2.2.6 Air Quality

This section evaluates potential impacts to air quality that could result from the operation of the Tier I and Tier II project alternatives. Impacts to air quality that could occur during project construction are discussed in Section 2.4, and cumulative impacts are discussed in Section 2.5.

Regulatory Setting

The Federal Clean Air Act, as amended, is the primary federal law that governs air quality while the California Clean Air Act is its companion state law. These laws, and related regulations by the United States Environmental Protection Agency and the California Air Resources Board, set standards for the quantity of pollutants in the air. At the federal level, these standards are called National Ambient Air Quality Standards. National Ambient Air Quality Standards and state ambient air quality standards have been established for six transportation-related criteria pollutants that have been linked to potential health concerns: carbon monoxide, nitrogen dioxide, ozone, and particulate matter, which is broken down for regulatory purposes into particles of 10 micrometers or smaller [PM_{10}] and particles of 2.5 micrometers and smaller [$PM_{2.5}$]), and sulfur dioxide. In addition, national and state standards exist for lead, and state standards exist for visibility-reducing particles, sulfates, hydrogen sulfide, and vinyl chloride. The National Ambient Air Quality Standards and state standards are set at levels that protect public health with a margin of safety, and are subject to periodic review and revision. Both state and federal regulatory schemes also cover toxic air contaminants (air toxics); some criteria pollutants are also air toxics or may include certain air toxics within their general definition.

Federal air quality standards and regulations provide the basic scheme for project-level air quality analysis under the National Environmental Policy Act. In addition to this environmental analysis, a parallel “Conformity” requirement under the Federal Clean Air Act also applies.

Conformity

The conformity requirement is based on Federal Clean Air Act Section 176(c), which prohibits the United States Department of Transportation and other federal agencies from funding, authorizing, or approving plans, programs or projects that do not conform to State Implementation Plan for attaining the National Ambient Air Quality Standards. “Transportation Conformity” applies to highway and transit projects and takes place on two levels: the regional—or, planning and programming level—and the project level. The proposed project must conform at both levels to be approved.

Conformity requirements apply only in nonattainment and “maintenance” (former nonattainment) areas for the National Ambient Air Quality Standards, and only for the specific National Ambient Air Quality Standards that are or were violated. United States Environmental Protection Agency regulations at 40 *Code of Federal Regulations* 93 govern the conformity process. Conformity requirements do not apply in unclassifiable/attainment areas for National Ambient Air Quality Standards and do not apply at all for state standards regardless of the status of the area.

Regional conformity is concerned with how well the regional transportation system supports plans for attaining the National Ambient Air Quality Standards for carbon monoxide, nitrogen dioxide, ozone, particulate matter (PM_{10} and $PM_{2.5}$), and in some areas (although not in California), sulfur dioxide. California has attainment or maintenance areas for all of these transportation-related “criteria pollutants” except sulfur dioxide, and also has a nonattainment area for lead; however, lead is not currently required by the Federal Clean Air Act to be covered in transportation conformity analysis. Regional conformity is based on emission analysis of Regional Transportation Plans and Federal Transportation Improvement Programs that include all transportation projects planned for a region over a period of at least 20 years (for the Regional Transportation Plan), and 4 years (for the Federal Transportation Improvement Program). Regional Transportation Plan and Federal Transportation Improvement Program conformity uses travel demand and emission models to determine whether or not the implementation of those projects would conform to emission budgets or other tests at various analysis years showing that requirements of the Clean Air Act and the State Implementation Plan are met. If the conformity analysis is successful, the Metropolitan Planning Organization, Federal Highway Administration, and Federal Transit Administration, make the determinations that the Regional Transportation Plan and Federal Transportation Improvement Program are in conformity with the State Implementation Plan for achieving the goals of the Clean Air Act. Otherwise, the projects in the Regional Transportation Plan and/or Federal Transportation Improvement Program must be modified until conformity is attained. If the design concept, scope, and “open-to-traffic” schedule of a proposed transportation project are the same as described in the Regional Transportation Plan and the Transportation Improvement Program, then the proposed project meets regional conformity requirements for purposes of project-level analysis.

Conformity analysis at the project level includes verification that the project is included in the regional conformity analysis and a “hot spot” analysis if an area is “nonattainment” or “maintenance” for carbon monoxide and/or particulate matter (PM_{10} or $PM_{2.5}$). A region is “nonattainment” if one or more of the monitoring stations in the region measures a violation of the relevant standard, and the United States Environmental Protection Agency officially designates the area nonattainment. Areas that were previously designated as nonattainment areas but subsequently meet the standard may be officially redesignated to attainment by the United States Environmental Protection Agency, and are then called “maintenance” areas. “Hot spot” analysis is essentially the same, for technical purposes, as carbon monoxide or particulate matter analysis performed for National Environmental Policy Act purposes. Conformity does include some specific procedural and documentation standards for projects that require a “hot spot” analysis. In general, projects must not cause the "hot spot” related standard to be violated, and must not cause any increase in the number and severity of violations in nonattainment areas. If a known carbon monoxide or particulate matter violation is located in the project vicinity, the project must include measures to reduce or eliminate the existing violation(s) as well.

