/A	N/A	No	N/A	No	No
Exceeds GC threshold?	No	N/A	No	No	No	No	No	No
Year 2020								
Emissions (tons/year)	0.25	2.50	1.43	1.21	1.95	0.01	2.95	0.14
Exceeds SJVAPCD CEQA thresholds?	No	N/A	N/A	N/A	No	N/A	No	No
Exceeds GC threshold?	No	N/A	No	No	No	No	No	No
Year 2021								
Emissions (tons/year)	3.87	19.56	8.85	9.26	79.74	0.12	4.33	2.49
Exceeds SJVAPCD CEQA thresholds?	No	N/A	N/A	N/A	Yes	N/A	No	No
Exceeds GC threshold?	No	N/A	No	No	Yes	No	No	No
Year 2022								
Emissions (tons/year)	0.09	1.13	0.00	0.00	0.53	0.00	0.13	0.05
Exceeds SJVAPCD CEQA thresholds?	No	N/A	N/A	N/A	No	N/A	No	No
Exceeds GC threshold?	No	N/A	No	No	No	No	No	No

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

Table 7.10-2
Programmatic Construction Emissions: BNSF Alternative (tons/year)[a]

Activities	VOC	CO			NO_x	SO_2	PM_{10}[d]	$PM_{2.5}$[d]
		Total	Fresno[e]	Bakersfield[e]				
Year 2023								
Emissions (tons/year)	0.03	0.39	0.00	0.00	0.19	0.00	0.08	0.02
Exceeds SJVAPCD CEQA thresholds?	No	N/A	N/A	N/A	No	N/A	No	No
Exceeds GC threshold?	No	N/A	No	No	No	No	No	No

Notes:
[a] These construction emissions were estimated for the BNSF Alternative, which is used as a proxy to estimate construction emissions for all other alternatives. Total construction emissions of criteria pollutants from all other alternatives are estimated to differ from the BNSF by less than 3%.

[b] The SJVAPCD has significance thresholds for NO_x, ROG/VOC, PM_{10}, and $PM_{2.5}$. The district currently does not have thresholds for CO or SO_x.

[c] The GC *de minimis* thresholds for criteria pollutants are based on the SJVAB federal attainment status. The SJVAB is considered in extreme nonattainment for the ozone NAAQS, is a nonattainment area for $PM_{2.5}$, and is a maintenance area for the CO NAAQS (Fresno and Bakersfield urbanized areas only) and PM_{10} NAAQS. Although the SJVAB is in attainment for SOx, since SOx is a precursor for $PM_{2.5}$, the $PM_{2.5}$ GC *de minimis* thresholds was used.

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

[e] The Fresno Urbanized Area and the Bakersfield Metropolitan Area are separate CO maintenance areas. CO emissions presented for these areas represent the Fresno and Bakersfield urbanized maintenance areas only.

Acronyms:
CEQA California Environmental Quality Act
CO carbon monoxide
GC general conformity
N/A not applicable
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
SJVAPCD San Joaquin Valley Air Pollution Control District
SO_2 sulfur dioxide
VOC volatile organic compound

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 ballast, sub-ballast, and concrete slabs. Sub-ballast and concrete slab would be available within the SJVAB; however, the ballast material could potentially be transported from areas outside the SJVAB. A preliminary emission evaluation was conducted for transporting ballast materials from outside the SJVAB to the border of the air basin. Five scenarios were analyzed, representing a range of combination of supply from the different quarries and different methods of hauling (either by truck to the nearest railhead and railway for the remainder of the distance, or by truck the entire distance).

Tables 7.10-3 and Table 7.10-4 present the programmatic emissions for material hauling outside the air basin for the worst-case scenarios compared with the GC *de minimis* thresholds and the CEQA thresholds, respectively.[12] Detailed analysis and emission calculations for material hauling outside the SJVAB for all scenarios are provided in Appendix G.

Table 7.10-3
Worst-Case Emissions for Scenario 1 Compared to GC *de minimis* Thresholds

Nonattainment/Maintenance Area (Air Basin)	Emissions (tons per year) Fresno to Bakersfield					
	CO	NO_x	$PM_{2.5}$	PM_{10}	SO_2	VOC
Riverside County (Salton Sea Air Basin)	8.82	35.76*	0.87	0.89	0.03	1.39
GC *de minimis* threshold[a]	100	25	N/A	70	N/A	25
San Bernardino/Los Angeles County (Mojave Desert Air Basin)	3.29	13.35	0.32	0.33	0.01	0.52
East Kern County (Mojave Desert Air Basin)	3.41	13.85	0.34	0.35	0.01	0.54
Total Mojave Desert Air Basin	6.71	27.20*	0.66	0.68	0.02	1.06
GC *de minimis* threshold[a]	100	25	N/A	100	N/A	25
Los Angeles County (South Coast)	6.21	25.18*	0.61	0.63	0.02	0.98
GC *de minimis* threshold[a]	100	10	100	100	100	10

Notes:
* Exceeds 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.

[12] Note that several changes have been made to this analysis compared to the analysis presented in the Revised DEIR/Supplemental DEIS. These revisions include updates from EMFAC2007 emission factors to EMFAC2011 emissions factors, updates to estimated material hauling volumes and material hauling schedules, and updates to attainment designations and classifications for the studied air basins. These changes are detailed in Appendix G.

Table 7.10-4
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	**NOx**	**PM2.5**	**PM10**	**SO2**	**VOC**	**CO**	**NOx**	**PM2.5**	**PM10**	**SO2**	**VOC**
San Bernardino/Los Angeles County (Mojave Desert AQMD)	3.29	13.35	0.32	0.33	0.01	0.52	63.28	256.69*	6.22	6.42	0.23	9.98
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)	15.02	60.95	1.48	1.52	0.05	2.37	288.93	1,172.03*	28.42	29.30	1.04	45.58
CEQA Annual Threshold Limits[a]	N/A	N/A	N/A	N/A	N/A	N/A	550	100	55	150	150	75

Notes:
* 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
[b] Emissions in AQMDs/APCDs that have no CEQA annual or daily construction threshold for these pollutants are not shown in this table.

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

The emissions results demonstrated that at least one scenario would result in emissions that would not exceed the GC *de minimis* thresholds in the surrounding air basins. However, the emission results demonstrated that the worst-case emissions would be above the GC threshold for NO_x in the South Coast Air Basin for four of the five scenarios analyzed, above the GC threshold for NO_x in the Salton Sea Air Basin for one of the five scenarios analyzed, and above the GC threshold for NO_x in the Mojave Desert Air Basin for one of the five scenarios analyzed. The emissions for NO_x in other air basins (Sacramento Valley Air Basin and San Francisco Bay Area Air Basin) would be below the GC thresholds for all scenarios. The emissions for all other pollutants would be below the GC thresholds for all scenarios in all air basins.

Emissions could exceed the SCAQMD CEQA thresholds for NO_x for all five scenarios and could exceed Bay Area AQMD's CEQA thresholds for two of the scenarios. Emissions could also exceed the Mojave Desert AQMD CEQA thresholds for NO_x for two of the scenarios. NO_x emissions would be offset to less-than-significant levels in South Coast AQMD, BAAQMD, and Mojave Desert AQMD through the purchase of offsets.[13]

7.10.2 Other Localized Construction Impacts

7.10.2.1 Guideway/Alignment Construction

Construction emissions have the potential to cause elevated criteria pollutant concentrations. These elevated concentrations may cause or contribute to exceedances of the NAAQS and CAAQS, which are established concentrations of criteria pollutants that provide public health protection. Sensitive receptors (such as schools, residences, and health care facilities) are located near the construction areas in Fresno, Bowles, Corcoran, Wasco, Shafter, Rosedale, Green Acres, and Bakersfield. During construction, sensitive receptors would be exposed to increased concentrations of toxic air contaminants, such as diesel particulate matter, which may present cancer risks. According to the OEHHA guidance, cancer risk is defined as the predicted risk of cancer (unitless) over a lifetime based on a long-term (70-year) continuous exposure, and is usually expressed as chances per million persons exposed (OEHHA 2012).

The construction emissions associated with the guideway/alignment construction includes several different phases such as mobilization, demolition, earth moving, land clearing, track construction at grade and elevated structures. These emissions were modeled using USEPA's AERMOD atmospheric dispersion model to predict pollutant concentrations at locations near the construction of the guideway/alignment. Meteorological data from the Fresno County Airport was used since the SJVAPCD Air Dispersion Modeling Guidance indicates that this station has the most conservative wind speeds for the air district (SJVAPCD 2007c). Since it is not practical to model the entire 114 mile HST segment, a 2-mile section of track was modeled as this was determined to be an appropriate segment length to represent a reasonable work area, and emissions from further away are unlikely to have any appreciable impact to local sensitive receptors. The increase in pollutant concentration associated with the project emissions is added to the background concentration to estimate the ambient air pollutant concentration for comparison to the applicable NAAQS and CAAQS. The modeled DPM concentrations were used to determine the exposure dose and associated health impact following OEHHA guidance for health risk assessments. Specific details of the air dispersion modeling and health risk assessment are found in Appendix H.

[13] Emissions presented in Table 4.7-10 are for the worst-case scenario only, which shows an exceedance of the SCAQMD CEQA threshold. Other scenarios (as shown in Appendix G) show potential BAAQMD and Mojave Desert AQMD CEQA exceedances. Since it is unknown which scenario will be selected, NO_x offsets were determined for all scenarios.

According to the construction localized impact air dispersion modeling conducted, construction activities along the guideway/alignment would not exceed the applicable NAAQS and CAAQS or substantially contribute to further exacerbation of exceedances of PM_{10} and $PM_{2.5}$ standards. The health risk assessment concludes that the incremental increase in cancer risk associated with the DPM emissions from construction equipment exhaust would not exceed the applicable threshold of 10 in a million.

7.10.2.2 HST Stations Construction

Station construction would take place over a period of four years, and sensitive receptors at schools, residences, and health care facilities near the station construction areas could potentially be exposed to health impacts from elevated concentrations of criteria pollutants and cancer risks associated with TACs. There are several sensitive receptors located near the station locations including residences, schools, and health care facilities. The NAAQS and CAAQS are established concentrations of criteria pollutants that provide public health protection. According to the OEHHA guidance, cancer risk is defined as the predicted risk of cancer (unitless) over a lifetime based on a long-term (70-year) continuous exposure, and is usually expressed as chances per million persons exposed (OEHHA 2012).

