FINAL
AIR QUALITY ANALYSIS

YERBA BUENA ISLAND RAMPS IMPROVEMENT PROJECT

SF-80 PM 7.6/8.1

EA 04-3A640K

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ACRONYMS AND ABBREVIATIONS

°F	Fahrenheit
$\mu g/m^3$	micrograms per cubic meter
AADT	annual average daily trips
ACM	asbestos containing material
ADT	Average daily trips
ARB	California Air Resources Board
BAAQMD	Bay Area Air Quality Management District
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standard
Caltrans	California Department of Transportation
CAP	Clean Air Plan
CCAA	California Clean Air Act of 1988
CDC	California Department of Conservation
CFR	Code of Federal Regulations
CO	carbon monoxide
diesel PM	diesel-fueled engines
EPA	U.S. Environmental Protection Agency
ESA	environmental site assessments
FHWA	Federal Highway Administration
FHWA Interim Guidance	Federal Highway Administration's *Interim Guidance on Air Toxic Analysis for NEPA Documents*
ft.	feet
FTA	Federal Transit Administration
HAP	hazardous air pollutant
HEI	Health Effects Institute
HOV	high occupancy vehicle
I-80	Interstate 80
IRIS	Integrated Risk Information System
LOS	Level of Service
MEI	maximally exposed individual
MSAT	Mobile Source Air Toxic
MTC	Metropolitan Transportation Commission
NAAQS	National Ambient Air Quality Standards
NATA	National Air Toxics Assessment
NEPA	National Environmental Protection Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants

NLEV	national low emission vehicle
NO	nitric oxide
NO_2	nitrogen dioxide
NOA	naturally occurring asbestos
NOAA	National Oceanic and Atmospheric Administration
NO_X	oxides of nitrogen
OEHAA	Office of Environmental Health Hazard Assessment
ozone	photochemical smog
PAH	polycyclic aromatic hydrocarbons
PM	particulate matter
PM_{10}	particulate matter with aerodynamic diameter less than 10 microns
$PM_{2.5}$	particulate matter with aerodynamic diameter less than 2.5 microns
POAQC	projects of air quality concern
ppm	parts per million
proposed project	Yerba Buena Island Ramp Improvement Project
Protocol	*Transportation Project-Level Carbon Monoxide Protocol*
RFG	reformulated gasoline
RTIP	Regional Transportation Improvement Plan
RTP	Regional Transportation Plan
SFBAAB	San Francisco Bay Area Air Basin
SFCTA	San Francisco County Transportation Authority
SFOBB	San Francisco-Oakland Bay Bridge
SIP	State Implementation Plan
SO_2	sulfur dioxide
TAC	toxic air contaminant
TI	Treasure Island
TIP	Transportation Improvement Program
UCD ITS	University of California, Davis Institute of Transportation Studies
USCG	U.S. Coast Guard
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
VMT	vehicle miles traveled
VOC	volatile organic gases
YBI	Yerba Buena Island

CHAPTER 1.0 – INTRODUCTION

1.1 INTRODUCTION

The San Francisco County Transportation Authority (SFCTA) proposes to replace the existing westbound on- and off-ramps located east of the Yerba Buena Island (YBI) tunnel with new westbound on- and off-ramps. The project, referred to as the Yerba Buena Island Ramp Improvement Project (proposed project), is located in San Francisco County (the County), approximately halfway between the City of San Francisco and the City of Oakland along the San Francisco-Oakland Bay Bridge (SFOBB). Exhibit 1 shows the location of the project on a regional map, and Exhibit 2 provides a vicinity map for the project site.

The primary purpose of the proposed project is to improve the safety of the existing westbound on- and off-ramps. The existing ramps do not meet current California Department of Transportation (Caltrans) design standards. The new ramps would address the current geometric deficiencies of the existing ramps, provide standard deceleration distance for the off-ramp, and improve acceleration/merging distance for the on-ramp. Overall, implementation of the proposed project would improve traffic operations to and from YBI.

This analysis also provides a description of the regulatory framework for air quality management on federal, state, and regional levels. In addition, this analysis will evaluate the types (e.g., criteria air pollutants, toxic air contaminants [TACs]) and relative quantities of air pollutant emissions that would be generated during short-term construction activities associated with the ramp improvements and the change in long-term operational emissions following completion of the proposed project. The following analysis of air quality impacts is based on air quality regulations administered by the U.S. Environmental Protection Agency (USEPA), Federal Highway Administration (FHWA), Caltrans, the California Air Resources Board (ARB), and the Bay Area Air Quality Management District (BAAQMD).

Source: Prepared by EDAW 2009

Exhibit 1. Regional Map

Source: Prepared by EDAW 2009

Exhibit 2. Project Vicinity Map

1.2 SUMMARY

The proposed project is included in the Transportation 2035 Plan (2035 RTP [Regional Transportation Plan]) as Reference Number 230555 (Reconstruct ramps on east side of the San Francisco-Oakland Bay Bridge's Yerba Buena Island Tunnel) (MTC 2008a). The FHWA and Federal Transit Administration (FTA) adopted the air quality conformity finding for the 2035 RTP on May 29, 2009. The project is also included in Metropolitan Transportation Commission (MTC) financially constrained 2009 Transportation Improvement Program (2009 TIP) on page 38 as TIP ID SF-070027 – Yerba Buena Island Ramp Improvements (MTC 2008b). The design concept and scope of the proposed project are consistent with the project description in the 2035 RTP, the 2009 TIP, and the assumptions in MTC's regional emissions analysis. Therefore, the project would satisfy the regional conformity requirements and is assumed to conform to the State Implementation Plan (SIP). Thus, no adverse regional air quality impact would occur as a result of the project.

This is a new project in an area designated as nonattainment/maintenance for transportation-related criteria air pollutants and therefore, a new project-level conformity determination is required. Analysis of local carbon monoxide (CO) and particulate matter (PM) impacts is required to demonstrate conformity at a project level. The San Francisco Bay Area Air Basin (SFBAAB) is currently a CO maintenance area and therefore federal projects located within the SFBAAB require a local CO impact analysis. Analysis of CO impacts in accordance with the *Transportation Project-Level Carbon Monoxide Protocol* (Protocol) (UCD ITS 1997) shows that the project is satisfactory with respect to local CO impacts and would not cause a violation of the state or federal CO ambient air quality standards. The SFBAAB is designated as an attainment area for particulate matter with aerodynamic diameter less than 10 microns (PM_{10}). In December 2008, the SFBAAB was designated as a nonattainment area for the new 35 micrograms per cubic meter ($\mu g/m^3$) 24-hour particulate matter with aerodynamic diameter less than 2.5 microns ($PM_{2.5}$) standard, which replaced the previous 65 $\mu g/m^3$ 24-hour standard in September 2006. Prior to the December 2008 designation, the SFBAAB was designated as a $PM_{2.5}$ attainment area for the 65 $\mu g/m^3$ 24-hour $PM_{2.5}$ standard. On October 9, 2009, USEPA published a final ruling that designated the SFBAAB as nonattainment for the 2006 24-hour $PM_{2.5}$ standard. In accordance with the new nonattainment status, an analysis of the proposed project's localized PM impacts was also conducted. According to USEPA's *Transportation Conformity Guidance for Qualitative Hot Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (PM Guidance), PM impacts from transportation projects are of concern only for projects defined as "projects of air quality concern" (POAQC) (FHWA 2006a). Analysis of proposed project pursuant to the PM Guidance determined that the project is not a POAQC.

The proposed project was evaluated for potential Mobile Source Air Toxics (MSATs) air quality impacts in accordance with the FHWA's *Interim Guidance on Air Toxic Analysis for NEPA Documents* (FHWA Interim Guidance) (FHWA 2006b) and *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents* (MSAT Interim Guidance Update) (FHWA 2009a) and was found to not result in any adverse MSAT impacts.

In addition, a discussion of construction emissions, potential impacts, and measures to avoid or minimize the impacts is included in this analysis. These emissions would be temporary and would cease at the completion of construction activities.

1.3 PROJECT DESCRIPTION

The proposed project is located in the County along the SFOBB. YBI is only accessible to vehicular traffic via the SFOBB stretch of Interstate 80 (I-80). The SFOBB is considered a "lifeline structure" and is a critical link between the East Bay and San Francisco. It provides the only vehicle access to YBI, the active U.S. Coast Guard (USCG) facilities located on the south side of the island, and Treasure Island (TI), located immediately north of YBI.

The current ramps do not meet current Caltrans design standards. The proposed project would remove the existing ramps and construct new ramps that maintain the functional role of the current ramps while satisfying seismic requirements, highway design standards, traffic operations, and improving safety. The new ramps would also provide standard deceleration distance for the off-ramp and improved acceleration/merging distance for the on-ramp. The proposed project is independent of both the SFOBB East Span Seismic Safety Project, currently under construction, and the Treasure Island and Yerba Buena Island (TI/YBI) Redevelopment Plan, currently undergoing its own environmental review process.

The proposed project is located between post-mile 7.6 and 8.1 beginning at the east portal of the YBI tunnel and ending at the east side of the Transition Structure portion of the new SFOBB. The SFOBB Transition Structure is located between post mile 7.9 and 8.1 between the YBI tunnel and the SFOBB Self-Anchored Suspension span.

Alternatives have been proposed to address the geometric deficiencies of the existing on- and off-ramps. The three following alternatives are currently under consideration:

- **No Build Alternative**

  This Alternative assumes that the existing on- and off-ramps would remain in place and no further action or improvements would occur.

- **Alternative 2b**

  Alternative 2b would include removal of the existing westbound on- and off-ramps on the east side of YBI, construction of a westbound loop on-ramp from Macalla Road on the east side of YBI, and construction of a westbound off-ramp to Macalla Road on the east side of YBI.

  This alternative proposes to reconstruct two of the existing six on- and off-ramps at the I-80/YBI interchange. The proposed on- and off-ramps would provide standard shoulder widths, and would include the following features:

  - Westbound on-ramp on the east side of YBI — This ramp would begin at the "T" intersection at Macalla Road, loop right with a tight radius, and merge on to the north side of the SFOBB. The length of this ramp would be approximately 876 feet. This ramp would have two traffic lanes merging into one as it connects to the SFOBB. One lane would be a high occupancy vehicle (HOV) lane and the other a mixed-flow lane.

  - Westbound off-ramp on the on the east side of YBI — This ramp would diverge from the new SFOBB Transition Structure between bents W3 and W4 curving around the Nimitz House and terminate at the "T" intersection at Macalla Road. The length of this ramp would be approximately 1,115 feet. A stop sign is proposed at the ramp terminus.

  - Macalla Road would be widened for approximately 660 feet adjacent to the terminus of the westbound on- and off-ramps. The existing roadway is about 20 feet wide near the ramp terminus. The roadway widening is required to accommodate a 12-foot-wide multi-use pedestrian/bike path and two 12-foot-wide lanes within the Caltrans right-of-way. A retaining wall would be constructed adjacent to Macalla Road to provide the required width. The height of the retaining wall would vary from 4 to 16 feet and would retain the hillside above Macalla Road. The stairway adjacent to the Caltrans Substation would be relocated to the west side of the building to make room for the new retaining wall. The roadway width would vary around the curve at South Gate Road to provide proper width for truck turning movements.

  - Under Alternative 2b, the westbound on- and off-ramps would terminate at Macalla Road where Quarters 10 and Building 267 are currently located. Quarters 10 and Building 267 would be relocated prior to construction of the ramps at Macalla Road. The relocation site for these buildings would be on YBI and would be determined under the Section 106 mitigation development process.

- **Alternative 4**

  Alternative 4 would include the removal of the existing westbound on- and off-ramps on the east side of the YBI, construction of a westbound on-ramp from South Gate Road, and construction of a westbound off-ramp to Macalla Road on the east side of YBI.

  This alternative proposes to reconstruct two of the existing six on- and off-ramps at the I-80/YBI interchange. The proposed on- and off-ramps would provide standard shoulder widths, and would include the following features:

  - Westbound on-ramp on the east side of YBI — This ramp would begin at South Gate Road, proceed east paralleling the eastbound on-ramp, loop under the new SFOBB Transition Structure near its eastern end to provide adequate merging distances, cross over the westbound off-ramp along the north side of the SFOBB. The length of this ramp would be approximately 2,883 feet. A HOV lane would not be provided under Alternative 4.

  - Westbound off-ramp on the east side of YBI — This ramp would diverge from the new SFOBB Transition Structure between bents W2 and W3, parallel the Transition Structure, cross under the westbound on-ramp and terminate at the "T" intersection at Macalla Road. The length of this ramp would be approximately 1,168. A stop sign is proposed at the ramp terminus.

  - Macalla Road would be widened for approximately 660 feet adjacent to the terminus of the westbound on- and off-ramps. The existing roadway is about 20 feet wide near the ramp terminus. The roadway widening is required to accommodate a 12-foot-wide multi-use pedestrian/bike path and two 12-foot-wide lanes within the Caltrans right-of-way. A retaining wall would be constructed adjacent to Macalla Road to provide the required width. The height of the retaining wall would vary from 4 to 16 feet and would retain the hillside above Macalla Road. The roadway width would vary around the curve at South Gate Road to provide proper width for truck turning movements.

  - Under Alternative 4, Quarters 10 and Building 267 and its associated landscaping would remain in place.

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CHAPTER 2.0 – REGULATORY SETTING

The Clean Air Act (CAA) as amended in 1990 is the federal law that governs air quality. Its counterpart in California is the California Clean Air Act of 1988 (CCAA). These laws set standards for the quantity of pollutants that can be in the air. At the federal level, these standards are called National Ambient Air Quality Standards (NAAQS). NAAQS have been established for six criteria air pollutants that have been linked to potential health concerns; the criteria air pollutants are CO, nitrogen dioxide (NO_2), ozone, PM (which PM_{10} and $PM_{2.5}$ are a subset of), lead, and sulfur dioxide (SO_2).

Under the 1990 CAA Amendments, the U.S. Department of Transportation (USDOT) cannot fund, authorize, or approve federal actions to support programs or projects that are not first found to conform to the SIP for achieving the goals of the CAA requirements. The specific requirements for determining conformity for transportation projects are included in the USEPA's Transportation Conformity Rule. Transportation conformity with the CAA takes place on two levels—first, at the regional level and second, at the project level. The proposed project must conform at both levels to be approved.

Regional level conformity within California is focused on the standards set for CO, NO_2, ozone, and PM, as California is in attainment for the other criteria air pollutants. At the regional level, RTPs are developed that include all of the transportation projects planned for a region over a period of years, usually at least 20. Based on the projects included in the RTP, air quality modeling is conducted to determine whether the implementation of those projects would conform to emission budgets or other tests showing that the projects in the RTP would not obstruct or conflict with the SIP regarding the timely attainment of the NAAQS. If conformity with the SIP is demonstrated, the regional planning organization, such as MTC for the SFBAAB and the appropriate federal agencies, such as the USDOT, make determinations that the RTP is in conformity with the SIP for achieving the goals of the CAA. Otherwise, the projects in the RTP must be modified until conformity is attained. If the design and scope of the proposed transportation project are the same as those described in the RTP, then the proposed project is deemed to meet regional conformity requirements.

Conformity at the project-level requires a "hot spot" (i.e., exceedance of NAAQS or California Ambient Air Quality Standard [CAAQS]) analysis if an area is a "nonattainment" or "maintenance" area for CO and/or PM. A region is a "nonattainment" area if one or more monitoring stations in the region fail to attain the relevant standard. Areas that were previously designated as nonattainment areas, but have recently met the standard are called "maintenance" areas. A "hot spot" analysis is essentially the same, for technical purposes, as a CO or PM analysis performed for National Environmental Protection Act (NEPA) purposes. Conformity does include some specific standards for projects that require a "hot spot" analysis. In general, projects must not cause the CO standard to be violated, and in "nonattainment" areas the project must not cause any increase in the number and severity of violations. If a known CO or PM violation is located in the project vicinity, the project must include measures to reduce or eliminate the existing violation(s) as well. The SFBAAB is a CO "maintenance" area; therefore, the proposed project is subject to a CO "hot spot" analysis. As discussed above, the SFBAAB was previously designated as attainment for the $PM_{2.5}$ standard; however, in December 2008, it was designated as nonattainment for the new $PM_{2.5}$ 24-hour standard (i.e., 35 $\mu g/m^3$). On October 9, 2009, USEPA published a final ruling that designated the SFBAAB as nonattainment for the 2006 24-hour $PM_{2.5}$ standard. The ruling will become effective 30 days after publication in the Federal Register; however, in anticipation of the new nonattainment status, a PM "hot spot" analysis was performed for the proposed project.

2.1 REGIONAL SETTING

Management of air quality in the basin is the responsibility of the BAAQMD. The BAAQMD is responsible for bringing and/or maintaining air quality in the basin within federal and state air quality standards. Specifically, the BAAQMD has responsibility for monitoring ambient air pollutant levels throughout the basin and developing and implementing attainment strategies to ensure that future emissions will be within federal and state standards. The following plans have been developed by the BAAQMD to achieve attainment of the federal and state ozone standards. The Clean Air Plan (CAP) and Ozone Strategy fulfill the planning requirements of the CCAA, while the Ozone Attainment Plan fulfills the federal CAA requirements. In addition, in December of 1999, the BAAQMD released a revision to the previously adopted CEQA guidelines document. The BAAQMD is currently in the process of updating its CEQA guidelines and recommended significance thresholds. The new guidelines would involve developing quantitative CEQA significance thresholds for construction-related emissions of criteria air pollutants, precursors, TACs, and GHG (BAAQMD 2009). The BAAQMD expects to adopt these new thresholds of significance in late 2009.

Bay Area Air Quality Management District Rules and Regulations

The BAAQMD is primarily responsible for limiting the amount of emissions that can be generated throughout the basin by stationary sources. Specific rules and regulations have been adopted that limit emissions that can be generated by various uses and/or activities and identify specific pollution reduction measures that must be implemented in association with various uses and activities. These rules regulate not only the emissions of the state and federal criteria air pollutants, but also the emissions of TACs. The rules are also subject to ongoing refinement by the BAAQMD. The following rules and regulations would apply to the proposed project:

- Regulation 7: Odorous Substances;
- Regulation 8, Rule 3: Architectural Coatings; and
- Regulation 8, Rule 15: Emulsified Asphalt.

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CHAPTER 3.0 – AFFECTED ENVIRONMENT

The proposed project is located along the SFOBB, approximately 2.3 miles northeast of the City of San Francisco. The project site is located in the County, which is part of the SFBAAB. The SFBAAB includes all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara counties as well as the southern half of Sonoma County and the southwestern portion of Solano County. Air quality within the SFBAAB is regulated by USEPA, ARB, and BAAQMD. The following analysis describes the existing air quality conditions on a regional and local level that influence air quality.

3.1 TOPOGRAPHY, METEOROLOGY, AND CLIMATE

The SFBAAB is characterized by complex terrain, consisting of coastal mountain ranges, inland valleys, and bays, which distort normal wind flow patterns. Air quality within the SFBAAB is influenced by two main mountain ranges. The Diablo Range forms the eastern and southern border while the Coast Range forms the western border. The gaps and directional orientation of these mountain ranges affect the location of where air flow enters and exits the SFBAAB. In the northern portion of the SFBAAB, the Coast Range splits, resulting in the western (Golden Gate) coast gap and the eastern (Carquinez Strait) coast gap. These gaps allow air to flow in and out of the SFBAAB. The Golden Gate coast gap allows marine air during afternoons and evenings to flow into the SFBAAB, which disperses and transports air pollution to neighboring counties and air basins. Winds coming from the Pacific Ocean through the Golden Gate coast gap have typical speeds of 20–30 miles per hour (NOAA 1995). Air flows into Solano County through the Carquinez Strait, moving across the Sacramento–San Joaquin River Delta, and transporting pollution from the Bay Area. In the areas south of the Carquinez Strait, the Coast Range, which has an average elevation of 3,000 feet, impedes pollutants from dispersing to the east.

Localized meteorological conditions, such as moderate winds, disperse pollutants and reduce pollutant concentrations. An inversion layer develops when a layer of warm air traps cooler air close to the ground. Such temperature inversions hamper dispersion by creating a ceiling over the area and trapping air pollutants near the ground. During summer mornings and afternoons, these inversions are present in the northeast areas of the SFBAAB. During summer's longer daylight hours, plentiful sunshine provides the energy needed to fuel photochemical reactions between volatile organic gases (VOC) and oxides of nitrogen (NO_X), which result in ozone formation.

Local meteorology of the project area is represented by measurements recorded at the San Francisco Bay Area station. The region receives an average of 21.5 inches of precipitation per year, which primarily occurs from the months of October through April (NOAA 1995). Off-season rains (May through September) account for approximately 5 percent of the annual average rainfall. Maximum summer temperatures range from 60 to 70 degrees Fahrenheit (°F). Minimum wintertime temperatures range from 45 to 50°F (NOAA 1995).

Climate within the SFBAAB is largely controlled by the presence of the Pacific High Pressure Cell, which is located in the northern Pacific Ocean off the coast of California. During the summertime, the High Pressure Cell deflects incoming storms from traveling inland. As a result, the SFBAAB receives little precipitation during these months, as described above. Beginning in the fall and continuing through the winter, the High Pressure Cell weakens and resides off the coast of Southern California. The absence of the High Pressure Cell allows storms to travel inland and reach many portions of the SFBAAB. Temperature, winds, and rainfall become more variable during the winter months with the frequent presence of dense fog. Winter weather patterns include periods of stormy weather with rain and gusty winds.

3.2 EXISTING SENSITIVE RECEPTORS

Sensitive land uses are facilities that generally house people that may experience adverse effects from unhealthful concentrations of air pollutants (i.e., sensitive receptors). Commonly identified sensitive land uses are residences, schools, playgrounds, childcare centers, retirement homes or convalescent homes, hospitals, and clinics. Sensitive receptors in the project area include three residential units south of the project site (approximately 650 feet). Commercial buildings are situated to the west and southeast of the project site; however, these uses are not considered sensitive receptors.

3.3 EXISTING AIR QUALITY — CRITERIA AIR POLLUTANTS

Criteria air pollutants can cause health risks to the public when their concentrations reach certain levels. As discussed above, the meteorology, topography, and climate of a region can influence the concentration and dispersion of air pollutants in the atmosphere. A brief description of each criteria air pollutant including source types, health effects, and future trends is provided below along with the current attainment area designations and monitoring data for the project study area.

Ozone

Ozone is a photochemical oxidant, a substance whose oxygen combines chemically with another substance in the presence of sunlight, and the primary component of smog. Ozone is not directly emitted into the air, but is formed through complex chemical reactions between precursor emissions of VOC and NO_X in the presence of sunlight. VOC emissions result primarily from incomplete combustion and the evaporation of chemical solvents and fuels. NO_X are a group of gaseous compounds of nitrogen and oxygen that results from the combustion of fuels.

Ozone located in the upper atmosphere (stratosphere) acts in a beneficial manner by shielding the earth from harmful ultraviolet radiation that is emitted by the sun. However, ozone located in the lower atmosphere (troposphere) is a major health and environmental concern. Meteorology and terrain play a major role in ozone formation. Generally, low wind speeds or stagnant air coupled with warm temperatures and clear skies provide the optimum conditions for formation. As a result, summer is generally the peak ozone season. Because of the reaction time involved, peak ozone concentrations often occur far downwind of the precursor emissions. Therefore, ozone is a regional pollutant that often affects large areas. In general, ozone concentrations over or near urban and rural areas reflect an interplay of emissions of ozone precursors, transport, meteorology, and atmospheric chemistry (Godish 2004).