The construction emissions associated with HST station construction were modeled for each station location using local meteorological data sets (Fresno County Airport, Bakersfield Airport, and Hanford Airport). These emissions were modeled using USEPA's AERMOD atmospheric dispersion model to predict pollutant concentrations at locations near the construction of the stations. The modeled work area for each station was based on the approximate station footprint. The analysis used station footprints for the station alternatives associated with the BNSF Alternative (Fresno Station-Mariposa Alternative, Kings/Tulare Regional Station-East Alternative, Bakersfield Station-North Alternative). These footprints were assumed to be representative of the other station alternatives in terms of size and distance to sensitive receptors. The increase in pollutant concentration associated with the project emissions is added to the background concentration to estimate the ambient air pollutant concentration for comparison to the applicable NAAQS and CAAQS. The modeled DPM concentrations were used to determine the exposure dose and associated health impact following OEHHA guidance for health risk assessments. Specific details of the air dispersion modeling and health risk assessment are found in Appendix H.

The health risk analysis for DPM using AERMOD indicated that the incremental increase in cancer risk associated with the DPM from construction equipment exhaust would not exceed the applicable threshold of 10 in a million for sensitive receptors located near the station construction area. Similarly, the concentration increase of criteria air pollutants associated with construction of the stations would not exceed the applicable NAAQS and CAAQS or substantially contribute to further exacerbation of exceedances of PM_{10} and $PM_{2.5}$ standards.

7.10.2.3 Power Substations Construction

Three types of power substations (TPSS, SPSS, and PPSS) will be constructed along the HST guideway at various intervals. The construction of these power substations will emit criteria pollutants and diesel particulate matter, a TAC. These power substations would be constructed at various locations along the alignment, and sensitive receptors may be located near these power substation construction areas. These sensitive receptors may be exposed to health impacts from elevated concentrations of criteria pollutants and cancer risks associated with TACs.

Construction activities for the power substations would be similar to the activities involved in HST station construction, but would be more limited in duration and intensity because the power substations would require less building square footage and paved area compared to the HST stations. Construction emissions associated with the construction of each power substation would also be less than the emissions associated with HST station construction. The detailed analysis of the HST stations indicated that emissions from HST station construction would not exceed the health risk thresholds and would not cause or substantially contribute to exceedances of NAAQS or CAAQS. Based on the limited amount of construction activities and emissions associated with these power substations compared to the HST stations, construction of the power substations would not be anticipated to exceed the applicable thresholds for health risks, NAAQS, or CAAQS.

7.10.2.4 Road Crossing Construction

In order to accommodate the HST tracks and stations, several road crossings will need to be modified. The construction of these road crossings will emit criteria pollutants and diesel particulate matter, a TAC. These road crossings would be constructed at various locations along the alignment, and sensitive receptors may be located near these road crossing construction areas. These sensitive receptors may be exposed to health impacts from elevated concentrations of criteria air pollutants and cancer risks associated with TACs.

The construction emissions associated with road crossing modifications were modeled using USEPA's AERMOD atmospheric dispersion model to predict pollutant concentrations at locations near the road crossing construction areas. Meteorological data from the Fresno County Airport was used since SJVAPCD has identified this station as having worst case conditions for air dispersion modeling (SJVAPCD 2007c). Since the exact size and distribution of equipment needed for each individual road crossing is not available at this time, a generalized road crossing construction area was modeled using representative site size and emissions. The increase in pollutant concentration associated with the project emissions is added to the background concentration to estimate the ambient air pollutant concentration for comparison to the applicable NAAQS and CAAQS. The modeled DPM concentrations were used to determine the exposure dose and associated health impact following OEHHA guidance for health risk assessments. Specific details of the air dispersion modeling and health risk assessment are found in Appendix H.

The health risk analysis for DPM using AERMOD indicated that the incremental increase in cancer risk associated with the DPM from construction equipment exhaust would not exceed the applicable threshold of 10 in a million. Similarly, the concentration increase of criteria air pollutants associated with construction of the road crossings would not exceed the applicable NAAQS and CAAQS or substantially contribute to further exacerbation of exceedances of PM_{10} and $PM_{2.5}$ standards.

7.10.2.5 Concrete Batch Plant

Emissions generated from operation of concrete batch plants, which would produce concrete for the elevated structures (elevated rail) and retaining wall (retained-fill rail), are included in the total regional construction emissions for each alternative. These plants would be located along the alignment. To mitigate localized impacts from the plants, Mitigation Measure AQ-MM#3 would be implemented. This would require the plants to be at least 1,000 feet from sensitive receptors, such as schools and hospitals. The air dispersion modeling and health risk assessment of the fugitive dust emissions and their associated TAC constituents concludes that the cancer risks as well as the chronic and acute non-cancer health impacts would be less than the applicable thresholds of 10 in a million and a hazard index of less than 1, respectively. After mitigation, emissions would not substantially contribute to further exacerbation of exceedances of PM_{10} and $PM_{2.5}$ standards.

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

7.10.2.6 Maintenance-of-Way Facility and Heavy Maintenance Facility

Activities associated with construction of the MOWF include mass site grading, asphalt paving, building construction, and architectural coating as well as construction of the MOWF guideway. Construction of the MOWF is expected to begin in May 2017 and be completed by the end of 2018.

Emissions generated from construction of a heavy maintenance facility (HMF) are included in the total regional construction emissions for each alternative. 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.

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 114 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.

Impacts of construction of the HMF would be localized; therefore, potential exposure to DPM was evaluated for areas adjacent to the construction site. 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 20 months, and this short period of exposure is not expected to increase the cancer risk or noncancer chronic health risks to sensitive receptors. This is confirmed by the localized air dispersion analysis and health risk assessment described in Appendix H. The incremental increase in cancer risk associated with the DPM from construction equipment would be less than the applicable threshold of 10 in a million. The concentration increase of criteria air pollutants associated with construction of the HMF/MOWF would also be below the applicable thresholds.

7.10.3 Asbestos and Lead-based Paint

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

The counties of Fresno, Kings, Tulare, and Kern, through which the Fresno to Bakersfield 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 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.

Buildings in the study area might be contaminated with residual lead, which was used as a pigment and drying agent in oil-based paint until the Lead-Based Paint Poisoning Prevention Act of 1971 prohibited such use. If encountered during structure demolitions and relocations, lead-based paint and asbestos will be handled and disposed of in accordance with applicable standards. Section 3.10, Hazardous Materials and Wastes, discusses potential issues concerning lead-based paint during project construction.

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

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 7.10-5, because GHG emissions from the construction phase of the BNSF Alternative would be greater than the 25,000 metric tons of CO_2e threshold, these GHG emissions were quantified (CEQ 2010). The total GHG construction emissions of the HST project would be less than 0.05% of the total annual statewide GHG emissions.[14]

Table 7.10-5 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, personal communication). The amortized GHG construction emissions for the BNSF Alternative would be less than 9,200 metric tons CO_2e per year, as shown in Table 7.10-5. The increase in GHG emission generated during construction would be offset by the net GHG reductions in operation (because of car and plane trips removed in the Fresno-to-Bakersfield area) in less than 12 months for the BNSF Alternative[15].

Table 7.10-5
HST Alternative CO_2e Construction Emissions (metric tons/year) [a, b]

Year	BNSF Alternative
2014	51,661
2015	75,421
2016	51,561
2017	16,782
2018	18,509
2019	498
2020	271
2021	10,876

[14] A GHG emissions 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 that the annual CO_2e emissions in California are about 484 million metric tons (CARB 2007).

[15] The GHG emissions from construction will be partially paid back prior to operation since the VERA program will also have the co-benefit of reducing some GHG emissions, although this is not formally part of the VERA. The Authority will track these reductions, which will be included in both the GHG report to the legislature and the Sustainability Plan. This will result in some of the construction GHG emissions being paid back closer in time to their occurrence. Lastly, the Authority is developing a multi-faceted urban forestry program that would directly offset construction GHG emissions in the Fresno to Bakersfield section, further reducing GHG impacts.

Table 7.10-5
HST Alternative CO_2e Construction Emissions (metric tons/year) [a, b]

Year	BNSF Alternative
2022	111
2023	38
Total	225,728
Amortized GHG Emissions (averaged over 25 years)	
CO_2e per year	9,029
Payback of GHG Emissions (months)[c]	
Payback period (Project vs. No Project)	7 to 12
Payback period (Project vs. Existing Condition)	7 to 12

Source: USEPA 2011d.

Notes:
Emission factors for CO_2 do not account for improvements in technology.

[a] Project life assumed to be 25 years.

[b] According to the USEPA, emissions of CH_4 and N_2O from passenger vehicles are much lower than emissions of CO_2, which contribute in the range of 5 to 6% of the CO_2e emissions. In addition, the URBEMIS 2007 model does not estimate CH_4 and N_2O emissions. Therefore, to account for the CH_4 and N_2O emissions, the CO_2 emissions were conservatively increased by 5% to calculate the CO_2e emissions. This approach for passenger vehicles was assumed to be applicable to all emission sources evaluated.

[c] Payback periods were estimated by dividing the GHG emissions during construction years by the annual GHG emission reduction during project operation. See Tables 3.3-17 and 3.3-18 for operational GHG emission-reduction data. The data range represents the emission changes based on the range of HST ticket price of 50 to 83% of airfare.

Acronyms:
CO_2 carbon dioxide
CO_2e carbon dioxide equivalent
GHG greenhouse gas
HST high-speed train

7.10.4.2 Material Hauling Outside the SJVAB

The GHG emissions associated with material hauling outside the SJVAB would be short term. As shown in Table 7.10-6, total GHG emissions from the various material-hauling scenarios would be less than 43,000 metric tons of CO_2e. The total GHG construction emissions for the HST project would be less than 0.05% of the annual statewide GHG emissions.[16] The detailed analysis and the emissions rates for the other scenarios are provided in Appendix G.

Table 7.10-6
GHG Emissions from Material Hauling outside SJVAB

Scenarios	CO_2 (metric tons/year)	CO_2e (metric tons/year)[a]
Scenario 1	7,565	7,943
Scenario 2	5,612	5,893
Scenario 3	4,577	4,806
Scenario 4	7,927	8,323
Scenario 5	9,609	10,090

Notes:
[a] According to the USEPA, 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_2e emissions (USEPA 2011d). 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_2e emissions. It was assumed that this approach for passenger vehicles was applicable to these other mobile emissions sources.

Acronyms:
CO_2 carbon dioxide
CO_2e carbon dioxide equivalent
GHG greenhouse gas
SJVAB San Joaquin Valley Air Basin

7.11 Cumulative Impacts

7.11.1 Air Quality and Global Climate Change

The study area for cumulative of air quality impacts is the SJVAB because the entire Fresno to Bakersfield Section of HST is located in the SJVAB. The study area for GHG emissions encompasses the State of California because existing reports and plans typically describe GHG emissions at the state-level, policies establish emissions targets at the state level, and the SJVAPCD CEQA thresholds are established based upon statewide goals. Additionally, the HST System's GHG impacts (benefits) would also occur at the state level because many of the reductions in mobile source emissions would be achieved by long distance travel on the HST System.

To provide guidance in assessing cumulative air quality and GHG impacts under CEQA in the SJVAB, the SJVAPCD developed the 2012 document *Guidance for Assessing and Mitigating Air Quality Impacts* (SJVAPCD 2012). This guidance document contains significance thresholds for assessing project-specific as well as cumulative air quality impacts under CEQA. These thresholds

[16] 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 2006 CARB emissions inventory, which estimated the annual CO_2e emissions in California are about 484 million metric tons (CARB 2007b).

were derived to prevent exceedances of federal air quality standards, and therefore are used for the NEPA assessment as well because the federal air quality standards are designed to protect human health and the environment.

Regulatory agencies continue to adopt increasingly stringent standards for criteria pollutants, TACs, and GHGs with the goal of reducing the amount of pollutant emissions in the atmosphere. Many of these regulations are not yet fully implemented as of 2013 but would be implemented prior to the project planning horizon of 2035. Overall, air quality has improved and is anticipated to continue to improve because of these current and foreseeable regulations. However, population growth and proposed developments are projected to result in thousands of new homes and millions of square feet of new retail uses. The associated increase in traffic congestion would continue to incrementally affect air quality and GHG emissions.

The SJVAB is in federal nonattainment for O_3 and $PM_{2.5}$, federal maintenance for PM_{10} and CO (for the urban portions of Fresno County and Kern 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.

Some material needed for construction of the HST project, such as ballast, may be sourced from areas outside of the SJVAB. As described in Section 7.10.1.2, the transport of ballast construction materials from quarries outside the SJVAB to the project site may result in exceedances of NOx mass emission thresholds in other air districts. Emission offsets would be purchased to reduce these exceedances to less than significant as required by Mitigation Measure AQ-MM#5. With the purchase of offsets, the HST project would not contribute to air quality impacts outside the SJVAB. The cumulative scenario is based upon the District's future emissions inventories.

7.11.2 Construction

Air quality construction impacts associated with the HST project would be above the SJVAPCD's significance thresholds; however, with implementation of mitigation measures identified in Chapter 8.0, the project's emissions would be below the thresholds (i.e. project-specific impacts would be less than significant). Therefore, consistent with the SJVAPCD's Guidance for cumulative impacts analysis, the HST alternatives' contribution to cumulative construction air quality impacts would not be significant under NEPA and would not be cumulatively considerable under CEQA, as further described below.

State: As described in Section 7.10.1.2, construction of the HST would result in a one-time increase in GHG emissions. The emissions associated with construction of the HST are anticipated to be offset in less than one year of train operations because of reduced passenger vehicle travel on roadways. Based on this short offset time period, the overall GHG impacts (construction plus operation) would be negative and would therefore be consistent with the AB 32 goals. The SJVAPCD guidance states that projects that are consistent with California's State-wide goals listed in AB 32 should be considered to have a less than significant impact on global climate change and a less than significant cumulative impact. Therefore, because the project meets these goals by reducing GHG emissions overall, the HST alternatives' contribution to GHG emissions would not be significant under NEPA and would not be cumulatively considerable under CEQA.

Regional: For criteria pollutants, the SJVAPCD has adopted a cumulative threshold of significance of 10 tons per year for ozone precursors (VOC and NOx) and 15 tons per year for PM_{10} and $PM_{2.5}$. The SJVAPCD has determined that projects below these significance thresholds would not have a cumulatively considerable impact on air quality in the SJVAB as they are consistent with the SJVAPCD's attainment strategy and would not prevent the District from achieving attainment. Implementation of mitigation measures described in Chapter 8.0 would reduce construction criteria pollutant mass emissions below these significance thresholds.

Specifically, mitigation measure AQ-MM#4 offsets construction emissions above the SJVAPCD thresholds for ozone precursors and particulate matter through the VERA. Therefore, HST project construction emissions of these criteria pollutants would not be significant under NEPA and would not be cumulatively considerable under CEQA.

Local: Emissions analysis at the local level includes certain criteria pollutants (PM_{10}, $PM_{2.5}$, NO_2, CO, and SO_2) and TACs. The construction of the HST project would result in criteria pollutant and TAC emissions near the HST guideway/alignment area, maintenance facilities, concrete batch plants, and station areas.

The cumulative NO_2 threshold is the ambient air quality standard for hourly (188 micrograms per cubic meter) and annual (57 micrograms per cubic meter) concentrations. The cumulative CO threshold is the ambient air quality standard for 1-hour average (23,000 micrograms per cubic meter) and 8-hour average (10,000 micrograms per cubic meter) concentrations. The cumulative SO_2 threshold is the ambient air quality standard for 1-hour average (196 micrograms per cubic meter) and 24-hour average (105 micrograms per cubic meter) concentrations. Maximum concentrations for the HST project would be less than these thresholds as discussed in the Section 7.10.2. Therefore, construction emissions would not cause or contribute to projected localized exceedances of the NO_2, CO, and SO_2 air quality standards.

For PM_{10} and $PM_{2.5}$, the background concentrations in the SJVAB already exceed applicable ambient air quality standards. Therefore, the project's impacts are evaluated by examining the incremental increase in PM_{10} and $PM_{2.5}$ concentration associated with project emissions. If the incremental PM_{10} and $PM_{2.5}$ concentration increases are estimated to result in an increase in ambient concentrations less than the SJVAPCD SILs for 24-hour (10.4 micrograms per cubic meter) and annual (2.08 micrograms per cubic meter) concentrations, the project would not contribute substantially to further exceedances of the ambient air quality standards as discussed in the Section 7.10.2. The project design incorporates the enhanced dust control measures recommended by SJVAPCD, which would decrease PM_{10} and $PM_{2.5}$ emissions and concentrations. The contribution of HST project construction emissions to localized PM_{10} and $PM_{2.5}$ concentrations would not contribute substantially to further exceedances of the PM_{10} and $PM_{2.5}$ ambient air quality standards after mitigation of the concrete batch plants.

The SJVAPCD has established thresholds of significance for TACs that are protective of health. Because the established TAC significance thresholds are highly conservative, if project-specific TAC emissions have a less than significant health impact, the project would not be expected to result in a cumulatively considerable net increase in TACs (SJVAPCD 2012). Cancer risks associated with TAC emissions from project construction were compared to the SJVAPCD CEQA threshold of 10 in a million to assess the level of impact. Chronic and acute hazard indices associated with project construction emissions were compared to the SJVAPCD CEQA threshold of 1. The HST assessment of localized TAC health impacts to sensitive receptors near construction work areas indicates that risks would be below the TAC risk thresholds of significance (see Section 7.10.2). Therefore, project construction emissions of criteria pollutants and TACs would not result in a significant localized impacts under NEPA and would not be cumulatively considerable under CEQA.

7.11.3 Near- and Long-Term Operations

The mitigated HST operations emissions would be below the SJVAPCD's project-specific significance thresholds, as described in Chapter 7.0. Therefore, consistent with the SJVAPCD's Guidance for cumulative impacts analysis, the contribution of HST project emissions to cumulative air quality impacts would not be significant under NEPA and would not be cumulatively considerable under CEQA, as further described below.

State: Even with the more stringent regulations on GHG emissions expected in the future, the projected growth in California may result in cumulative increases in GHG emissions. Increased GHG emissions from past, present, and reasonably foreseeable projects in the state may result in significant cumulative impacts on global climate change under NEPA and CEQA. The HST project statewide demand for electricity, estimated to be 11.04 to 16.55 gigawatt hours per day (based on ridership estimates with a ticket price equivalent to 83% and 50% of air fare, respectively) could result in indirect GHG emissions from power generation facilities. Although the Authority has adopted a policy to purchase renewable, clean power energy sources, it cannot ensure that only renewable energy is used to power the HST System, because the PG&E power distribution network does not distribute energy based on energy sources. Therefore, there may be GHG emissions associated with the provisions of energy to the HST System. However, overall, the HST project would decrease GHG emissions by reducing vehicle and aircraft trips and also would result in a net reduction in CO_2 emissions as described in Section 7.9. This reduction in GHG emissions would more than offset the increase in GHG emissions associated with project facilities. Therefore, the HST project would result in a net decrease in GHG emissions from operation.

Regional: Operation of the HST would help the region attain air quality standards and plans by reducing the amount of regional vehicular traffic and providing an alternative mode of transportation. Because the HST project would help to decrease emissions of criteria pollutants and precursors (such as ROG and NO_x), it would result in a net benefit to regional air quality. Therefore, project contribution to cumulative air quality impacts would not be significant under NEPA and would not be cumulatively considerable under CEQA.

Local: Cumulative CO impacts are accounted for in the CO hot-spot analysis, as presented in Section 7.4. The CALINE4 air dispersion modeling evaluation indicated that the cumulative CO emissions[17] from past, present, and reasonably foreseeable future projects in combination with the HST project would not exceed state and federal ambient air quality standards.

Operations at the HMF may emit criteria pollutants and TACs. Based on the air dispersion analysis, criteria pollutant concentration increases from HMF operations would not exceed the applicable thresholds after mitigation (Section7.2.2). Cancer risks associated with these TAC emissions were compared to the SJVAPCD CEQA threshold of 10 in a million to assess the level of impacts. Chronic and acute hazard indices from project emissions were compared to the SJVAPCD CEQA hazard index threshold of 1. The health risk analysis (Section 7.2.2) performed for HMF emissions indicates that health impacts would be less than significant after implementation of mitigation measure AQ-MM #6. Thus, the HST alternatives would have a less than cumulatively significant impact on air quality.

Because the HST project would not increase local air quality emissions beyond any of the air quality thresholds established to protect human health and the environment, the project contribution to local air quality impacts would not be significant under NEPA and would not be cumulatively considerable under CEQA.

7.11.4 Summary of NEPA/CEQA Impacts

At the state level, GHG emissions from HST project construction and operations would meet the State goals by reducing GHG emissions overall and therefore, would not be cumulatively significant under NEPA and would not result in a cumulatively considerable impact under CEQA. At the regional level, since criteria pollutant emissions from project construction would be mitigated to below the project significance threshold as described above, the project's contribution to cumulative air quality impacts would not be significant under NEPA and would not

[17] The CO hot spot analysis is inherently a cumulative analysis, because it analyzes project and other future traffic that would increase CO concentrations which are added to the ambient CO concentrations.

be cumulatively considerable under CEQA. Similarly, localized impacts from criteria pollutants and TACs emissions associated with project construction would be mitigated to below the project significance thresholds and would not be cumulatively significant under NEPA and would not be cumulatively considerable under CEQA.

Operation of the HST System would help the region attain air quality standards and plans by reducing the amount of regional vehicular traffic and providing an alternative mode of transportation. Because the HST project would help to decrease emissions of criteria pollutants, the project would result in a net benefit to regional air quality. Therefore, at the regional level, project operation would have a beneficial contribution under NEPA and not contribute to the cumulative air quality impact under CEQA.