The adverse health effects associated with exposure to ozone pertain primarily to the respiratory system. Scientific evidence indicates that ambient levels of ozone affect not only sensitive receptors, such as asthmatics and children, but healthy adults as well. Exposure to ambient levels of ozone ranging from 0.10 to 0.40 parts per million (ppm) for 1 or 2 hours has been found to significantly alter lung function by increasing respiratory rates and pulmonary resistance, decreasing tidal volumes, and impairing respiratory mechanics. Ambient levels of ozone above 0.12 ppm are linked to symptomatic responses that include such symptoms as throat dryness, chest tightness, headache, and nausea. In addition to the above adverse health effects, evidence also exists relating ozone exposure to an increase in the permeability of respiratory epithelia; such increased permeability leads to an increase in responsiveness of the respiratory system to challenges, and the interference or inhibition of the immune system's ability to defend against infection (Godish 2004).

Emissions of ozone precursors VOC and NO_X have decreased over the past several years as a result of more stringent motor vehicle standards and cleaner burning fuels. Consequently, peak 1-hour and 8-hour ozone concentrations in the SFBAAB have declined overall by about 18 percent during the last 20 years. Peak 1-hour and 8-hour ozone concentrations in the SFBAAB have declined approximately 17 percent and 18 percent, respectively, in the past 20 years (1988 to 2007) (ARB 2009a). However, it is not clear if this reduction represents a significant change in the overall trend due to the variability caused by meteorological conditions in the SFBAAB (ARB 2009a).

Carbon Monoxide

CO is a colorless, odorless gas that is formed when carbon in fuel is not burned completely. It is a component of motor vehicle exhaust, which contributes about 56 percent of all CO emissions nationwide. Other non-road engines and vehicles (such as construction equipment and boats) contribute about 22 percent of all CO emissions nationwide. Higher levels of CO generally occur in areas with heavy traffic congestion. In cities, 85–95 percent of all CO emissions may come from motor vehicle exhaust. Other sources of CO emissions include industrial processes (such as metals processing and chemical manufacturing), residential wood burning, and natural sources such as forest fires. Woodstoves, gas stoves, cigarette smoke, and unvented gas and kerosene space heaters are sources of CO indoors. The highest levels of CO in the outside air typically occur during the colder months of the year when inversion conditions are more frequent. The air pollution becomes trapped near the ground beneath a layer of warm air (USEPA 2009a).

CO enters the bloodstream through the lungs by combining with hemoglobin, which normally supplies oxygen to the cells. However, CO combines with hemoglobin much more readily than oxygen does, resulting in a drastic reduction in the amount of oxygen available to the cells. Adverse health effects associated with exposure to CO concentrations include such symptoms as dizziness, headaches, and fatigue. CO exposure is especially harmful to individuals who suffer from cardiovascular and respiratory diseases (USEPA 2009a).

The highest concentrations are generally associated with cold, stagnant weather conditions that occur during the winter. In contrast to problems caused by ozone, which tends to be a regional pollutant, CO problems tend to be localized.

Nitrogen Dioxide

NO_2 is a brownish, highly reactive gas that is present in all urban environments. The major human-made sources of NO_2 are combustion devices, such as boilers, gas turbines, and mobile, and stationary reciprocating internal-combustion engines. Combustion devices emit primarily nitric oxide (NO), which reacts through oxidation in the atmosphere to form NO_2 (USEPA 2009a). The combined emissions of NO and NO_2 are referred to as NO_X, which are reported as equivalent NO_2. Because NO_2 is formed and depleted by reactions associated with photochemical smog (ozone), the NO_2 concentration in a particular geographical area may not be representative of the local NO_X emission sources.

Inhalation is the most common route of exposure to NO_2. Because NO_2 has relatively low solubility in water, the principal site of toxicity is in the lower respiratory tract. The severity of the adverse health effects depends primarily on the concentration inhaled rather than the duration of exposure. An individual may experience a variety of acute symptoms, including coughing, difficulty with breathing, vomiting, headache, and eye irritation, during or shortly after exposure. After a period of approximately 4–12 hours, an exposed individual may experience chemical pneumonitis or pulmonary edema with breathing abnormalities, cough, cyanosis, chest pain, and rapid heartbeat. Severe, symptomatic NO_2 intoxication after acute exposure has been linked on occasion with prolonged respiratory impairment, with such symptoms as chronic bronchitis and decreased lung functions (USEPA 2009a).

Sulfur Dioxide

SO_2 is produced by such stationary sources as coal and oil combustion, steel mills, refineries, and pulp and paper mills. The major adverse health effects associated with SO_2 exposure pertain to the upper respiratory tract. SO_2 is a respiratory irritant with constriction of the bronchioles occurring with inhalation of SO_2 at five ppm or more. On contact with the moist mucous membranes, SO_2 produces sulfurous acid, which is a direct irritant. Concentration rather than duration of the exposure is an important determinant of respiratory effects. Exposure to high SO_2 concentrations may result in edema of the lungs or glottis and respiratory paralysis.

Particulate Matter

Respirable particulate matter with an aerodynamic diameter of 10 micrometers or less is referred to as PM_{10}. PM_{10} consists of particulate matter emitted directly into the air, such as fugitive dust, soot, and smoke from mobile and stationary sources; construction operations, fires, and natural windblown dust, and particulate matter formed in the atmosphere by condensation and/or transformation of SO_2 and VOC (USEPA 2009a). $PM_{2.5}$ is another classification of particulate matter that has been evaluated as a pollutant due to the increased health risks associated with these smaller particulates that can reach deeper into the lungs (ARB 2009a).

The adverse health effects associated with PM_{10} depend on the specific composition of the particulate matter. For example, health effects may be associated with metals, polycyclic aromatic hydrocarbons (PAH), and other toxic substances adsorbed onto fine particulate matter (which is referred to as the “piggybacking effect”), or with fine dust particles of silica or asbestos. Generally, adverse health effects associated with PM_{10} may result from both short-term and long-term exposure to elevated concentrations and may include breathing and respiratory symptoms, aggravation of existing respiratory and cardiovascular diseases, alterations to the immune system, carcinogenesis, and premature death (USEPA 2009a). $PM_{2.5}$ poses an increased health risk because the particles can deposit deep in the lungs and contain substances that are particularly harmful to human health.

Direct emissions of both PM_{10} and $PM_{2.5}$ increased slightly in the SFBAAB between 1975 and 2005 and are projected to increase through 2020. These emissions are dominated by areawide sources, primarily because of development. Direct emissions of PM from mobile and stationary sources have remained relatively steady (ARB 2009a).

Lead

Lead is a metal found naturally in the environment as well as in manufactured products. The major sources of lead emissions have historically been mobile and industrial sources. As a result of the phase-out of leaded gasoline, as discussed in detail below, metal processing is currently the primary source of lead emissions. The highest levels of lead in air are generally found near lead smelters. Other stationary sources are waste incinerators, utilities, and lead-acid battery manufacturers.

Twenty years ago, mobile sources were the main contributor to ambient lead concentrations in the air. In the early 1970s, USEPA set national regulations to gradually reduce the lead content in gasoline. In 1975, unleaded gasoline was introduced for motor vehicles equipped with catalytic converters. USEPA banned the use of leaded gasoline in highway vehicles in December 1995 (USEPA 2009a).

As a result of USEPA's regulatory efforts to remove lead from gasoline, emissions of lead from the transportation sector have declined dramatically (95 percent between 1980 and 1999), and levels of lead in the air decreased by 94 percent between 1980 and 1999. Transportation sources, primarily airplanes, now contribute only 13 percent of lead emissions. A recent National Health and Nutrition Examination Survey reported a 78-percent decrease in the levels of lead in people's blood between 1976 and 1991. This dramatic decline can be attributed to the move from leaded to unleaded gasoline (USEPA 2009a).

Lead emissions and ambient lead concentrations have decreased dramatically in California over the past 25 years. The rapid decrease in lead concentrations can be attributed primarily to phasing out the lead in gasoline. This phase-out began during the 1970s, and subsequent ARB regulations have eliminated virtually all lead from gasoline now sold in California. All areas of the state are currently designated as attainment for the state lead standard (USEPA does not designate areas for the national lead standard). Although the ambient lead standards are no longer violated, lead emissions from stationary sources still pose "hot spot" problems in some areas. As a result, ARB has identified lead as a TAC.

Monitoring Station Data

To identify ambient concentrations of criteria air pollutants, the BAAQMD and ARB operate more than 30 air quality monitoring stations throughout the SFBAAB. The nearest monitoring station to the project site is located at 10 Arkansas Street in San Francisco, approximately four miles southwest of the project site. This monitoring station measures ozone, NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$. In general, the ambient air-quality measurements from this station are representative of the air quality in the project area. Table 1 summarizes the air quality data from the most recent 3 years (2006–2008).

Table 1 lists the concentrations registered and the exceedances of CAAQS and the NAAQS that have occurred at this monitoring station from 2006 through 2008. During this period, the station did not register any days above the state 1-hour or 8-hour ozone standards. The state CO and NO_2 standards were also not exceeded at the monitoring station in the last 3 years. The 24-hour PM_{10} CAAQS was exceeded on multiple days in 2006 and 2007, but not in 2008. The 24-hour $PM_{2.5}$ NAAQS was also exceeded during 2006 and 2007, but not in 2008.

Table 1. Summary of Annual Ambient Air Quality Data [1]

	2006	2007	2008
OZONE			
Maximum concentration (1-hour/8-hour, ppm)	0.053/0.046	0.060/0.053	0.082/0.066
Number of days state standard exceeded (1-hour/8-hour)	0/0	0/0	0/0
Number of days national standard exceeded (8-hour) [2]	0	0	0
Carbon Monoxide (CO)			
Maximum concentration (1-hour/8-hour, ppm)	2.7/2.09	2.5/1.60	2.1/2.29
Number of days state standard exceeded (8-hour)	0	0	0
Number of days national standard exceeded (1-hour/8-hour)	0/0	0/0	0/0
Nitrogen Dioxide (NO_2)			
Maximum concentration (1-hour, ppm)	0.107	0.069	0.062
Number of days state standard exceeded	0	0	0
Annual average (ppm)	0.016	0.016	0.016
Sulfur Dioxide (SO_2)			
Maximum concentration (24-hour, ppm)	0.007	0.006	0.004
Number of days state standard exceeded	0	0	0
Number of days national standard exceeded	0	0	0
Fine Particulate Matter ($PM_{2.5}$)			
Maximum concentration ($\mu g/m^3$) (National/California [3])	54.3/54.3	45.2/45.2	29.4/39.2
Number of days national standard exceeded (measured/estimated [4]) [5]	3/3.1	5/5.1	0/—
Annual average ($\mu g/m^3$) (National/California)	9.7/9.7	8.7/8.9	—/11.7
Respirable Particulate Matter (PM_{10})			
Maximum concentration ($\mu g/m^3$) (National/California [3])	58.0/61.4	65.7/69.8	41.2/41.3
Number of days state standard exceeded (measured/estimated [4])	3/17.3	2/12.0	0/0.0
Number of days national standard exceeded (measured/estimated [4])	0/0.0	0/0.0	0/0.0
Annual average ($\mu g/m^3$) (National/California)	22.9	21.9	2.00

Notes: $\mu g/m^3$ = micrograms per cubic meter; ppm = parts per million; — = data not available

1 Measurements were recorded at the Arkansas Street monitoring station.

2 The 8-hour national ozone standard was revised to 0.075 ppm in March 2008. Statistics shown are based on the previous 0.08 ppm standard.

3 State and national statistics may differ for the following reasons: State statistics are based on California-approved samplers, whereas national statistics are based on samplers using federal reference or equivalent methods. State and national statistics may therefore be based on different samplers. State statistics are based on local conditions while national statistics are based on standard conditions. State criteria for ensuring that data are sufficiently complete for calculating valid annual averages are more stringent than the national criteria.

4 Measured days are those days that an actual measurement was greater than the level of the state daily standard or the national daily standard. Measurements are typically collected every 6 days. Estimated days mathematically estimate the number of days concentrations would have been greater than the level of the standard had each day been monitored. The number of days above the standard is not necessarily the number of violations of the standard for the year.

5 The national $PM_{2.5}$ 24-hour standard was revised from 65 $\mu g/m^3$ to 35$\mu g/m^3$ in September 2006. Statistics shown are based on the 65 $\mu g/m^3$ standard.

Sources: ARB 2009b; USEPA 2009b

3.4 ATTAINMENT STATUS

Both ARB and USEPA use monitoring data (Table 1) to designate an area's attainment status for criteria air pollutants. The purpose of these designations is to identify areas with air quality problems and thereby initiate planning efforts for improvement. The three basic designation categories are "nonattainment," "attainment," and "unclassified." The "unclassified" designation is used in an area that cannot be classified on the basis of available information as meeting or not meeting the standards. In addition, ARB designations include a subcategory of the nonattainment designation, called "nonattainment-transitional." The nonattainment-transitional designation is given to nonattainment areas that are progressing and nearing attainment. The most recent attainment designations with respect to the SFBAAB are shown in Table 2 for each criteria air pollutant.

The determination of whether a region's air quality is healthful or unhealthful is made by comparing contaminant levels in ambient air samples to national and state standards. Health-based air quality standards have been established by ARB, at the state level, and USEPA, at the national level for the following criteria air pollutants: ozone, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and lead. These standards were established to protect the public with a margin of safety from adverse health impacts due to exposure to air pollution. California has also established standards for sulfates, visibility-reducing particles, hydrogen sulfide, and vinyl chloride. The state and national ambient air quality standards for each of the monitored pollutants are presented in Table 3. The current attainment designations for the County portion of the SFBAAB are summarized in Table 2 below.

Federal Attainment Status

The NAAQS (other than for ozone, PM_{10}, $PM_{2.5}$ and those based on annual averages or arithmetic mean) are not to be exceeded more than once per year. The NAAQS for ozone, PM_{10}, and $PM_{2.5}$ are based on statistical calculations over 1- to 3-year periods, depending on the pollutant. The SFBAAB is currently designated as a marginal nonattainment area with respect to the national ozone standard, a maintenance area with respect to the national CO standards, and a nonattainment area with respect to the $PM_{2.5}$ 24-hour standard. The SFBAAB is designated as attainment or unclassified for all other pollutants. Additional details regarding the national attainment status are provided in Table 2 above. The NAAQS along with health effects, atmospheric effects, and common source types are shown in Table 3.

Table 2. San Francisco Bay Area Air Basin California and Federal Attainment Status

Pollutant	Averaging Time	California Attainment Status	Federal Attainment Status
Ozone	1-hour	N	—
	8-hour	N	N
Carbon Monoxide (CO)	1-hour	A	A/M
	8-hour	A	A/M
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	—	U/A
	1-hour	A	—
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	—	—
	24-hour	A	A
	3-hour	—	—
	1-hour	A	—
Respirable Particulate Matter (PM_{10})	Annual Arithmetic Mean	N	—
	24-hour	N	U
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	N	A
	24-hour	—	N [1]
Lead	30-day Average	A	—
	Calendar Quarter	—	A

Notes: N = nonattainment; A = attainment; M = maintenance; U/A = unclassified/attainment; U = unclassified; — = no standard
[1] On October 9, 2009, USEPA published a final ruling in the Federal Register designating the SFBAAB as nonattainment for the 2006 24-hour $PM_{2.5}$ standard. The rule will become effective 30 days after publication in the Federal Register.
Sources: ARB 2009c; USEPA 2009c

California Attainment Status

Air quality of a region is considered to be in attainment of the CAAQS if the measured ambient air pollutant levels for ozone, CO, SO_2 (1- and 24-hour), NO_2, PM_{10}, $PM_{2.5}$, and visibility-reducing particles are not exceeded, and all other standards are not equaled or exceeded at any time in any consecutive 3-year period. The SFBAAB is currently designated as a nonattainment area with respect to the state standards for ozone, PM_{10}, and $PM_{2.5}$ and is designated as attainment or unclassified for all other pollutants. Additional details regarding the state attainment status are provided in Table 2 above. The CAAQS along with health effects, atmospheric effects, and common source types are shown in Table 3.

Table 3. National and California Ambient Air Quality Standards

Pollutant	Averaging Time	State Standard	Federal Standard	Health and Atmospheric Effects	Typical Sources
Ozone[a]	1 hour 8 hours	0.09 ppm 0.070 ppm	–[b] 0.075 ppm	High concentrations irritate lungs. Long-term exposure may cause lung tissue damage. Long-term exposure damages plant materials and reduces crop productivity. Precursor organic compounds include a number of known toxic air contaminants.	Low-altitude ozone is almost entirely formed from VOC and NO_X in the presence of sunlight and heat. Major sources include motor vehicles and other mobile sources, solvent evaporation, and industrial and other combustion processes. Biologically-produced VOC may also contribute.
Carbon Monoxide (CO)	1 hour 8 hours 8 hours (Lake Tahoe)	20 ppm 9.0 ppm[c] 6 ppm	35 ppm 9 ppm –	Asphyxiant. CO interferes with the transfer of oxygen to the blood and deprives sensitive tissues of oxygen.	Combustion sources, especially gasoline-powered engines and motor vehicles. CO is the traditional signature pollutant for on-road mobile sources at the local and neighborhood scale.
Respirable Particulate Matter (PM_{10})[a]	24 hours Annual	50 µg/m^3 20 µg/m^3	150 µg/m^3 –	Irritates eyes and respiratory tract. Decreases lung capacity. Associated with increased cancer and mortality. Contributes to haze and reduced visibility. Includes some toxic air contaminants. Many aerosol and solid compounds are part of PM_{10}.	Dust- and fume-producing industrial and agricultural operations; combustion smoke; atmospheric chemical reactions; construction and other dust-producing activities; unpaved road dust and re-entrained paved road dust; natural sources (wind-blown dust, ocean spray).
Fine Particulate Matter ($PM_{2.5}$)[a]	24 hours Annual	– 12 µg/m^3	35 µg/m^3 15 µg/m^3	Increases respiratory disease, lung damage, cancer, and premature death. Reduces visibility and produces surface soiling. Most diesel exhaust particulate matter – considered a toxic air contaminant – is in the $PM_{2.5}$ size range. Many aerosol and solid compounds are part of $PM_{2.5}$.	Combustion including motor vehicles, other mobile sources, and industrial activities; residential and agricultural burning; also formed through atmospheric chemical (including photochemical) reactions involving other pollutants including NO_X, SO_X, ammonia, and VOC.
Nitrogen Dioxide (NO_2)	1 hour Annual	0.18 ppm 0.030 ppm	– 0.053 ppm	Irritating to eyes and respiratory tract. Colors atmosphere reddish-brown. Contributes to acid rain.	Motor vehicles and other mobile sources; refineries; industrial operations.
Sulfur Dioxide (SO_2)	1 hour 3 hours 24 hours Annual	0.25 ppm – 0.04 ppm –	– 0.5 ppm 0.14 ppm 0.030 ppm	Irritates respiratory tract; injures lung tissue. Can yellow plant leaves. Destructive to marble, iron, steel. Contributes to acid rain. Limits visibility.	Fuel combustion (especially coal and high-sulfur oil), chemical plants, sulfur recovery plants, metal processing.
Lead [d]	Monthly Quarterly	1.5 µg/m^3 –	– 1.5 µg/m^3	Disturbs gastrointestinal system. Causes anemia, kidney disease, and neuromuscular and neurological dysfunction. Also considered a toxic air contaminant.	Primary: lead-based industrial process like batter production and smelters. Past: lead paint, leaded gasoline. Moderate to high levels of aerially deposited lead from gasoline may still be present in soils along major roads, and can be a problem if large amounts of soil are disturbed.

Notes: ppm = parts per million; µg/m^3 = micrograms per cubic meter; VOC = volatile organic gases; NO_X = oxides of nitrogen; SO_X = sulfur oxides

[a] Annual PM_{10} NAAQS revoked October 2006; was 50 µg/m^3. 24-hr. $PM_{2.5}$ NAAQS tightened October 2006; was 65 µg/m^3.

[b] The Federal 1-hour ozone standard was revoked in 2005.

[c] Rounding to an integer value is not allowed for the State 8-hour CO standard. A violation occurs at or above 9.05 ppm.

[d] The ARB has identified lead, vinyl chloride, and the particulate matter fraction of diesel exhaust as toxic air contaminants. Diesel exhaust particulate matter is part of PM_{10} and, in larger proportion, $PM_{2.5}$. Both the ARB and USEPA have identified various organic compounds that are precursors to ozone and $PM_{2.5}$ as toxic air contaminants. There is no threshold level of exposure for adverse health effect determined for toxic air contaminants, and control measures may apply at ambient concentrations below any criteria levels specified for these pollutants or the general categories of pollutants to which they belong.

Sources: California Air Resources Board Ambient Air Quality Standards chart,11/17/2008 (http://www.arb.ca.gov/aqs/aaqs2.pdf)
Sonoma-Marin Area Rail Transit Draft Air Pollutant Standards and Effects table, November 2005, page 3-52.
USEPA and California Air Resources Board air toxics websites, 05/17/2006

Existing Emission Sources

Criteria air pollutant emission sources in the County include stationary, area, and mobile sources. According to the 2008 emissions inventory for the County, the majority of VOC and NO_X emissions are attributable to mobile sources, while areawide sources are the greatest contributor of particulate matter emissions (ARB 2009d).

Major stationary sources of air pollutant emissions within the County include industrial processes, fuel combustion from electric utilities and other processes, waste disposal, surface coating and cleaning, petroleum production, and other sources. Local air districts issue permits to various types of stationary sources, which must demonstrate implementation of best available control technologies (BACT).

Areawide sources of emissions include consumer products, application of architectural coatings, residential fuel combustion, farming operations, construction and demolition, road dust, fugitive dust, landscaping, fires, and other miscellaneous sources. Paved road dust is the largest contributor to particulate matter emissions within the County.

On-road and other mobile sources are the largest contributors of ozone precursor emissions within the County. On-road sources consist of passenger vehicles, trucks, buses, and motorcycles, while off-road vehicles and other mobile sources comprise heavy-duty equipment, boats, aircraft, trains, recreational vehicles, and farm equipment. Major roadways in the County include I-80 and I-280. Major United States routes include U.S. Highway 101 and major state routes include State Route 1.

3.5 EXISTING AIR QUALITY — TOXIC AIR CONTAMINANTS

Concentrations of TACs, or in federal parlance, hazardous air pollutants (HAPs), are also used as indicators of ambient-air-quality conditions. A TAC is defined as an air pollutant that may cause or contribute to an increase in mortality or in serious illness, or that may pose a hazard to human health. TACs are usually present in minute quantities in the ambient air; however, their high toxicity or health risk may pose a threat to public health even at low concentrations.

According to the *California Almanac of Emissions and Air Quality* (ARB 2009a), the majority of the estimated health risk from TACs can be attributed to relatively few compounds, the most important being PM from diesel-fueled engines (diesel PM). Diesel PM differs from other TACs in that it is not a single substance, but rather a complex mixture of hundreds of substances. Although diesel PM is emitted by diesel-fueled internal combustion engines, the composition of the emissions varies depending on engine type, operating conditions, fuel composition, lubricating oil, and whether an emission control system is present.