At a local level, the CO and particulate matter emissions associated with operation of the HST stations would not exceed the threshold of significance established by the SJVAPCD; therefore, it is unlikely that the operation of the station and associated local traffic increases would contribute to the cumulative impact of CO, PM_{10}, and $PM_{2.5}$ emissions. Therefore, local criteria pollutant emissions during operation of the HST project would not result in a cumulatively considerable impact.

The health risk analysis performed for HMF emissions indicates that health impacts would be less than significant for sensitive receptors after mitigation. Since health impacts to sensitive receptors would be less than the SJVAPCD threshold of significance, TAC emissions impacts associated with the HMF would be mitigated to below the project significance thresholds and would not be cumulatively significant under NEPA and would not be cumulatively considerable under CEQA.

7.11.5 Mitigation

The HST project would implement air quality mitigation measures provided in Section 8.2, and the same measures would be applied to address cumulative impacts for cumulative construction impacts.

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

Table 7.11-1
Construction Emissions for Combined HST Merced to Fresno and Fresno to Bakersfield Alignments for Years 2014–2023[a] (tons/year)

Year	VOC	CO			NO_x	SO_2	PM_{10}[d]	$PM_{2.5}$[d]
		Total	Fresno[e]	Bakersfield[e]				
GC *de minimis* Threshold[b]	10	N/A	100	100	10	100	100	100
CEQA Threshold of Significance[c]	10	N/A	N/A	N/A	10	N/A	15	15
2014 Emissions	31.97	170.58	56.29	26.95	549.40	0.75	55.81	21.55
Exceed GC *de minimis* Threshold	Yes	N/A	No	No	Yes	No	No	No
Exceed CEQA Threshold	Yes	N/A	N/A	N/A	Yes	No	Yes	Yes
2015 Emissions	47.77	338.66	94.62	62.12	727.50	1.25	76.43	36.77
Exceed GC *de minimis* Threshold	Yes	N/A	No	No	Yes	No	No	No
Exceed CEQA Threshold	Yes	N/A	N/A	N/A	Yes	No	Yes	Yes
2016 Emissions	40.60	287.88	77.12	57.37	615.25	0.94	65.98	31.56
Exceed GC *de minimis* Threshold	Yes	N/A	No	No	Yes	No	No	No
Exceed CEQA Threshold	Yes	N/A	N/A	N/A	Yes	No	Yes	Yes
2017 Emissions	10.92	60.39	16.59	15.31	193.45	0.26	19.65	13.79
Exceed GC *de minimis* Threshold	Yes	N/A	No	No	Yes	No	No	No
Exceed CEQA Threshold	Yes	N/A	N/A	N/A	Yes	No	Yes	No
2018 Emissions	5.62	37.92	6.19	3.74	84.23	0.24	15.73	10.24
Exceed GC *de minimis* Threshold	No	N/A	No	No	Yes	No	No	No
Exceed CEQA Threshold	No	N/A	N/A	N/A	Yes	No	Yes	No
2019 Emissions	11.25	36.49	6.33	1.70	53.52	0.04	14.76	9.91
Exceed GC *de minimis* Threshold	Yes	N/A	No	No	Yes	No	No	No
Exceed CEQA Threshold	Yes	N/A	N/A	N/A	Yes	No	No	No
2020 Emissions	2.06	20.90	4.18	1.21	17.09	0.05	4.84	1.16

Table 7.11-1
Construction Emissions for Combined HST Merced to Fresno and Fresno to Bakersfield Alignments for Years 2014–2023[a] (tons/year)

Year	VOC	CO			NO_x	SO_2	PM_{10}[d]	$PM_{2.5}$[d]
		Total	Fresno[e]	Bakersfield[e]				
Exceed GC *de minimis* Threshold	No	N/A	No	No	Yes	No	No	No
Exceed CEQA Threshold	No	N/A	N/A	N/A	Yes	No	No	No
2021 Emissions	4.88	31.14	10.11	9.26	87.10	0.16	4.93	2.99
Exceed GC *de minimis* Threshold	No	N/A	No	No	Yes	No	No	No
Exceed CEQA Threshold	No	N/A	N/A	N/A	Yes	No	No	No
2022 Emissions	4.99	3.64	0.54	0.00	4.49	0.01	9.02	2.03
Exceed GC *de minimis* Threshold	No	N/A	No	No	No	No	No	No
Exceed CEQA Threshold	No	N/A	N/A	N/A	No	No	No	No
2023 Emissions	0.03	0.39	0.00	0.00	0.19	0.00	0.08	0.02
Exceed GC *de minimis* Threshold	No	N/A	No	No	No	No	No	No
Exceed CEQA Threshold	No	N/A	N/A	N/A	No	No	No	No

Notes:
[a] The emissions presented here are unmitigated emissions for the construction of the Merced to Fresno and Fresno to Bakersfield alignment during 2013-2023 construction period in the San Joaquin Valley Air Basin.
[b] The SJVAPCD has significance thresholds for NO_x ROG/VOC, PM_{10}, and $PM_{2.5}$. The district currently does not have thresholds for CO or SO_x. Section 3.2.8.8 summarizes the CEQA significance for these pollutants.
[c] The General Conformity *de minimis* thresholds for criteria pollutants are based on the SJVAB federal attainment status. The SJVAB is considered in extreme nonattainment for the ozone National Ambient Air Quality Standards (NAAQS), is a nonattainment area for $PM_{2.5}$, and is a maintenance area for the CO and PM_{10} NAAQS. Although the SJVAB is in attainment for SO_x, since SO_x is a precursor for $PM_{2.5}$, the $PM_{2.5}$ General Conformity Rule *de minimis* thresholds was used.
[d] The SJVAPCD Regulation VIII requirements and dust control measures the Authority committed to in the Statewide Program EIR/EIS are included here for PM_{10} and $PM_{2.5}$ emissions.

Acronyms:
CEQA California Environmental Quality Act
CO carbon monoxide
N/A not applicable
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
SJVAPCD San Joaquin Valley Air Pollution Control District
SO_2 sulfur dioxide

Table 7.11-1

Construction Emissions for Combined HST Merced to Fresno and Fresno to Bakersfield Alignments for Years 2014–2023[a] (tons/year)

Year	VOC	CO			NO_x	SO_2	PM_{10}[d]	$PM_{2.5}$[d]
		Total	Fresno[e]	Bakersfield[e]				
VOC volatile organic compound								

Chapter 8.0

Mitigation Analysis and Project Design Features

8.0 Mitigation Analysis and Project Design Features

Construction of the HST project would increase regional emissions and could 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 the controls required by the SJVAPCD for compliance.

8.1 Project Design Features

The Authority and FRA have considered avoidance and minimization measures consistent with the Statewide Program EIR/EIS commitments. During project design and construction, the Authority and FRA would implement measures to reduce impacts on air quality. These measures are considered to be part of the project and are summarized below:

- Trucks will be covered to reduce significant fugitive dust emissions while hauling soil and other similar material.
- All trucks and equipment will be washed before exiting the construction site.
- Exposed surfaces and unpaved roads will be watered three times daily.
- Vehicle travel speed on unpaved roads will be reduced to 15 mph.
- Any dust-generating activities will be suspended when the wind speed exceeds 25 mph.
- All disturbed areas, including storage piles, which are not being actively used for construction purposes will be effectively stabilized for dust emissions using water or a chemical stabilizer/suppressant, or covered with a tarp or other suitable cover or vegetative ground cover. In areas adjacent to organic farms, the Authority will use non-chemical means of dust suppression.
- All onsite unpaved roads and offsite unpaved access roads will be effectively stabilized for dust emissions using water or a chemical stabilizer/suppressant. In areas adjacent to organic farms, the Authority will use non-chemical means of dust suppression.
- All land clearing, grubbing, scraping, excavation, land leveling, grading, cut and fill, and demolition activities will be effectively controlled for fugitive dust emissions by an application of water or by presoaking. With the demolition of buildings up to six stories in height, all exterior surfaces of the buildings will be wetted during demolition.
- All materials transported offsite 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 when 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 for fugitive dust emissions using sufficient water or a chemical stabilizer/suppressant. In areas adjacent to organic farms, the Authority will use non-chemical means of dust suppression.

- 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 take actions specified in SJVAPCD's Rule 8041 to prevent carryout and trackout.
- Low- or super-compliant VOC (Clean Air) paints, coatings, and industrial coatings that meet the regulatory limits in the SCAQMD Rule 1113 will be used.

8.2 Mitigation Measures

Operation of the HST project would, in general, improve air quality because of the reduction in regional emissions. Construction of the project, however, would temporarily increase regional emissions and possibly cause or exacerbate an exceedance of an air quality standard. As such, mitigation measures designed to minimize potential air quality impacts focused on the construction phase of the project. These measures, which would go beyond the control measures listed in Section 8.1, Project Design Features, included Statewide Program EIR/EIR and controls required by the SJVAPCD rules. The mitigation measure would be the same regardless of whether the project is compared to the existing conditions as baseline or No Project as baseline. Temporary, short-term, emissions increases associated with construction activities could be reduced with mitigation strategies and design practices.

The FRA and Authority will take the following approach to mitigating the project's construction regional emissions impacts for NO_x, PM_{10}, $PM_{2.5}$, and VOCs. First, FRA and the Authority will require the construction contractor to comply with AQ-MM#1 and AQ-MM#2. These measures essentially require the contractor to use the cleanest/newest construction and truck-hauling fleet mix that is reasonably available, and to document efforts to locate and secure such equipment. Clean fleet equipment, however, was not assumed in the emissions reported for the project in this EIR/EIS, given the uncertainty of its availability. Accordingly, AQ-MM#1 and AQ-MM#2, if successful, will reduce project emissions. Secondly, AQ-MM#4 will be used to ensure emissions—either amounts reported in this EIR/EIS or a lesser amount if AQ-MM#1 and AQ-MM#2 are successful—are fully mitigated to less-than-significant levels. In other words, the project will first attempt to reduce emissions directly onsite (AQ-MM#1 and AQ-MM#2) before using emissions offsets (AQ-MM#4).

AQ-MM#1: Reduce Criteria Exhaust Emissions from Construction Equipment. This mitigation measure will apply to heavy-duty construction equipment used during the construction phase. All off-road construction diesel equipment will use the cleanest, reasonably available equipment (including newer equipment and/or tailpipe retrofits), but in no case less clean than the average fleet mix for the current calendar year, as set forth in CARB's OFFROAD 2011 database, and no less than a 40% reduction compared to a Tier 2 engine standard for NO_x emissions. The contractor will document efforts undertaken to locate newer equipment (such as, in order of priority, Tier 4, Tier 3, or Tier 2 equipment) and/or tailpipe retrofit equivalents. The contractor will provide documentation of such efforts, including correspondence with at least two construction equipment rental companies. A copy of each unit's certified tier specification and any required CARB or SJVAPCD operating permit will be made available at the time of mobilization of each piece of equipment. The contractor will keep a written record (supported by equipment-hour meters, where available) of equipment usage during project construction for each piece of equipment.