Unlike the other TACs, no ambient monitoring data are available for diesel PM because no routine measurement method currently exists. However, ARB has made preliminary concentration estimates based on a PM exposure method. This method uses the ARB emissions inventory's PM_{10} database, ambient PM_{10} monitoring data, and the results from several studies to estimate concentrations of diesel PM. In addition to diesel PM, the TACs for which data are available that pose the greatest existing ambient risk in California are benzene, 1,3-butadiene, acetaldehyde, carbon tetrachloride, hexavalent chromium, *para*-dichlorobenzene, formaldehyde, methylene chloride, and perchloroethylene.

Diesel PM poses the greatest health risk among TACs in California. Based on receptor modeling techniques, ARB estimated its health risk to be 480 excess cancer cases per million people in the SFBAAB during 2000. Since 1990, the health risk associated with diesel PM has been reduced by 36 percent in the SFBAAB. Overall, levels of most TACs, except para-dichlorobenzene and formaldehyde, have decreased since 1990 (ARB 2009a).

Mobile Source Air Toxics

The CAA identified 188 compounds as HAPs. USEPA has assessed this expansive list of toxics and identified a group of 21 as MSATs. The MSATs are compounds emitted from highway vehicles and non-road equipment (e.g., off-road construction equipment). Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline. USEPA also extracted a subset of this list of 21 compounds that it now labels as the six priority MSATs. These are benzene, formaldehyde, acetaldehyde, diesel particulate matter/diesel exhaust organic gases, acrolein, and 1,3-butadiene (FHWA 2006b). However, in September 2009, FHWA released its MSAT Interim Guidance Update that identified seven compounds "with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers" (FHWA 2009a). These seven compounds are now considered the priority MSATs: acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. While these MSATs are considered the priority transportation toxics, USEPA stresses that the lists are subject to change and may be adjusted in future rules (FHWA 2006b, FHWA 2009a).

USEPA has issued a number of regulations that will dramatically decrease MSATs through cleaner fuels and cleaner engines. According to an FHWA analysis, even if the number of vehicle miles traveled (VMT) increases by 64 percent, reductions of 57–87 percent in MSATs are projected from 2000 to 2020 (FHWA 2006b). Project MSAT impacts are discussed in Chapter 4.0, "Environmental Consequences," of this analysis.

Asbestos

The CAA requires USEPA to develop and enforce regulations to protect the general public from exposure to airborne contaminants that are known to be hazardous to human health. In accordance with CAA Section 112, USEPA established National Emissions Standards for Hazardous Air Pollutants (NESHAP) to protect the public. Asbestos was one of the first HAPs regulated under this section. On March 31, 1971, USEPA identified asbestos as a HAP, and on April 6, 1973, first promulgated the asbestos NESHAP in 40 Code of Federal Regulations (CFR) 61. In 1990, a revised NESHAP regulation was promulgated by USEPA.

The asbestos NESHAP regulations protect the public by minimizing the release of asbestos fibers during activities involving the processing, handling, and disposal of asbestos-containing material. Accordingly, the asbestos NESHAP specifies work practices to be followed during demolitions and renovations of all structures, installations, and buildings (excluding residential buildings that have four or fewer dwelling units). In addition, the regulations require the project applicant to notify applicable state and local agencies and/or USEPA regional offices before all demolitions or before construction that contains a certain threshold amount of asbestos.

Naturally Occurring Asbestos

Serpentine is a mineral commonly found in seismically active regions of California, usually in association with ultramafic rocks and along associated faults. Certain types of serpentine occur naturally in a fibrous form known generically as asbestos. Asbestos is a known carcinogen and inhalation of asbestos may result in the development of lung cancer or mesothelioma. ARB has regulated the amount of asbestos in crushed serpentinite used in surfacing applications, such as for gravel on unpaved roads, since 1990. In 1998, new concerns were raised about health hazards from activities that disturb asbestos-bearing rocks and soil. In response, ARB revised their asbestos limit for crushed serpentines and ultramafic rock in surfacing applications from 5 percent to less than 0.25 percent and adopted a new rule requiring best practices dust control measures for activities that disturb rock and soil containing naturally occurring asbestos (NOA) (CDC 2000).

According to A General Location Guide for Ultramafic Rocks in California—Areas More Likely to Contain Naturally Occurring Asbestos (CDC 2000), the project site is not located in an area that is likely to contain NOA. Thus, hazardous exposure to asbestos-containing serpentine materials would not be a concern with the proposed project.

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CHAPTER 4.0 – ENVIRONMENTAL CONSEQUENCES

4.1 PROJECT IMPACT ANALYSIS

Operational Impacts

As determined in the traffic study, traffic operations resulting from implementation of Alternative 2b and 4 would be the same. Therefore, the following operational impacts analysis refers to the proposed project as the build alternatives (Alternative 2b and Alternative 4).

Regional Air Quality Conformity

For federal or joint projects, the air quality analysis and technical report must comply with the federal CAA and the environmental document must contain a regional and a project-level air conformity statement, unless the project is exempt (see 40 CFR 93, 126-128). The proposed project must match the design, concept, and scope of the project as described in the most recent RTP and Regional Transportation Improvement Plan (RTIP).

The proposed project is included in the 2035 RTP (latest RTP update) which was found to conform by MTC on April 22, 2009. The FHWA and FTA adopted the air quality conformity finding for the 2035 RTP on May 29, 2009. MTC used the latest planning assumptions for the purpose of preparing the conformity analysis. Current and future population and employment assumptions were obtained from ABAG's latest socio-economic/land use forecast series, *Projections 2007*. MTC's latest travel demand forecast model, BAYCAST 2000, was used to estimate future vehicle activity while taking into consideration the ARB's most recent vehicle emissions inventory model, EMFAC 2007. EMAC 2007 takes into consideration the most recent available vehicle registration data. The proposed project is included in the 2035 RTP as Reference Number 230555 – Reconstruct ramps on east side of the San Francisco-Oakland Bay Bridge's Yerba Buena Island Tunnel. The project is also included in MTC financially constrained 2009 TIP on page 38 as TIP ID SF-070027 – Yerba Buena Island Ramp Improvements. The original MTC 2009 TIP, which includes the proposed project, was found to conform by FHWA and FTA on November 17, 2008. Revisions to the MTC 2009 TIP following FHWA and FTA's decision did not affect the proposed project. The year the project is expected to open to traffic is consistent with the project's TIP listing. The design concept and scope of the proposed project is consistent with the project description in the 2035 RTP, the 2009 TIP and the assumptions in the MTC regional emissions analysis.

Project-Level Conformity

The Transportation Conformity Rule requires a determination that federal projects not cause or contribute to any new localized CO, PM_{10}, and/or $PM_{2.5}$ violations or increase the frequency or severity of any existing CO, PM_{10}, and/or $PM_{2.5}$ violations in CO, PM_{10}, and $PM_{2.5}$ nonattainment and maintenance areas.

A project-level conformity analysis must be completed to determine the potential for a CO and PM "hot spot." The SFBAAB is currently designated as a maintenance area for the CO NAAQS and therefore a CO "hot spot" analysis is required under the USEPA Transportation Conformity Rule. An analysis of the potential for a CO "hot spot" was performed below consistent with the Protocol. For PM_{10}, the SFBAAB is unclassified with respect to the NAAQS. For $PM_{2.5}$, the SFBAAB was previously designated as attainment for the 65 $\mu g/m^3$ standard; however, on October 9, 2009, USEPA published a final ruling in the Federal Register designating the SFBAAB as nonattainment for the 2006 35 $\mu g/m^3$ 24-hour standard. The ruling will become effective 30 days after October 9, 2009. As a result of the new designation, a PM "hot spot" analysis was performed for the proposed project in accordance to the PM Guidance. This analysis was performed consistent with the USEPA and FHWA's PM Guidance (FHWA 2006a).

Carbon Monoxide

The Protocol provides procedures and guidelines for use by agencies to evaluate the potential localized CO impacts of a transportation project (UCD ITS 1997). The Protocol provides decision flow charts designed to assist the lead agency in evaluating requirements that specifically apply to a proposed project. An examination of each flow chart inquiry as it pertains to the proposed project is provided below. The Protocol states that the determination of project-level CO impacts should be carried out in accordance with the Local CO Analysis flow charts shown as Figure 3 of the Protocol.

The procedures of Section 4 in Figure 3 of the Protocol are provided for the proposed project to identify level of effort required.

Section 4, Local CO Analysis

Level 1

Is the project in a CO nonattainment area?

No, the SFBAAB has attained the federal CO standard, but is currently a maintenance area for the CO standard, as shown in Table 2 of this analysis. Go to next question.

Was the area redesignated as "attainment" after the 1990 Clean Air Act?

Yes, the SFBAAB was redesignated as attainment in 1998.

Has "continued attainment" been verified with the local Air District (if appropriate)?

Yes. ARB's "2004 Revision to the California State Implementation Plan for Carbon Monoxide" demonstrates continued attainment of the CO standard in 10 areas including the SFBAAB. Go to Level 7.

Level 7

4.7.1: Does the project worsen air quality?

The guidance for this question states: "Only those projects that are likely to worsen air quality necessitate further analysis." To determine whether a project is likely to worsen air quality for the area substantially affected by the project, the guidance asks the following questions:

Would "the project significantly increase the percentage of vehicles operating in cold start mode"? An increase of as little as 2 percent should be considered significant.

No. The proposed project does not involve development of housing, employment centers, or other attractions and, thus, would not generate traffic. Rather, the proposed project would maintain the functional role of the YBI on- and off-ramps while satisfying the seismic requirements and highway design standards and improving traffic operations and safety. The proposed on- and off-ramps are not anticipated to increase the percentage or total number of vehicles operating in cold start mode.

Would "the project significantly increase traffic volumes?" Increases in traffic volumes in excess of 5 percent or more should be considered potentially significant. Additionally, an increase of less than 5 percent may still be potentially significant, if there is also a reduction in average speeds.

No. The proposed project would not develop any land uses that would generate vehicle trips and increase traffic volumes on the on- and off-ramps. The proposed ramps would add additional capacity to the westbound on-ramp for the SFOBB; however, because the ramps would be metered, the proposed project would not increase traffic volumes entering the SFOBB. Therefore, according to the criterion described above, the proposed project would not adversely affect on traffic volumes.

Would "the project worsen traffic flow"? A reduction in average speeds of 3 to 50 [miles per hour] mph or an increase in average delay at an intersection should be regarded as worsening traffic flow.

Yes. The proposed project would not worsen traffic flow on or off of the SFOBB because only the same number of vehicles exiting the SFOBB would be allowed to enter. In other words, the metering system for the proposed on-ramp would only allow a vehicle to enter the SFOBB if another vehicle exited the SFOBB. Therefore, with implementation of proper ramp metering, the proposed project is not anticipated to adversely affect the traffic operations of the SFOBB. However, the proposed metering system could worsen traffic flow on the on-ramp due to vehicles idling prior to entering the SFOBB. Vehicles attempting to enter the SFOBB would have to idle at the proposed meter until another vehicle exits off of the SFOBB. Therefore, although the proposed metering system would not be anticipated to worsen traffic flow on the SFOBB due to a one-to-one ratio of vehicles entering and exiting at the Yerba Buena exit, the metering system would worsen traffic flow on the on-ramp. Thus, the proposed project could worsen traffic flow.

According to the criteria discussed above, implementation of the proposed project could potentially worsen air quality. Proceed to Question 4.7.2.

4.7.2 Would the project result in higher CO concentrations than those existing in the region at the time of attainment demonstration?