Impacts of Mitigation: The methodologies used to reduce emissions may result in increased fuel or energy consumption associated with emissions control equipment. The change in fuel consumption would likely be small on a per-equipment basis; however, given the number of equipment pieces and the construction duration, the total fuel consumption would result in a moderate increase in volume, but still a small percentage of the total volume. If aftermarket control devices are used, such as diesel particulate filters, additional waste would be generated associated with the disposal of spent filters. In comparison to the scope of the project, these additional increases would be small in comparison. Therefore, the impacts of mitigation would be less than significant under CEQA and the impact would have negligible intensity under NEPA.

AQ-MM#2: Reduce Criteria Exhaust Emissions from On-Road Construction Equipment. This mitigation measure applies to all on-road trucks used to haul construction materials, including fill, ballast, rail ties, and steel. Material-hauling trucks will consist of an average fleet mix of equipment model year 2010, or newer, but no less than the average fleet mix for the current calendar year as set forth in CARB's EMFAC 2011 database. The contractor will provide documentation of efforts to secure such a fleet mix. The contractor will keep a written record of equipment usage during project construction for each piece of equipment.

Impacts of Mitigation: The mitigation measure would have no impacts.

AQ-MM#3: Reduce the Potential Impact of Concrete Batch Plants. Concrete batch plants would be sited at least 1,000 feet from sensitive receptors, including daycare centers, hospitals, senior care facilities, residences, parks, and other areas where people may congregate. The concrete batch plant will utilize typical control measures to reduce the fugitive dust, such as water sprays, enclosures, hoods, curtains, shrouds, movable and telescoping chutes, central dust collection systems and other suitable technology, to reduce emissions to be equivalent to the U.S. EPA AP-42 controlled emission factors for concrete batch plants.

Impacts of Mitigation: The control measures utilized at the batch plant may increase water usage and energy consumption, and may generate additional waste from consumables used by the control devices. These impacts would be minor in comparison to the operations as a whole. Therefore, the impacts of mitigation would be less than significant under CEQA and the impact would have negligible intensity under NEPA.

With AQ-MM#1 and AQ-MM#2, regional construction phase emissions of NO_x, VOCs, PM_{10}, and $PM_{2.5}$ for certain years could still be greater than applicable thresholds. As such, construction phase emissions would be offset as follows:

AQ-MM#4: Offset Project Construction Emissions Through an SJVAPCD Voluntary Emission Reduction Agreement (VERA). The Authority and SJVAPCD will enter into a contractual agreement to mitigate the project's emissions (by offsetting) to net zero the project's actual emissions from construction equipment and vehicle exhaust emissions of VOC, NO_x, PM_{10}, and $PM_{2.5}$. The agreement will provide funds for the district's Emission Reduction Incentive Program[18] (SJVAPCD 2011a) to fund grants for projects that achieve emission reductions, with preference given to highly impacted communities, thus offsetting project impacts on air quality. Projects funded in the past include electrification of stationary internal combustion engines (such as agricultural irrigation pumps), replacing old heavy-duty trucks with new, cleaner, more efficient heavy-duty trucks, and replacement of old farm tractors. The project will commit to reduce construction emissions for NO_x and VOC through the VERA program. To lower overall cost, funding for the VERA program to cover estimated construction emissions for any funded construction phase will be provided at the beginning of the construction phase if feasible. At a minimum, funding shall be provided so that mitigation/offsets will occur in the year of impact, or as otherwise permitted by 40 C.F.R. Part 93 Section 93.163.

Impacts of Mitigation: The methodologies used to reduce emissions may result in increased fuel or energy consumption associated with emissions control equipment. However, it is also

[18] See www.valleyair.org/Grant_Programs/GrantPrograms.htm.

possible that fuel and energy consumption may decrease. The change in fuel consumption would likely be small on a per-equipment basis. If aftermarket control devices are used, such as diesel particulate filters, additional waste would be generated associated with disposal of spent filters. In comparison to the scope of the project, these additional increases would be small. Therefore the impacts of mitigation would be less than significant under CEQA and the impact would have negligible intensity under NEPA.

AQ-MM#5: Purchase Offsets and Offsite Emission Mitigation for Emissions Associated with Hauling Ballast Material in Certain Air Districts. This mitigation measure will apply if ballast material is hauled from quarries outside the SJVAB and the hauling activities result in the exceedance of applicable annual General Conformity threshold(s) or local air basin CEQA threshold(s) for NO_x. To determine whether an exceedance will occur based on actual hauling activities, the Authority shall at the beginning of each calendar year or as soon as practicable thereafter obtain the most up-to-date information, based on actual or projected contractor-specific information about hauling in the Mojave Desert AQMD, South Coast AQMD, and Bay Area AQMD, and calculate the expected NOx emissions from hauling activities in those districts using the same methodology used in this FEIR/EIS. If, based on that calculation, exceedance of the applicable NOx threshold(s) is anticipated to occur in that next calendar year, the Authority will secure from the appropriate air district(s) or other appropriate source the production or generation of a sufficient quantity of NO_x offsets for that calendar year necessary to achieve conformity (in the case of exceedance of GC thresholds) and/or to offset NO_x emissions below the applicable CEQA threshold(s). At a minimum, mitigation/offsets will occur in the year of impact, or as otherwise permitted by 40 C.F.R. Part 93 Section 93.163.

The Mojave Desert AQMD's emission bank has 2,061 tons of NO_x credits (MDAQMD 2012); therefore, there should be enough NO_x credits to offset approximately 6 tons per year from this project in the Mojave Desert Air Basin. The exact number of NO_x credits in the SCAQMD RECLAIM program is unknown, but 1,199 tons of NO_x credits were traded in 2011 and 235 tons of NO_x credits were traded in 2012 (SCAQMD 2012). Therefore, there should be enough available NO_x credits in the program to offset approximately 75 tons of NO_x per year from this project in the SCAQMD.

In the Bay Area AQMD, any material emissions above the district's significance threshold will be mitigated through an offsite emission mitigation program to achieve emission reduction due to material hauling in the Bay Area AQMD. Potential offsite mitigation programs include the Bay Area AQMD's Carl Moyer Memorial Air Quality Standards Attainment Program (CMP) or other air district emission reduction incentive programs. Depending on the final location selected to obtain ballast material, this would amount to a maximum of 3 tons per year of NO_x credits.

Impacts of Mitigation: This mitigation measure would have no impacts.

The following operational phase measures would be implemented to reduce emissions from HMF/MOWF operations:

AQ-MM#6: Reduce the Potential Impact of Toxics. This mitigation measure will apply to HMF/MOWF operation for all site options to ensure that the nearest sensitive receptor has a health risk less than the applicable threshold of 10 in a million cancer risk and a hazard index of one, with final decisions on the range of mitigation measures to achieve emission reductions to meet this standard to be selected before the issuance of the authority to construct permit for the HMF facility; these measures may include the following options:

- Use of electric or hybrid trucks to serve the facility.
- Use of electric or Clean Switcher Locomotive to minimize the emissions from HMF operation.

- When advertising for a train set vendor, a preference for the use of highly polished external manufactured aluminum for train sets will be stated in the proposal.
- Adjustment of the facility operation and orientation to move emission activities to areas where impacts on the surrounding sensitive areas are lessened, thus reducing localized impacts on surrounding sensitive receptors.
- A minimum buffer distance of 1,300 feet from sensitive receptors for diesel vehicles, limitations on idling of diesel vehicles at the facility, or preparation of a detailed health risk assessment that shows cancer risk to be less than 10 in a million when the site design is refined.

Impacts of Mitigation: The methodologies used to reduce emissions may result in increased fuel or energy consumption associated with emissions control equipment. However, it is also possible that fuel and energy consumption may decrease. The change in fuel consumption would likely be small on a per-equipment basis. Consumables used by the emissions control equipment could result in additional waste that would be generated from disposal of spent consumables. Some emissions control equipment may require water, which may result in increased water consumption and may increase the amount of water that needs treatment. This increase in water consumption and water treatment will be incorporated into the design assumptions and therefore will be addressed, resulting in a small impact. Some emissions control equipment may require additional hazardous chemicals to be used and stored onsite. However, any hazardous chemicals would be subject to applicable hazard control plans and therefore are unlikely to be a significant concern compared to material that may already be used at the facility. In comparison to the scope of the project, these additional increases would be small in comparison. Therefore, the impacts of mitigation would be less than significant under CEQA, and the impact would have negligible intensity under NEPA.

AQ-MM#7: Reduce the Potential Impact of Stationary Sources. This mitigation measure will apply to criteria pollutant sources at the HMF sites. Large stationary equipment (combustion equipment, paint booths, wastewater treatment, etc.) will use best industry practices, or alternative equipment will be used, to the extent practicable, to reduce emissions of criteria pollutants.

Impacts of Mitigation: The methodologies used to reduce emissions may result in increased fuel or energy consumption associated with emissions control equipment. However, it is also possible that fuel and energy consumption may decrease. The change in fuel consumption would likely be small on a per-equipment basis. Consumables used by the emissions control equipment could result in additional waste that would be generated from disposal of spent consumables. Some emissions control equipment may require water, which may result in increased water consumption and may increase the amount of water that needs treatment. This increase in water consumption and water treatment will be incorporated into the design assumptions and therefore will be addressed, resulting in a small impact. Some emissions control equipment may require additional hazardous chemicals to be used and stored onsite. However, any hazardous chemicals would be subject to applicable hazard control plans, and therefore is unlikely to be a significant concern compared to materials that may already be in use at the facility. These additional increases would be small in comparison to the scope of the project. Therefore, the impacts of mitigation would be less than significant under CEQA, and the impact would have negligible intensity under NEPA.

Note that the mitigation measure AQ-MM#7 was included in the Revised DEIR/Supplemental DEIS but is no longer necessary based on this FEIR/EIS analysis. The analysis in the Revised DEIR/Supplemental DEIS previously concluded that localized PM_{10} and $PM_{2.5}$ impacts would be significant because current background concentrations in the SJVAPCD already exceed the ambient air quality standards, and any minimal increases in concentration would exacerbate these exceedances. This effectively set a significance threshold of zero, which was extremely conservative. This conservative zero threshold was used because no other threshold was known at the time. The Revised DEIR/Supplemental DEIS included Mitigation Measure AQ-MM#7 to reduce these impacts to less than significant levels. Since the Revised DEIR/Supplemental DEIS, the significance thresholds recommended by SJVAPCD became known (Villalvazo 2014). Accordingly, in this FEIR/EIS analysis, the incremental increases in PM_{10} and $PM_{2.5}$ concentration from project emissions were compared to the SJVAPCD recommended significant impact levels. Because the incremental increase in PM_{10} and $PM_{2.5}$ concentrations would not exceed these levels, localized PM_{10} and $PM_{2.5}$ impacts would be less than significant. Mitigation Measure AQ-MM#7 is therefore no longer applicable.

AQ-MM#8: Reduce the Potential Impact of Air Toxics at Schools around Bakersfield Station: The following mitigation measure will reduce the cancer risk impacts to the 2 schools located within 1,400 feet of the Bakersfield station. One or more of the following methods would be used to the extent practicable:

- Use of at least Tier 4-compliant engines, or use of any add-on control technology, such as diesel particulate filters, that could achieve the emission reductions.
- Adjusted work hour, so that construction operations do not overlap with school hours.
- Longer construction work hours when schools are not in session, such as during summer vacation.
- Work with the schools on temporary relocation until the Bakersfield station construction has been completed.

Impacts of Mitigation: The methodologies used to reduce emissions may result in increased fuel or energy consumption associated with emissions control equipment. The change in fuel consumption would likely be small on a per-equipment basis; however, given the number of pieces of equipment and the construction duration, the total fuel consumption would result in a moderate increase in volume, but still a small percentage of the total volume. If aftermarket control devices are utilized, such as diesel particulate filters, additional waste would be generated associated with the disposal of spent filters. These additional increases would be small in comparison to the scope of the project. Therefore, the impacts of mitigation would be less than significant under CEQA, and the impact would have negligible intensity under NEPA.

Note that the mitigation measure, AQ-MM#8, was included in the Revised DEIR/Supplemental DEIS, but is no longer necessary. This mitigation measure was included to reduce the localized impacts of station construction to less than significant levels. However, as described in section 7.10.2.2, based on the more exacting and realistic analysis described in section 6.8.3.11, the localized impacts from construction of the HST stations would be less than significant without mitigation. Therefore, AQ-MM#8 is no longer applicable.

8.3 Construction Emissions after Mitigation

NO_x emissions would exceed GC applicability thresholds for most of the construction phase, while VOC emissions would exceed GC applicability for 4 years, with or without onsite mitigation (such as AQ-MM#1). PM_{10}, $PM_{2.5}$, CO, and SO_2 emissions would be below the GC threshold with the application of mitigation measures and control measures for all years. As such, with implementation of AQ-MM#4, which will offset construction phase VOC and NO_x emissions through the VERA program, the project would have impacts of negligible intensity for all pollutants.

Material hauling outside the SJVAB would have impacts of substantial intensity in the South Coast Air Basin, Mojave Desert Air Basin, and the Salton Sea Air Basin.[19] Mitigation measures AQ-MM#2 and AQ-MM#5 would be implemented to reduce NO_x impacts in these air basins to negligible intensity under NEPA. Other pollutants in these air basins would have impacts of negligible intensity. Material hauling in other air basins for all pollutants would be of negligible intensity under NEPA.

NO_x emissions would exceed the SJVAPCD CEQA significance thresholds for most of the construction phase, while VOC, PM_{10}, and $PM_{2.5}$ emissions would exceed the SJVAPCD CEQA significance thresholds for some of the construction phase. Therefore, the project may violate an air quality standard and/or contribute substantially to an existing or projected air quality violation for NO_x, VO, PM_{10}, and $PM_{2.5}$ and, as such, has the potential to result in a significant impact under CEQA. Air dispersion modeling showed that the incremental increase of PM_{10} and $PM_{2.5}$ concentrations is less than the applicable threshold to exacerbate the existing exceedances of the ambient air quality standards, and would be considered less than significant after mitigation of the concrete batch plant. These emissions would only last through the HST construction period; these emissions would be offset through the VERA program (AQ-MM#4), and the project would result in emissions reduction of VOC, NO_x, PM_{10}, and $PM_{2.5}$ throughout the project operations. After mitigation, these impacts would be less than significant.

There is no SO_2 threshold from SJVAPCD CEQA guidance. However, through the use of air dispersion modeling for construction work areas, SO_2 impacts were shown to be less than the ambient air quality standards and would be less than significant. No CO hot spots are expected to occur during project construction as demonstrated by the absence of exceedances of ambient air quality standards for CO at the construction work areas modeled. CO impacts are expected to be less than significant.

Material hauling in SCAQMD, BAAQMD, and Mojave Desert AQMD would have significant impacts for NO_x. Mitigation measure AQ-MM#5 would be implemented to reduce NO_x emissions in these regions (as described above in Section 8.2, Mitigation Measures). The CEQA impacts after reducing on-road truck exhaust, purchasing NO_x offsets, and implementing offsite mitigation programs would make the material-hauling emissions less than significant.

The localized air quality impacts near construction work areas were evaluated through an ambient air quality analysis and a health risk assessment. After mitigation, the localized impacts would be below the applicable significance thresholds. Therefore, the localized impacts due to construction would be less than significant after mitigation.

[19] Both the South Coast and Salton Sea air basins are under the jurisdiction of the SCAQMD; therefore, NO_x credits would be purchased from the SCAQMD RECLAIM program.

This page intentionally left blank

Chapter 9.0
Conformity Analysis

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 USEPA's Conformity Rule. The two types of federal conformity are transportation conformity and GC.

"Conformity" refers to conforming to, or being consistent with, SIP for compliance with the CAA. USEPA'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 (GC). Transportation conformity applies to those projects that will have FHWA or Federal Transit Authority (FTA) funding or require FHWA/FTA approval. GC 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 GC 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 this project element will be added to the affected area's Regional Transportation Improvement Program (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 GC rule and requirements.

9.1 General Conformity

To determine whether projects are subject to the GC determination requirements, USEPA 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 of the applicable pollutants are lower under the operational phase of the HST alternatives than under 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) for the following:

- VOC for the years 2014-2016 for the alternatives.
- NO_x for the years 2014-2018 and 2021 for the alternatives.

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, Salton Sea Air Basin, and 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 offsetting the project's construction-phase emissions for pollutant emissions that exceed the annual GC thresholds. For example, if the VOC threshold will be exceeded in 2015, the project would offset those emissions in that year.

- 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.

- Compliance with the GC Rule for the Preferred Alternative is required before construction of the HST project, but may be completed concurrent with EIR/EIS certification, and would be demonstrated through one or more of the methods listed above. Demonstration of compliance with the GC Rule will not change the results of the analysis described in this section.

A GC determination is required for this project for NO_x and VOCs for the years indicated. This determination, which is anticipated to be published concurrently with the ROD for the project, will include a commitment from the FRA/Authority that all construction-phase NO_x and VOC emissions for the years when the applicability thresholds are exceeded will be offset using a VERA with the SJVAPCD, as explained below.

To support the GC compliance determination, the FRA demonstrates that the emissions of NO_x and VOCs (a precursor to O_3) caused by the construction of the proposed project will not result in an increase in regional NO_x and VOC emissions. This will be achieved by offsetting all of the VOC and NO_x emissions generated by the construction of the HST for the years 2014 through 2023.

The offsets will be accomplished through a VERA between the Authority, the project proponent, and the SJVAPCD. The requirement for the VERA would be imposed on the project through the following mitigation measure from the Final EIR/EIS:

AQ-MM#4: Offset Project Construction Emissions through a SJVAPCD Voluntary Emission Reduction Agreement (VERA). The Authority and SJVAPCD will enter into a contractual agreement to mitigate the project's emissions by providing funds for the district's Emission Reduction Incentive Program to fund grants for projects that achieve emission reductions, thus offsetting project impacts on air quality. The project will commit to reduce construction emissions for NO_x and VOC exceedance years to net zero through the VERA program.

A VERA is a mitigation measure by which the project proponent (the Authority, in this case, in partnership with the FRA) will provide pound-for-pound offsets of emissions that exceed GC

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

thresholds through a process that develops, funds, and implements emissions reduction projects, with the SJVAPCD serving role of administrator of the emissions-reduction projects and verifier of the successful mitigation effort.

To implement a VERA, the project proponent and the SJVAPCD will enter into a contractual agreement in which the proponent agrees to mitigate the project's emissions (NO_x and VOCs, in this case, in the years of exceedance) by providing funds for the SJVAPCD's Emission Reduction Incentive Program to fund grants for projects that achieve emission reductions, thus offsetting project impacts on air quality. The SJVAPCD is obligated under the VERA to seek and implement such reductions, using the project proponent’s funds. The types of projects that have been used in the past to achieve such reductions include electrification of stationary internal combustion engines (such as agricultural irrigations pumps), replacing old trucks with new, cleaner, more efficient trucks, and a host of other emissions-reducing projects.

In implementing a VERA, the SJVAPCD verifies the actual emission reductions that have been achieved as a result of completed grant contracts, monitors the emission-reduction projects, and ensures the enforceability of achieved reductions. The initial agreement is generally based on the projected maximum emissions that exceed thresholds as calculated by a district-approved Air Quality Impact Assessment and/or the project’s EIR/EIS; the agreement then requires the proponent to deposit funds sufficient to offset those maximum emissions exceedances. However, because the goal is to mitigate actual emissions, the district has designed adequate flexibility into these agreements such that the final mitigation is based on actual emissions related to the project, on actual equipment used, hours of operation, and so on, which the proponent tracks and reports to SJVAPCD during construction. After the project is mitigated, the district certifies to the lead agency that the mitigation is completed. Thus, a VERA provides the lead agency with an enforceable mitigation measure that will result in emissions exceedances being fully offset.

According to the SJVAPCD, since 2005 the SJVAPCD has entered into 17 VERAs with project proponents and achieved 1,393 tons of NO_x and PM_{10} reductions each year. It is the SJVAPCD's experience that implementation of a VERA is a feasible mitigation measure that effectively achieves actual emission reductions and mitigates the project to a net-zero air quality impact.

The Authority is negotiating a VERA with the SJVAPCD. Final approval and execution of the VERA by the Authority and the SJVAPCD is expected approximately concurrent with final approval of the GC determination. The SJVAPCD has stated that it is certain that there are enough emission-reduction projects within its air basin to fully offset the project’s NO_x and VOC exceedances.[20]

Construction-phase emissions associated with material hauling outside the SJVAB are greater than the applicable GC threshold (s) for NO_x in the South Coast Air Basin, Salton Sea Air Basin, and Mojave Desert Air Basin for certain hauling scenarios, and NO_x offsets will be purchased to mitigate impacts. Detailed analysis is presented in Appendix G.

9.2 Transportation Conformity

Transportation conformity is an analytical process required for all federally funded transportation projects but does not apply to this project. 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

[20] The information in this GC determination regarding the VERA and the SJVAPCD’s Grant Incentives Program comes from (a) www.valleyair.org/Grant_Programs/GrantPrograms.htm, (b) the SJVAPCD’s October 12, 2011, comment letter on the Merced to Fresno Draft EIR/EIS document, and (c) telephone discussions with the SJVAPCD.