The guidance for this question states: "Projects potentially creating CO concentrations higher than those existing within the region at the time of attainment demonstration should proceed to Section 4.7.3; other projects should be deemed satisfactory and no further analysis is needed." In order to answer the question, the Protocol recommends that the features of the proposed project are compared with an existing project in region. If the project features of the "build" scenario would be less likely to cause a CO "hot spot" than the existing worst-case project, then there is no reason to expect higher concentrations of CO at the proposed project location. Table 4 presents the conditions and parameters of the proposed on- and off-ramps and the U.S. Route 101 southbound on- and off-ramps at Blossom Hill Road for comparison purposes.

Table 4. Comparison of Ramp Conditions

	Parameters	Yerba Buena Island Build Alternatives	U.S. Route 101 – Blossom Hill Road Southbound Ramps
A	Receptor Distance	650 ft.	250 ft.
B	Roadway Geometry	2 lanes on-ramp 1 lane off-ramp	1 lanes on-ramp 3 lanes off-ramp
C	Worst-Case Meteorology	Coastal Valley	Coastal Valley
D	AADT Volumes	3,040 (2008) [1] 16,730 (2035) [1]	26,400 (2007) [2]
E	Hot/Cold Starts Percentage	75/25 on-ramp 85/15 off-ramp	75/25 on-ramp 85/15 off-ramp
F	Percent Heavy Duty Gasoline Trucks	0.76%	1.8% [3]
G	8-Hour Background CO	2.3 ppm (2006–2008)	2.9 ppm (2006–2008) [4]

Notes: ft = feet; AADT = annual average daily trips; ppm = parts per million; CO = carbon monoxide
1 Average daily trips (ADT) were calculated by multiplying the PM peak hour traffic using the westbound on- and off-ramps and a k factor of 10. ADT is anticipated to be comparable to AADT. However, the adjustment made to calculate AADT would not be expected to cause the proposed project's AADT to exceed the comparison project's AADT.
2 Traffic volumes from Caltrans were provided in ADT, which is expected to be comparable to AADT. Any adjustment made to calculate AADT would not be expected to cause the AADT to be below the proposed project's AADT. The ramp volume shown only represents the southbound on- and off-ramps at U.S. Route 101 and Blossom Hill Road.
3 Percent of heavy-duty gasoline trucks for the comparison project was determined using the CO Protocol methodology and truck volumes and distributions from the San Jose, Junction Route 85, Bernal Road Interchange from Caltrans 2007 Truck Traffic data, which is the closest data point to the comparison project.
4 Background 8-hour CO concentration was obtained from the Jackson Street monitoring station in San Jose, California, which is the closest monitoring station to the Blossom Hill Road southbound ramps.
Sources: Caltrans 2009a; Caltrans 2009b; UCD ITS 1997; ARB 2009b

As shown above, all conditions in items A through G for Question 4.7.2 have been satisfied; therefore, there is no reason to expect higher CO concentrations at the project location than at the U.S. Route 101 on- and off-ramps at Blossom Hill Road. Thus, the proposed project would not cause an exceedance of the state or federal CO standards.

4.7.3: Would the project involve signalized intersections at Level of Service (LOS) E, or F?

No, the proposed project would not impact any signalized intersections. Although metering is proposed for the on-ramp, the on-ramp would be considered a roadway segment for which the Protocol does not apply. Proceed to Question 4.7.4.

4.7.4: Would the project result in worsening of signalized intersections LOS to E, or F?

No, the proposed project would not impact any signalized intersections. Although metering is proposed for the on-ramp, the on-ramp would be considered a roadway segment for which the Protocol does not apply. Proceed to Question 4.7.5.

4.7.5: Would there be any other reasons the project could cause adverse air quality impacts?

The guidance for this question states: "Under certain special conditions, there still may be cause for concern about the air quality impacts of the project even if no further analysis was required according to Sections 4.7.3 and 4.7.4." As discussed above, the proposed project would not generate vehicle trips or create any special conditions (e.g., urban street canyon, increase number of heavy-duty trucks, and proximity to large stationary sources of CO) that would increase CO concentrations at local signalized intersections. Therefore, it is determined there are no other reasons that the proposed project would cause adverse air quality impacts with respect CO concentrations.

According to the traffic study, the proposed project would not reduce the LOS of any signalized intersection to LOS E or F. In addition, no special conditions would contribute to the proposed project causing an adverse air quality impact with respect to CO. Therefore, the proposed build alternatives would not cause violations of the federal or state CO standards and further analysis of localized CO impacts is not necessary.

Particulate Matter

On March 10, 2006, USEPA published a final rule that establishes the transportation conformity criteria and procedures for determining which transportation projects must be analyzed for local air quality impacts in $PM_{2.5}$ and PM_{10} nonattainment and maintenance areas. Based on that rule, USEPA and FHWA published the PM Guidance (FHWA 2006a). In December 2008, USEPA designated the SFBAAB as nonattainment for the new 35 $\mu g/m^3$ $PM_{2.5}$ standard. On October 9, 2009, USEPA published the final ruling in the Federal Register, which officially designated the SFBAAB as nonattainment for the 2006 $PM_{2.5}$ standard. It should be noted that a "hot spot' analysis for particulate matter is not currently required for project conformity until December 2010 to allow a one-year conformity grace period; however, in anticipation of the nonattainment designation, a "hot spots" analysis was performed for the proposed project in accordance to the PM Guidance. In accordance with the nonattainment designation and pursuant to the transportation conformity requirements, the local PM impacts of the proposed project are analyzed in accordance with the PM Guidance.

A "hot spot" analysis is defined in 40 CFR 93.101 as an estimation of likely future localized $PM_{2.5}$ or PM_{10} pollutant concentrations and a comparison of those concentrations to the relevant air quality standards. A "hot spot" analysis assesses the air quality impacts on a scale smaller than an entire nonattainment or maintenance area, including, for example, congested roadway intersections and highways or transit terminals. Such an analysis demonstrates that a transportation project meets CAA conformity requirements to support state and local air quality goals with respect to potential localized air quality impacts. When a "hot spot" analysis is required, it is included within the project-level conformity determination that is made by FHWA and FTA.

The PM Guidance document describes qualitative "hot spot" analyses. Quantitative $PM_{2.5}$ and PM_{10} "hot spot" analyses will be required when appropriate methods and modeling guidance are available. Qualitative "hot spot" analyses involve more streamlined reviews of local factors such as local monitoring data near a proposed project location.

Since issuing the March 2006 guidance, a lawsuit was filed challenging a project's conformity determination, including the project's $PM_{2.5}$ "hot spot" analysis that relied on Method A (comparison to another location with similar characteristics). Method A is described in question 4.1 of the March 2006 guidance. As part of a settlement agreement on that lawsuit (Environmental Defense, et al. v. USDOT, et al., No. 08-1107 (4th Cir., dismissed Nov. 17. 2008)), FHWA agreed to issue a clarification on a specific schedule, in coordination with USEPA, related to the March 2006 guidance. This clarification does not supersede the March 2006 guidance or the March 10, 2006 Final Transportation Conformity Rule; it only further explains how to implement the existing guidance and the "hot spot" analysis requirements in the final rule. The clarification also does not create any new requirements and does not serve as guidance for $PM_{2.5}$ and PM_{10} quantitative "hot spot" analyses (FHWA 2009b).

Projects of Air Quality Concern

To meet statutory requirements, the March 10, 2006, final rule requires $PM_{2.5}$ and PM_{10} "hot spot" analyses to be performed for POAQC. Qualitative "hot spot" analyses would be done for these projects. Projects not identified as POAQCs are considered to have met statutory requirements without any further "hot spot" analyses.

The PM Guidance defines POAQCs as projects within a federally designated $PM_{2.5}$ or PM_{10} nonattainment or maintenance area that are funded or approved by FHWA or FTA, and are one of the following types of projects:

- New or expanded highway projects that have a significant number of or significant increase in diesel vehicles;
- Projects affecting intersections that are LOS D, E, or F with a significant number of diesel vehicles, or those that will change to LOS D, E, or F, because of increased traffic volumes from a significant number of diesel vehicles related to the project;
- New bus and rail terminals, and transfer points, that have a significant number of diesel vehicles congregating at a single location;
- Expanded bus and rail terminals, and transfer points, that significantly increase the number of diesel vehicles congregating at a single location; and

- Projects in, or affecting locations, areas, or categories of sites that are identified in the $PM_{2.5}$ applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation.

Appendix A of the PM Guidance contains examples of POAQCs and examples of projects that are not an air quality concern. Under the example of POAQC, a significant volume for a new highway or expressway is defined as facilities with an annual average daily traffic (AADT) volume of 125,000 or more, and a significant number of diesel vehicles is defined as 8 percent or more of the total AADT is diesel truck traffic.

The proposed project is not a land use project that is anticipated to generate vehicle trips. The traffic study analyzed the future (year 2035) traffic volumes that would use the proposed ramps to access YBI and TI. The total number of vehicles accessing YBI and TI via the proposed ramps during the p.m. peak hour in 2035 would be 3,835 vehicles, which would translate to approximately 38,350 average daily trips (ADT) (AECOM Transportation 2009). It should be noted that this analysis uses ADT rather than AADT, which is used to define traffic volumes for a POAQC. The ADT associated with the project is anticipated to be comparable to the AADT. Nevertheless, the ADT associated with the proposed project is approximately 25 percent of the AADT threshold; therefore, any adjustments made to the ADT to calculate AADT would still not be expected to result in an AADT that exceeds 125,000 AADT. Therefore, the proposed project would not exceed the first threshold for a POAQC. However, it is acknowledged that traffic volumes on the SFOBB during the p.m. peak hour would increase from 16,351 vehicles in 2008 to 19,350 vehicles in 2035, which would translate into 193,500 ADT. Although the SFOBB traffic volumes would exceed the 125,000-AADT threshold, those traffic volumes have been analyzed in a previous environmental analysis. As discussed above, the metering system proposed for the on-ramps would limit the amount of vehicles entering the SFOBB to the amount of vehicles exiting the SFOBB and therefore would not add a substantial traffic volume to the SFOBB that would cause a PM “hot spot.”

In addition, the vehicle trips along the proposed ramps would not be anticipated to cause an increase in the number of diesel vehicles. The proposed project is not a land use project that would generate an increased number of diesel trucks traveling on the ramps. As discussed in the traffic study, future traffic volumes would increase on the SFOBB and the proposed ramps, which would also increase the number of diesel trucks traveling along the SFOBB and the proposed ramps. However, the percentage of diesel trucks of the total traffic volume is anticipated to remain the same. It should be noted that the TI and YBI Redevelopment Plan would develop land uses on YBI and TI that could potentially increase the number of heavy-duty diesel trucks traveling on the proposed ramps to deliver goods. Therefore, although implementing the proposed project would not directly increase diesel vehicle traffic, future development on TI and YBI could increase the number and percent of diesel vehicle traffic. Because implementing the proposed project would not significantly increase AADT or diesel truck traffic along the proposed on- and off-ramps, the proposed project does not meet the criteria of a POAQC as defined in the PM Guidance and would not significantly increase the potential for a PM "hot spot." In addition, the proposed project would not involve developing a land use that would alter the vehicle mix traveling along the ramps.

Mobile Source Air Toxics

In addition to CO, MSAT emissions are of local concern. MSATs are compounds emitted from highway vehicles and non-road equipment. In February 2006, FHWA issued the FHWA Interim Guidance to advise when and how to analyze MSAT in the NEPA process for highways. However, USEPA currently recommends following the March 2007 report entitled "Analyzing, Documenting, and Communicating the Impacts of Mobile Source Air Toxic Emissions in the NEPA Process." FHWA and USEPA are currently undergoing mediation on the FHWA Interim Guidance. In September 2009, FHWA released an update to the FHWA Interim Guidance (i.e., Interim Guidance Update). The Interim Guidance Update did not change any project analysis thresholds, recommendations, or guidelines; however, an updated set of seven priority MSATs were identified as having significant contributions from mobile sources that are among the national- and regional-scale cancer risk drivers.

Evaluating the environmental and health impacts from MSATs on a proposed highway project may involve several key elements, including emissions modeling, dispersion modeling in order to estimate ambient concentrations resulting from the estimated emissions, exposure modeling in order to estimate human exposure to the estimated concentrations, and then final determination of health impacts based on the estimated exposure.

The following is an excerpt from Appendix C of the FHWA Interim Guidance (FHWA 2006b):

<u>Introduction to MSAT</u>

> In addition to the criteria air pollutants for which there are NAAQS, USEPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries).
>
> MSATs are a subset of the 188 air toxics defined by the CAA. The MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete

combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

USEPA is the lead Federal Agency for administering the CAA and has certain responsibilities regarding the health effects of MSATs. USEPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources, 66 FR 17229 (March 29, 2001). This rule was issued under the authority in Section 202 of the CAA. In its rule, USEPA examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline (RFG) program, its national low emission vehicle (NLEV) standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. Between 2000 and 2020, FHWA projects that even with a 64-percent increase in VMT, these programs would reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57–65 percent, and would reduce on-highway diesel PM emissions by 87 percent.

As a result, USEPA concluded that no further motor vehicle emissions standards or fuel standards were necessary to further control MSATs. The agency is preparing another rule under authority of CAA Section 202(l) that will address these issues and could make adjustments to the full 21 and the primary six MSATs.

<u>Incomplete or Unavailable Information for Project-Specific MSAT Health Impact Analysis</u>

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

The U.S. Environmental Protection Agency (EPA) is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the Clean Air Act and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The EPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. They maintain the Integrated Risk Information System (IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (EPA, http://www.epa.gov/ncea/iris/index.html). Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.

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

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then 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 affects emissions rates) over that time frame, since such information is unavailable. The results produced by the EPA's MOBILE6.2 model, the California EPA's Emfac2007 model, and the EPA's DraftMOVES2009 model in forecasting MSAT emissions are highly inconsistent. Indications from the development of the MOVES model are that MOBILE6.2 significantly underestimates diesel particulate matter (PM) emissions and significantly overestimates benzene emissions.

Regarding air dispersion modeling, an extensive evaluation of EPA's guideline CAL3QHC model was conducted in an NCHRP study (http://www.epa.gov/scram001/dispersion_alt.htm#hyroad), which documents poor model performance at ten sites across the country - three where intensive monitoring was conducted plus an additional seven 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 National Ambient Air Quality Standards for relatively short time frames than it is for forecasting individual exposure over an entire lifetime, especially given that some information needed for estimating 70-year lifetime exposure is unavailable. It is particularly difficult to reliably forecast MSAT exposure near roadways, and to determine the portion of time that people are actually exposed at a specific location.

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

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

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

Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of MSATs

Research into the health impacts of MSATs is ongoing. For different emission types, there are a variety of studies that show that some either are statistically associated with adverse health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that animals demonstrate adverse health outcomes when exposed to large doses.

Exposure to toxics has been a focus of a number of USEPA efforts. Most notably, the agency conducted the National Air Toxics Assessment (NATA) in 1996 to evaluate modeled estimates of human exposure applicable to the county level. While not intended for use as a measure of or benchmark for local exposure, the modeled estimates in the NATA database best illustrate the levels of various toxics when aggregated to a national or State level.

The USEPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The USEPA IRIS is a database of human health effects that may result from exposure to various substances found in the environment. The IRIS database is located at http://www.epa.gov/iris. The following toxicity information for the six prioritized MSATs was taken from the IRIS database *Weight of Evidence Characterization* summaries. This information is taken verbatim from USEPA's IRIS database and represents the Agency's most current evaluations of the potential hazards and toxicology of these chemicals or mixtures, unless noted otherwise.

- **Benzene** is characterized as a known human carcinogen.
- The potential carcinogenicity of **acrolein** cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.
- **Formaldehyde** is a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.
- **1,3-butadiene** is characterized as carcinogenic to humans by inhalation.
- **Acetaldehyde** is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.

- **Diesel PM exhaust** is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases.

- **Diesel exhaust** also represents chronic respiratory effects, possibly the primary noncancer hazard from MSATs. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.

- **Naphthalene** is classified in Group C, a possible human carcinogen. This is based on the inadequate data of carcinogenicity in humans exposed to naphthalene via the oral and inhalation routes, and the limited evidence of carcinogenicity in animals via the inhalation route.

- Epidemiological studies have shown an increase in lung cancer cases for individuals exposed to **polycyclic organic matter** sources such as coke oven emissions, roof tar emissions, and cigarette smoke. Seven polycyclic organic matter compounds have been classified as Group B2, probable human carcinogens (USEPA 2009d).

There have been other studies that address MSAT health impacts in proximity to roadways. The Health Effects Institute, a nonprofit organization funded by USEPA, FHWA, and industry, has undertaken a major series of studies to research near-roadway MSAT "hot spots," the health implications of the entire mix of mobile source pollutants, and other topics. The final summary of the series is not expected for several years.

Some recent studies have reported that proximity to roadways is related to adverse health outcomes — particularly respiratory problems (South Coast Air Quality Management District, Multiple Air Toxic Exposure Study-II (2000); Highway Health Hazards, The Sierra Club (2004) summarizing 24 Studies on the relationship between health and air quality); NEPA's Uncertainty in the Federal Legal Scheme Controlling Air Pollution from Motor Vehicles, Environmental Law Institute, 35 ELR 10273 (2005) with health studies cited therein).

Much of this research is not specific to MSATs, instead surveying the full spectrum of both criteria air and other pollutants.

This document provides a qualitative assessment of MSAT emissions relative to the various alternatives and has acknowledged that all the project alternatives may result in increased exposure to MSAT emissions in certain locations.

It is possible to qualitatively assess the levels of future MSAT emissions under the project. A qualitative analysis provides a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives* (FHWA 2009c), found at: www.fhwa.dot.gov/environment/airtoxic/msatcompare/ msatemissions.htm

Evaluation of Project MSAT Potential

The FHWA has developed a tiered approach (FHWA Interim Guidance and Interim Guidance Update) for analyzing MSATs in NEPA documents. This tiered approach has not been altered in the Interim Guidance Update. Depending on the specific project circumstances, FHWA has identified three levels of analysis:

- Category 1: No analysis for projects with no potential for meaningful MSAT effects,
- Category 2: Qualitative analysis for projects with low potential MSAT effects, or
- Category 3: Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

Category 1 is limited to projects that qualify as a categorical exclusion under 23 CFR 771.117(c); are exempt under the CAA conformity rule under 40 CFR 93.126; or have no meaningful impacts on traffic volumes or vehicle mix. The proposed project does not meet any of the Category 1 requirements.

For a project to be of the magnitude to have a higher potential for MSAT effects, Category 3, a project must:

- Create or significantly alter a major intermodal freight facility that has the potential to concentrate high levels of diesel particulate matter in a single location; or
- Create new or add significant capacity to urban highways such as interstates, urban arterials, or urban collector-distributor routes with traffic volumes where the AADT is projected to be in the range of 140,000 to 150,000, or greater, by the design year; and
- be proposed to be located in proximity to populated areas or in rural areas, in proximity to concentrations of vulnerable populations (i.e., schools, nursing homes, hospitals).

The proposed project would not alter a major intermodal freight facility or add significant capacity to urban highways where AADT is projected to be above 140,000. Therefore, by default, the proposed project would be classified as a Category 2 project with low potential MSAT effects. A Category 2 MSAT analysis is recommended for projects that would improve operations of highway, transit or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase emissions. A qualitative MSAT analysis should be performed for Category 2 projects discussing the expected effect of the project on traffic volumes, vehicle mix, or routing of traffic. The analysis should also qualitatively evaluate the change in MSAT emissions based on the expected effect of the project on VMT, vehicle mix, and vehicle speeds.

<u>Project-Specific MSAT Impact Analysis</u>

The amount of MSATs emitted would be proportional to the VMT, assuming that other variables such as fleet mix are the same for each alternative. In addition, the FHWA's *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives* study concluded that the most important factors affecting MSAT emissions are VMT and levels of traffic congestion (FHWA 2009c). A higher level of traffic congestion and reduced vehicle speeds were found to increase emission factors of all seven priority MSATs except for diesel particulate matter. The emission rate for diesel particulate matter is not as dependent on speeds as the other MSATs. Based on a review of the traffic study, year 2035 (i.e., buildout year) traffic volumes and associated VMT estimated for the two Build Alternatives and the No Build Alternative would be similar. The reason being, although the project would add additional capacity, the project itself would not generate trips or attract new trips as a result of its completion. In addition, the proposed project would not develop a land use that would alter the vehicle mix traveling along the ramps. Therefore, MSAT emissions associated with each alternative would vary as a function of vehicle congestion along the on- and off-ramps. The traffic study determined that compared with the No Build Alternative, the average operating speed on the on-ramp would be lower for the Build condition due to proposed metering system (i.e., one-to-one ratio of vehicles exiting and entering the SFOBB). Under the No Build Alternative (i.e., no metering), the average vehicle speed on the on-ramp would be slightly higher due to the lack of metering. However, it should be noted that the free flowing and unmetered on-ramp under the No Build Alternative could cause congestion and reduced speeds on the SFOBB. The operating speeds on the SFOBB were not analyzed in the traffic study. With respect to the operation of the on-ramp, the two build alternatives would result in more delays and queuing as a result of the proposed metering for the on-ramp, and therefore a lower average operating speed. According the *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives* study, it is anticipated that the build alternatives would result in higher emissions of MSATs than the No Build Alternative.

Regardless of the alternative chosen, emissions would likely be lower than present levels in the design year as a result of USEPA's national control programs that are projected to reduce MSAT emissions by 57–87 percent between 2000 and 2020 (FHWA 2006b). This reduction in MSAT emissions is projected to occur even with a 64-percent increase in VMT. 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.

Construction Impacts

During construction, short-term degradation of air quality may occur due to the release of particulate emissions (airborne dust) generated by excavation, grading, hauling, and various other activities. Emissions from construction equipment also are anticipated and would include CO, NO_X, VOCs, directly emitted PM_{10} and $PM_{2.5}$, and TACs such as diesel exhaust particulate matter. Ozone is a regional pollutant that is derived from NO_X and VOCs in the presence of sunlight. To minimize air quality impacts from construction activities, control measure will be implemented as specified in Caltrans Standard Specifications, Section 14-9.01, "Air Pollution Control," and Section 14-9.02, "Dust Control."

Site preparation and roadway construction would involve clearing, cut-and-fill activities, grading, removing or improving existing roadways, and paving roadway surfaces. Construction-related effects on air quality from most highway projects would be greatest during the site preparation phase because most engine and fugitive emissions are associated with the excavation, handling, and transport of soils to and from the site. If not properly controlled, these activities would temporarily generate PM_{10}, $PM_{2.5}$, and small amounts of CO, SO_2, NO_X, and VOCs. Sources of fugitive dust would include disturbed soils at the construction site and trucks carrying uncovered loads of soils. Unless properly controlled, vehicles leaving the site would deposit mud on local streets, which could be an additional source of airborne dust after it dries. PM_{10} emissions would vary from day to day, depending on the nature and magnitude of construction activity and local weather conditions. PM_{10} emissions would depend on soil moisture, silt content of soil, wind speed, and the amount of equipment operating. Larger dust particles would settle near the source, while fine particles would be dispersed over greater distances from the construction site.

Construction activities for large development projects are estimated by the USEPA to add 1.2 tons of fugitive dust per acre of soil disturbed per month of activity. If water or other soil stabilizers are used to control dust, the emissions can be reduced by up to 50 percent. Caltrans' Standard Specifications (Section 14) pertaining to dust minimization requirements requires use of water or dust palliative compounds and would reduce potential fugitive dust emissions during construction.