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

CAA requirements. Conformity with the CAA takes place at both the regional level and the project level.

The Fresno to Bakersfield Section of the HST project is not subject to the transportation conformity rule. However, if the project requires future actions that meet the definition of a project element subject to transportation conformity, additional determinations and associated analysis will be completed as may be required.

Chapter 10.0
References

10.0 References

10.1.1 Sources

Agency for Toxic Substances and Disease Registry (ATSDR). 1992. Toxicological Profile for 1,3-Butadiene. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Bay Area Air Quality Management District (BAAQMD). 2010. California Environmental Quality Act Air Quality Guidelines. May 2010.

California Air Resources Board (CARB). 2004. California State Implementation Plan (SIP): 2004 Revisions to the Carbon Monoxide Maintenance Plan. July 2004.

———. 2005. Air Quality and Land Use Handbook: A Community Health Perspective.

———. 2007. "Climate Change Program: California 1990 Greenhouse Gas Emission Level and 2020 Limit."

———. 2008b. Climate Change Scoping Plan: A Framework for Change. Pursuant to AB 32, the California Global Warming Solutions Act of 2006. December 2008. http://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf.

———. 2009. "Air Assembly Bill 1493 Climate Change Backgrounder: The Greenhouse Effect and California." http://www.arb.ca.gov/cc/factsheets/ccbackground.pdf. Accessed November 17, 2009.

———. 2010. "California Greenhouse Gas Inventory for 2000–2008: By Category as Defined in the Scoping Plan." California Environmental Protection Agency, Air Resources Board. http://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_00-08_2010-05-12.pdf. Accessed September 17, 2010.

———. 2011a. "California Toxics Inventory." http://www.arb.ca.gov/toxics/cti/cti.htm. Accessed May 2011.

———. 2011b. "Almanac Emission Projection Data." California Environmental Protection Agency, Air Resources Board. http://www.arb.ca.gov/app/emsinv/emssumcat.php. Accessed May 2011.

———. 2011c. "Organic Chemical Profiles for Source Categories." http://www.arb.ca.gov/ei/speciate/dnldopt.htm. Accessed May 2011.

———. 2011d. "PM Speciation Profile for Source Categories." http://www.arb.ca.gov/ei/speciate/dnldopt.htm. Accessed May 2011.

———. 2011e. Mobile Source Emission Inventory – Off-Road Motor Vehicles (OFFROAD Model 2011). May 2011. http://www.arb.ca.gov/msei/modeling.htm/categories.htm#inuse_or_category. Accessed August 2013.

———. 2012. "California State Implementation Plans." http://www.arb.ca.gov/planning/sip/sip.htm. Accessed November 2012.

———. 2013a. "California Ambient Air Quality Standards (CAAQS)." http://www.arb.ca.gov/research/aaqs/aaqs2.pdf. Accessed October 2013.

———. 2013b. "iADAM: Air Quality Data Statistics Top 4 Summary." http://www.arb.ca.gov/adam/topfour/topfourdisplay.php. Accessed August 2013.

———. 2013c. "2012 San Joaquin Valley PM2.5 Attainment Plan." http://www.arb.ca.gov/planning/sip/sjvpm25/24hrsjvpm25.htm. Accessed July 2013.

California Department of Conservation, Division of Mines and Geology (CDMG). 2000. A General Location Guide for Ultramafic Rocks in California Areas More Likely to Contain Naturally Occurring Asbestos.

California Department of Transportation (Caltrans). 1997. Transportation Project-Level Carbon Monoxide Protocol. Rev. ed. Prepared by University of California, Davis. December 1997.

———. 1997. Transportation Project-Level Carbon Monoxide Protocol. Rev. ed. Prepared by University of California, Davis. December 1997.

California Energy Commission (CEC). 2006. Refining Estimates of Water-Related Energy Use in California. December 2006.

California Environmental Protection Agency (Cal-EPA). 2010. Climate Action Team Report to Governor Schwarzenegger and the California Legislature. December 2010.

California High-Speed Rail Authority and USDOT Federal Railroad Administration (Authority and FRA). 2005. Final Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the Proposed California High-Speed Train System. Vol. 1, Report. Sacramento and Washington, DC.

———. 2008. Final Program EIR for the Bay Area to Central Valley HST. Sacramento and Washington, DC.

———. 2012a. California High-Speed Train Project Merced to Fresno Section: Transportation Impact Analysis Technical Report. Sacramento and Washington, DC.

———. 2012b. California High-Speed Train Fresno to Bakersfield Section: Transportation Analysis Technical Report. Sacramento and Washington, DC.

———. 2013. Contribution of the High-Speed Rail Program to Reducing California's Greenhouse Gas Emission Levels. June 2013.

California Natural Resources Agency. 2009. "Adopted and Transmitted Text of SB97 CEQA Guidelines Amendments." http://ceres.ca.gov/ceqa/docs/Adopted_and_Transmitted_Text_of_SB97_CEQA_Guidelines_Amendments.pdf. Accessed November 2013.

Cambridge Systematics, Inc. 2012. Transportation Technical Report. Statewide Summary Tables.

CEQ. See White House Council on Environmental Quality.

Council of Fresno County Governments (COG). 2010. 2011 Regional Transportation Plan Long-Range Transportation: Vision for the Fresno County Region for the Years 2010 TO 2035. July 29, 2010.

Dowling Associates, Inc. 2008. Traffix Version 8.0. http://www.traffixonline.com/index.html (accessed March 2012).

EPA. See U.S. Environmental Protection Agency.

Federal Aviation Administration. 2010. Emissions and Dispersion Modeling System (EDMS) Version 5.1.3. Updated November 2010. http://www.faa.gov/about/office_org/headquarters_offices/apl/research/models/edms_model/previous_edms/#513.

Federal Highway Administration (FHWA). 2006. Interim Guidance on Air Toxic Analysis in NEPA Documents. February 3, 2006.

———. 2009. Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents. September 30, 2009. http://www.fhwa.dot.gov/environment/air_quality/air_toxics/. Accessed July 2010.

———. 2010. "A Methodology for Evaluating Mobile Source Air Toxic Emissions among Transportation Project Alternatives." http://www.fhwa.dot.gov/environment/

air_quality/air_toxics/research_and_analysis/methodology/methodology00.cfm. Accessed August 2, 2010.

———. 2012. "Memorandum: Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents." December 6, 2012. http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/aqintguidmem.cfm. Accessed August 2013).

Federal Transit Authority (FTA). 2007. Useful Life of Transit Buses and Vans. April 2007.

Geographic Names Information System (GNIS). 2011. "Domestic Names – Metadata." Prepared by U.S. Geological Survey. http://geonames.usgs.gov/domestic/metadata.htm.

Golden Empire Transit (GET). 2010. "Welcome to Golden Empire Transit District: The GET Bus!" http://www.getbus.org/about/. Accessed December 3, 2010.

Health Effects Institute (HEI). 2007. Mobile-Source Air Toxics: A Critical Review of the Literature on Exposure and Health Effects. Special Report 16. November 2007. http://pubs.healtheffects.org/view.php?id=282. Accessed July 2011.

———. 2009. Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects. Special Report 17. May 2009. http://pubs.healtheffects.org/view.php?id=306. Accessed July 2011.

Intergovernmental Panel on Climate Change (IPCC). 1997. Stabilization of Atmospheric Greenhouse Gases: Physical, Biological, and Socio-Economic Implications. IPCC Technical Paper III. Geneva, Switzerland. February.

Kern Council of Governments (Kern COG). 2010a. 2011 Final Regional Transportation Plan.

———. 2010b Final Conformity Analysis for the 2011 Federal Transportation Improvement Program and 2011 Regional Transportation Plan. July 15, 2010.

Kings County Association of Governments (KCAG). 2010a. 2011 Regional Transportation Plan.

———. 2010b. Final Conformity Analysis for the 2011 Federal Transportation Improvement Program and 2011 Regional Transportation Plan. July 28, 2010.

Mojave Desert Air Quality Management District (MDAQMD). 2012. MD ERC Registry Report. http://www.mdaqmd.ca.gov/Modules/ShowDocument.aspx?documentid=3081. May 2012.

National Cooperative Highway Research Program (NCHRP). 2002. HYROAD Model Formulation. SYSAPP-02/074d, July 2002. http://www.epa.gov/scram001/dispersion_alt.htm#hyroad. Accessed July 2011.

Office of Environmental Health Hazard Assessment (OEHHA) 2003. Air Toxics Hot Spots Program Risk Assessment Guidelines: The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. August 2003

Office of Environmental Health Hazard Assessment (OEHHA). 2009. Technical Support Document for Cancer Potency Factors: Methodologies for derivation, listing of available values and adjustments to allow for early life stage exposures. May 2009..

———. 2012. Air Toxics Hot Spots Program Risk Assessment Guidelines: Technical Support Document for Exposure Assessment and Stochastic Analysis. June 2012

Office of the Governor. 2006. "Executive Order S-20-06." http://gov.ca.gov/news.php?id=4484. Issued October 18, 2006.

———. 2007. "Executive Order S-01-07." http://gov.ca.gov/executive-order/5172/. Issued January 18, 2007.

Parsons Brinckerhoff/Project Management Team. 2009. "Drawing No. TM 5.1-A." Heavy Maintenance Facility (HMF) Concept Plan. May 29, 2009.

———. 2010. Station Area Parking Guidance. June 9, 2010.

PSC. 2007. Title V Operation Permit Renewal Application: Amtrak – Wilmington Maintenance Facility, Wilmington, DE. Prepared by PSC on behalf of Amtrak. August 31, 2007.

Rimpo and Associates. 2007. URBEMIS2007 Version 9.2.4. Released June 2007. http://www.urbemis.com/.

Sacramento Metropolitan Air Quality Management District (SMAQMD). 2013. Guide to Air Quality Assessment in Sacramento County. Revised April 2013.

San Joaquin Valley Air Pollution Control District (SJVAPCD). 1992a. Rule 4201, Particulate Matter Concentration. Adopted May 21, 1992, amended December 17, 1992.

———. 1992b. Rule 4202, Particulate Matter Emission Rate. Adopted May 21, 1992, amended December 17, 1992.

———. 1992c. Rule 4301, Fuel Burning Equipment. Adopted May 21, 1992, amended December 17, 1992.

———. 1994. Rule 2303, Mobile Source Emission Reduction Credits. Adopted May 19, 1994.

———. 1996. Rule 2280, Portable Equipment Registration. Adopted October 20, 1994, amended May 16, 1996.

———. 2002. Guide for Assessing and Mitigating Air Quality Impacts. Adopted August 20, 1998, revised January 10, 2002.