In addition to dust-related PM_{10} emissions, heavy trucks and construction equipment powered by gasoline and diesel engines would generate CO, SO_2, NO_X, VOCs and some soot particulate (PM_{10} and $PM_{2.5}$) in exhaust emissions. These emissions would be temporary and limited to the immediate area surrounding the construction site. If construction activities were to last longer than 2 years and/or substantially affect traffic due to detours, road closures, and/or temporary terminations, the potential for a CO and PM "hot spot" should be analyzed. Construction of the proposed project is scheduled to last approximately 2 years and would not require substantial detours, road closures, and/or temporary terminations due to the proposed ramps being located in different areas than the existing ramp. In other words, the existing ramps could operate under current conditions while the new ramps are constructed to avoid substantial alternations to traffic flow. Therefore, construction activities were not considered in the CO or PM "hot spot" analyses.

SO_2 is generated by oxidation during combustion of organic sulfur compounds contained in diesel fuel. Off-road diesel fuel meeting federal standards can contain up to 5,000 ppm of sulfur, whereas on-road diesel is restricted to less than 15 ppm of sulfur. However, under California law and ARB regulations, off-road diesel fuel used in California must meet the same sulfur and other standards as on-road diesel fuel, so SO_2-related issues due to diesel exhaust would be minimal. Some phases of construction, particularly asphalt paving, would result in short-term odors in the immediate area of each paving site(s). Such odors would be quickly dispersed below detectable thresholds as distance from the site(s) increases.

Local Emissions

According to 40 CFR, Part 51, Section 93.123 (5), CO, PM_{10}, and $PM_{2.5}$ "hot spot" analyses are not required for construction-related activities, which create a temporary increase in air emissions. A temporary increase in air emissions is defined as an increase that would only occur during a construction phase and would last for 5 years or less at any individual site. As discussed above, construction-related activities would result in short-term emissions of PM_{10} and $PM_{2.5}$ from soil excavation and grading operations, and VOC, NO_X, and CO emissions from the exhaust of off-road heavy-duty diesel equipment used for site preparation (e.g., excavation, grading, and clearing); paving; and other construction activities. Construction activities leading to the generation of ozone precursors and criteria air pollutant emissions would be temporary and short term in duration and would not last longer than 5 years (i.e., approximately 2 years). Thus, project-generated emissions of criteria air pollutants and precursors would not expose sensitive receptors to substantial pollutant concentrations. It is concluded that local ambient air quality impacts from construction would not be adverse.

Toxic Air Contaminants — Diesel Particulate Matter Exhaust Emissions

Construction-related activities would result in short-term project-generated emissions of diesel PM from the exhaust of off-road heavy-duty diesel equipment for site preparation (e.g., excavation, grading, and clearing); paving; materials transport and handling; and other miscellaneous activities. The potential cancer risk from the inhalation of diesel PM, as discussed below, outweighs the potential noncancer health impacts (OEHHA 2003).

The dose to which receptors are exposed is the primary factor used to determine health risk (i.e., potential exposure to TACs to be compared to applicable standards). Dose is a function of the concentration of a substance or substances in the environment and the duration of exposure to the substance. Dose is positively correlated with time, meaning that a longer exposure period would result in a higher exposure level for the maximally exposed individual (MEI). Thus, the risks estimated for an MEI are higher if a fixed exposure occurs over a longer period of time. According to the Office of Environmental Health Hazard Assessment (OEHAA), health risk assessments, which determine the exposure of sensitive receptors to TAC emissions, should be based on a 70-year exposure period; however, such assessments should be limited to the period/duration of activities associated with the proposed project (Salinas 2004). The project construction period would be much less than the 70-year period used for risk determination. Because the use of off-road heavy-duty diesel equipment would be temporary in combination with the highly dispersive properties of diesel PM (Zhu et al. 2002) and further reductions in exhaust emissions, and project-generated and construction-related emissions of TACs would not expose sensitive receptors to substantial emissions of TACs. Nonetheless, a measure to reduce the potential short-term exposure of sensitive receptors to diesel PM is identified in Chapter 6.

Naturally Occurring Asbestos and Structural Asbestos

As discussed above in Naturally Occurring Asbestos, the project site is not located in an area that is likely to contain naturally occurring asbestos. However, certain building structures on YBI and the on- and off-ramp structures could potentially include structural asbestos that would be disturbed and emitted into the atmosphere during construction of the proposed project. As discussed in the Hazardous Waste/Materials section, the 2008 Site Management Plan has abated all known asbestos containing material (ACM) on the YBI and TI areas, including Quarters 10 and Building 267, which would be relocated as part of Alternative 2b. Therefore, the proposed project would not expose any receptors or workers to naturally occurring or structural asbestos.

4.2 COMPARISON OF AIR QUALITY IMPACTS BETWEEN ALTERNATIVES

The proposed project includes three possible alternatives: No Build Alternative, Alternative 2b, and Alternative 4. The No Build Alternative would not alter the existing YBI on- and off-ramps.

The two build alternatives would include the removal of the existing on- and off-ramps and construction of new ramps that meet geometric and highway design standards and seismic requirements. The traffic study determined that VMT along the ramp junctions would be similar for all three alternatives. Therefore, operational air quality impacts associated with each alternative would vary as a result of their affect on traffic flow along the ramp junctions. The following section discussed the differences in air quality impacts between alternatives. Please see the Project Description for a detailed description of each project alternative.

Carbon Monoxide "Hot Spot"

As discussed above, the proposed project would not affect any signalized intersections. Therefore, the selection of one alternative over another would not adversely affect the LOS of project intersections or the potential for a CO "hot spot."

Particulate Matter "Hot Spot"

Under the No Build Alternative, the YBI on-ramp would have insufficient capacity for future (2035) traffic volumes. However, the traffic volumes entering the SFOBB under the No Build Alternative would be slightly higher than the two build scenarios due to the unrestricted access (i.e., without metering) on the on-ramp. The two build alternatives would cause vehicles to remain on the on-ramp for longer due to the proposed metering system, which would cause more congestion and idling on the on-ramp than the No Build Alternative. Therefore, implementation of the two build alternatives is expected to be more likely to result in a $PM_{2.5}$ or PM_{10} "hot spot."

Mobile Source Air Toxics

Under the No Build Alternative, the on-ramp volumes entering the SFOBB are slightly higher than the two build alternatives due to the unrestricted access (i.e., without metering). It is anticipated that the lack of metering under the No Build Alternative would allow for vehicles to travel at a higher average speed along the on-ramp to reach the SFOBB than under the metered build alternatives. As cited in the FHWA study, *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives*, MSAT emission factors tend to be higher with increased traffic congestion. Therefore, it is anticipated that the No Build Alternative would result in a lower amount of MSAT emissions compared with the build alternatives.

Under the two build alternatives (2b and 4), the YBI on-ramp would be metered with a one-to-one ratio (i.e., one vehicle is allowed to enter the SFOBB if one vehicle exits the SFOBB). As cited in the traffic study, the average operating speed along the ramp junction would decrease with implementation of the two build alternatives as a result of the metering system. It should be noted that the amount of congestion on the SFOBB would be reduced with the build alternatives because only the same number of vehicles exiting the SFOBB, would be allowed to enter. Nevertheless, the two build alternatives would result in higher levels of delays and queuing and subsequent MSAT emissions than the No Build Alternative.

Construction Impacts

Under the No Build Alternative, the existing ramps would remain intact and no construction emissions would be generated. Both build alternatives would involve the removal of the existing ramps and construction of new on- and off-ramps on the east side of the island.

Alternative 2b and Alternative 4 would construct the proposed westbound on-ramp at different locations, which would affect the total length of the on-ramp. Alternative 4 would require an on-ramp approximately three times longer (2,883 feet) than that of Alternative 2b (876 feet). Accordingly, Alternative 4 may require increased construction effort to complete the longer on-ramp. However, Alternative 2b would include the relocation of Quarters 10 and Building 267, which is not included in Alternative 4. In terms of air pollutant emissions, it is anticipated that construction of Alternative 2b and Alternative 4 would be comparable on an annual basis. In addition, construction of either alternative is expected to last less than 2 years, which is considered a temporary increase in air pollutant emissions.

Naturally Occurring Asbestos and Structural Asbestos

As discussed above, the project site is not an area likely to contain naturally occurring asbestos. In addition, any asbestos containing material in Quarters 10 and Building 267, which would be relocated as part of Alternative 2b, has been abated in the 2008 Site Management Plan. Therefore, none of the alternatives are anticipated to cause adverse air quality impacts associated with naturally occurring or structural asbestos.

4.3 CUMULATIVE IMPACTS

The analysis of project impacts to regional air quality, as performed by MTC as part of the RTP and RTIP conformity process, is a cumulative analysis. The proposed project would conform to the assumptions in the conformity analyses for the 2035 RTP and 2009 RTIP, which are long-range planning documents that include roadway projects throughout the region. These plans, among others, are used in the SIP to determine if the region would achieve attainment or maintain attainment of ambient air quality standards. Therefore, the proposed project would not result in a cumulative impact to air quality.

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CHAPTER 5.0 – POLLUTION ABATEMENT MEASURES

Most of the construction impacts to air quality are short term in duration and, therefore, would not result in adverse or long-term conditions. Implementation of the following measures would reduce any air quality impacts resulting from construction activities:

- The construction contractor shall comply with Caltrans' Standard Specifications Section 14-9.01, "Air Pollution Control," and Section 14-9.02, "Dust Control," of Caltrans' Standard Specifications (1999).
    - Section 14-9.01, "Air Pollution Control," addresses the contractor's responsibility on many air quality concerns such as complying with air pollution control rules, regulations, ordinances, and statutes that apply to work performed under the Contract, including air pollution control rules, regulations, ordinances and statutes provided in the Government Code Section 11017 (Public Contract Code Section 10231). In addition, it is specified that material to be disposed of shall not be burned.
    - Section 14-9.02, "Dust Control," addresses the contractor's responsibility to minimize fugitive dust emissions during construction. The contractor shall prevent and alleviate dust by applying water, a dust palliative, or both under Section 14-9-01 (above); applying water under Section 17, "Watering"; applying a dust palliative under Section 18, "Dust Palliative"; and, if ordered, applying water, a dust palliative, or both to control dust caused by public traffic. This work will be paid for as extra work as specified in Section 4-1.03D, "Extra Work."
- Water or dust palliative will be applied to the site and equipment as frequently as necessary to control fugitive dust emissions.
- Soil binder will be spread on any unpaved roads used for construction purposes, and all project construction parking areas.
- Trucks will be washed off as they leave the right of way as necessary to control fugitive dust emissions.
- Construction equipment and vehicles shall be properly tuned and maintained. Low-sulfur fuel shall be used in all construction equipment as provided in California Code of Regulations Title 17, Section 93114.

- Develop a dust control plan documenting sprinkling, temporary paving, speed limits, and expedited revegetation of disturbed slopes as needed to minimize construction impacts to existing communities.

- Locate equipment and materials storage sites as far away from residential and park uses as practical. Keep construction areas clean and orderly.

- To the extent feasible, establish environmental site assessments (ESA) for sensitive air receptors within which construction activities involving extended idling of diesel equipment would be prohibited.

- Use track-out reduction measures such as gravel pads at project access points to minimize dust and mud deposits on roads affected by construction traffic.

- Cover all transported loads of soils and wet materials prior to transport, or provide adequate freeboard (space from the top of the material to the top of the truck) to reduce PM_{10} and deposition of particulate during transportation.

- Remove dust and mud that are deposited on paved, public roads due to construction activity and traffic to decrease particulate matter.

- To the extent feasible, route and schedule construction traffic to reduce congestion and related air quality impacts caused by idling vehicles along local roads during peak travel times.

- Install mulch or plant vegetation on disturbed areas as soon as practical after grading to reduce windblown particulate in the area.

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