———. 2004a. Regulation VIII, Fugitive PM10 Prohibitions. Adopted August 19, 2004, and September 16, 2004.

———. 2004b. 2004 Extreme Ozone Attainment Demonstration Plan: San Joaquin Valley Air Basin Plan Demonstrating Attainment of Federal 1-hour Ozone Standards. October 2004. http://www.valleyair.org/Air_Quality_Plans/AQ_Final_Adopted_Ozone2004.htm (accessed November 6, 2013).

———. 2005. Rule 9510, Indirect Source Review (ISR). Adopted December 15, 2005.

———. 2007a. 2007 Ozone Plan. April 2007. http://www.valleyair.org/Air_Quality_Plans/AQ_Final_Adopted_Ozone2007.htm (accessed November 6, 2013).

———. 2007b. PM10 Maintenance Plan and Request for Redesignation. September 30, 2007.

———. 2007c. Draft Guidance for Air Dispersion Modeling, Rev. 2.0. January 2007.

———. 2008. Rule 2201, New and Modified Stationary Source Review Rule. Adopted September 19, 1991, amended December 18, 2008.

———. 2009. Final Staff Report. Addressing Greenhouse Gas Emissions Impacts under the California Environmental Quality Act. December 17, 2009.

———. 2011a. "Emission Reduction Incentive Program." www.valleyair.org/Grant_Programs/GrantPrograms.htm. Fresno, CA.

———. 2011b. "Frequently Asked Questions." http://www.valleyair.org/General_info/Frequently_Asked_Questions.htm#About%20The%20Air%20Pollution%20Problem (accessed May 24, 2011).

———. 2012a. Draft Guidance for Assessing and Mitigating Air Quality Impacts. May.

———. 2012b. 2012 PM2.5 Plan. December.

———. 2013a. "Ambient Air Quality Standards & Valley Attainment Status." http://www.valleyair.org/aqinfo/attainment.htm (accessed August 2013).

———. 2013b. Ozone Plans, 1-hour and 8-hour Ozone Plan. http://www.valleyair.org/Air_Quality_Plans/Ozone_Plans.htm (accessed November 6, 2013).

Santa Barbara County Air Pollution Control District (SBCAPCD). 1997. Technical Information and References: Construction Equipment Emission Factors (APCD Form -24, 3/31/97). "Table 2, Construction Equipment Uncontrolled Emission Facts." http://www.sbcapcd.org/eng/tech/apcd-24.htm (accessed July 21, 2011).

South Coast Air Quality Management District (SCAQMD). 1993. CEQA Air Quality Handbook. Prepared April.

———. 2011. Appendix A: Calculation Details for CalEEMod. February 2011.

———. 2012. Twelve-Month Rolling Average Price of Compliance Year 2011 and 2012 NOX RTCs. Available at: http://www.aqmd.gov/reclaim/docs/2012-4_Avg_NOx_Price.pdf. April 2012.

Trafficware Ltd. 2004. "Syncho 6– Product Details." http://trafficware.infopop.cc/synchro_details.htm (accessed August 2013).

Tulare County Association of Governments (TCAG). 2010. 2011 Regional Transportation Plan.

University of California, Davis (UCD). 2007. CT-EMFAC: A Computer Model to Estimate Transportation Project Emissions. Prepared for the Division of Transportation Planning, California Department of Transportation. December 2007.

U.S. Environmental Protection Agency (USEPA). 1992. "Guideline for Modeling Carbon Monoxide from Roadway Intersections." November 1992.

———. 1999. "1999 National Scale Air Toxics Assessment." Available from web site, http://www.epa.gov/ttn/atw/nata1999/index.html.

———. 2003. "Ozone: Good Up High, Bad Nearby." EPA-451/K-03-001. Washington, DC: EPA, Office of Air and Radiation, June 2003. http://www.epa.gov/oar/oaqps/gooduphigh/ozone.pdf.

———. 2004. User's Guide for the AMS/EPA Regulatory Model – AERMOD. September 2004.

———. 2005a. Approval and Promulgation of Implementation Plans and Designation of Areas for Air Quality Planning Purposes; California; Carbon Monoxide Maintenance Plan Update for Ten Planning Areas; Motor Vehicles Emissions Budget; Technical Correction. 40 C.F.R. Parts 52 and 81. November 30, 2005.

———. 2005b. "Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle." February. Available from web site, http://www.epa.gov/otaq/climate/420f05004.htm. Accessed October 25, 2010.

———. 2005c. Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities. September 2005.

———. 2006a. Emission Factors & AP-42, Compilation of Air Pollutant Emission Factors. Chapter 11.12: Concrete Batching. June 2006.

———. 2006b. Emission Factors & AP-42, Compilation of Air Pollutant Emission Factors. Chapter 13.2.4: Aggregate Handling and Storage Piles. November 2006.

———. 2008. Federal Register, Vol. 73, No. 201, Thursday, October 16, 2008. Proposed Rule 61381. Environmental Protection Agency, 40 CFR Part 52, Approval and Promulgation of Implementation Plans: 1-Hour Ozone Extreme Area Plan for San Joaquin Valley, CA.

———. 2009a. "Adequacy Status of San Joaquin Valley 8-Hour Ozone Reasonable Further Progress and Attainment Plan Motor Vehicle Emissions Budgets." January 8, 2009. http://www.epa.gov/otaq/stateresources/transconf/adequacy/ltrs/sjv2009ltr.pdf. (accessed November 6, 2013).

———. 2009b. "Approval and Promulgation of Implementation Plans and Designation of Areas for Air Quality Planning Purposes; California; Carbon Monoxide Maintenance Plan Update for Ten Planning Areas; Motor Vehicles Emissions Budget; Technical Correction." Updated October 29, 2009. http://www.epa.gov/EPA-AIR/2005/November/Day-30/a23502.htm. Accessed January 22, 2010.

———. 2009c. Emission Factors for Locomotives. EPA-420-F-09-025. Prepared by the Office of Transportation and Air Quality. April 2009.

———. 2009d. "EPA Release MOVES2010 Mobile Source Emissions Model: Questions and Answers, EPA-420-F-09-073." December 2009.

———. 2010a. "Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act." http://www.epa.gov/climatechange/endangerment.html. Accessed September 12, 2010.

———. 2010b. Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas. December 2010.

———. 2011a. "National Summary of Carbon Monoxide Emissions." http://www.epa.gov/air/emissions/co.htm. Accessed May 2011.

———. 2011b. "eGRID2010 Version 1.1 Year 2007 Summary Tables." http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2010V1_1_year07_SummaryTables.pdf (accessed July 21, 2011).———. 2011c. "Integrated Risk Information System." http://www.epa.gov/ncea/iris/index.htm. Accessed May 2011.

———. 2011d. Greenhouse Gas Emissions from a Typical Passenger Vehicle. http://www.epa.gov/otaq/climate/documents/420f11041.pdf. December 2011.

———. 2012a. "Welfare Effects – Greenhouse Effect." http://www.epa.gov/apti/course422/ap7b2.html (accessed November 2012).

———. 2012c. "Nonattainment Status for Each County by Year for California." http://www.epa.gov/oar/oaqps/greenbk/anay_ca.html (accessed November 2012).

———. 2013. "Mobile Source Air Toxics." http://www.epa.gov/otaq/toxics.htm (accessed November 18, 2013).

———. 2013b. "US EPA Green Book: Carbon Monoxide Information." http://www.epa.gov/oaqps001/greenbk/cindex.html (accessed August 2013).

———. No date. Graphic to illustrate PM2.5. Washington, DC: EPA, no date. http://www.epa.gov/pm/graphics/pm2_5_graphic_lg.jpg.

Watson, J.G. 1996. Effectiveness Demonstration of Fugitive Dust Control Methods for Public Unpaved Roads and Unpaved Shoulders on Paved Roads. DRI Document No. 685-5200. IF2. Prepared for San Joaquin Valley Unified Air Pollution Control District. August 2, 1996.

Western Regional Climate Center. 2009. "Historical Climate Information, Fresno, California, Normals, Means, and Extremes." http://www.wrcc.dri.edu/cgi-bin/clilcd.pl?ca93193. Accessed October 27, 2009.

White House Council on Environmental Quality (CEQ). 2010. Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions. February 18, 2010.

10.1.2 Persons and Agencies Consulted

Barber, Dan. 2010. Air Quality Supervisor, SJVAPCD. Personal communication with Andrea White, CH2M Hill, regarding GHG construction emissions. December 29, 2010.

Earle, Quentin George. 2010. Hatch Mott MacDonald, Principal Project Manager. Phone conversation with Avanti Tamhane, URS, Air Quality Engineer, regarding maintenance activities for the California High-Speed Train. July 2010.

Shenson, David. 2010. Transportation Manager, County of Fresno Department of Public Works, Personal communication with Jodi Ketelsen, CH2M HILL. October 13, 2010.

Villalvazo, Leland. 2014. Supervising Air Quality Specialist, SJVAPCD. Email correspondence with David Joe, URS, Air Quality Engineer, regarding SJVAPCD significant impact levels. February 26, 2014.

Willis, Jessica. 2010. Air Quality Specialist (CEQA Significance Thresholds), SJVAPCD. Email correspondence with Cheri Velzy, URS-HMM-Arup Joint Venture, regarding the constituents for which the SJVAPCD has significance thresholds. August 4, 2010.

Chapter 11.0
Preparer Qualifications

11.0 Preparer Qualifications

Preparer & Title	Degrees/Qualifications
Avanti Tamhane Air Quality Engineer Principal Author	M.S., Environmental Analysis and Decision Making, Rice University, Houston, TX. B.S., Chemical Engineering, Rice University, Houston, TX.
Tim Rimpo Senior Air Quality Scientist Senior Technical Reviewer	M.S. Economics (Natural Resource and Environmental Specialization) Colorado State University, Fort Collins, Colorado B.A. Economics, University of Virginia, Charlottesville, Virginia
Ouattara Chris Fatogoma Senior Air Quality Specialist Quality Assurance/ Quality Control	Ph.D., Environmental Engineering, Purdue University, West Lafayette, IN. M.S., Environmental Engineering and Atmospheric Science, Purdue University, West Lafayette, IN. B.S., Physics, National University, Ivory Coast.
Nathalia Prasetyo Jo Air Quality Engineer	B.S., Chemical Engineering, University of California, Berkeley.
Jon Tamimi Air Quality Scientist	B.S., Chemical Engineering, University of California, Davis
David Joe Air Quality Engineer	M.S., Civil and Environmental Engineering, University of California, Davis B.S., Civil and Environmental Engineering, University of California, Davis
David Weaver Senior Air Quality Engineer	Ph.D., Chemical Engineering, Stanford University M.S., Chemical Engineering, Stanford University B.S., Chemical Engineering, Massachusetts Institute of Technology

This page intentionally left blank