Carbon Monoxide. Carbon monoxide is a public health concern because it combines readily with hemoglobin in human blood, reducing the amount of oxygen transported in the bloodstream. Effects on humans range from slight headaches to nausea to death. State and federal carbon monoxide standards have been set for both 1-hour and 8-hour averaging times. The state 1-hour standard is 20 parts per million by volume, and the federal 1-hour standard is 35 parts per million. Both the state and federal standard is 9 parts per million for the 8-hour averaging period. Motor vehicles are the predominant source of carbon monoxide emissions in most areas. High levels develop primarily during winter when periods of light wind combine with ground-level temperature inversions. These conditions result in reduced dispersion of the carbon monoxide in vehicle emissions. In addition, motor vehicles emit more carbon monoxide in cool temperatures than in warm temperatures.

Ozone. Ozone is not directly emitted into the air but is formed by a photochemical reaction in the atmosphere. Ozone precursors, which include oxides of nitrogen and reactive organic gases, react in the atmosphere in the presence of sunlight to form ozone. State and federal standards for ozone have been set for a 1-hour and an 8-hour averaging time. The state requires that ozone concentration not exceed 0.09 part per million produced in a given area in 1 hour. The federal 1-hour ozone standard is 0.12 part per million, but it does not apply in California. The federal 8-hour ozone standard is 0.075 part per million, and the state standard is 0.07 part per million.

Particulate Matter (PM_{10} and $PM_{2.5}$). Particulate matter emissions are generated by a wide variety of sources, including agricultural activities, industrial emissions, dust suspended by vehicular traffic and construction equipment, and secondary aerosols formed by reactions in the atmosphere. The National Ambient Air Quality Standards for particulate matter applies to two classes of particulate: $PM_{2.5}$ and PM_{10}. The state PM_{10} standards are 50 micrograms per cubic meter as a 24-hour average and 20 micrograms per cubic meter as an annual arithmetic mean. There is no separate federal standard for annual PM_{10}. The federal PM_{10} standard is 150 micrograms per cubic meter as a 24-hour average. The state standard for $PM_{2.5}$ is 12 micrograms per cubic meter as an annual arithmetic mean. There is no separate state standard for 24 hour $PM_{2.5}$. The federal annual standard for $PM_{2.5}$ is 15 micrograms per cubic meter, and the 24 hour standard is 35 micrograms per cubic meter.

Nitrogen Dioxide. Nitrogen dioxide belongs to a family of highly reactive gases called nitrogen oxides. These gases form when fuel is burned at high temperatures and come principally from motor vehicle exhaust and stationary sources such as electric utilities and industrial boilers. A suffocating, brownish gas, nitrogen dioxide is a strong oxidizing agent that reacts in air to form corrosive nitric acid, as well as toxic organic nitrates. It also plays a major role in the atmospheric reactions that produce ground-level ozone (or smog). The state standard annual arithmetic mean is 0.03 part per million, and the state 1-hour standard is 0.18 part per million. The Environmental Protection Agency's health-based annual national air quality standard for nitrogen dioxide is 0.053 part per million. A 1-hour standard of 0.1 part per million went into effect January 22, 2010.

Sulfur Dioxide. Sulfur dioxide belongs to the family of sulfur oxide gases. These gases are formed when fuel containing sulfur (mainly coal and oil) is burned, and during metal smelting and other industrial processes. The state 24-hour standard is 0.04 part per million, and the state 1-hour standard is 0.25 part per million. The Environmental Protection Agency's health-based national air quality standard for sulfur dioxide is 75 parts per billion (measured over 1 hour).

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 motor vehicles and industrial sources. Due to the phase out of leaded gasoline, metal processing is the major source of lead emissions to the air today. 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. The state 30-day average is 1.5 micrograms per cubic meter. The federal calendar quarter standard is 1.5 micrograms per cubic meter, and the 3-month rolling average standard is 0.15 microgram per cubic meter.

California-only Pollutants.

Visibility Reducing Particles. Visibility reducing particles are those that obstruct the range of visibility. The 8-hour standard extinction coefficient is 0.23 per kilometer visibility of 10 miles or more (0.07 per kilometer visibility of 30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent.

Sulfates. Sulfates are pungent solids formed primarily by the combustion of sulfur-containing fossil fuels, especially coal and oil. Considered major air pollutants, sulfates may impact human health and damage vegetation. The 24-hour standard is 25 micrograms per cubic meter using the ion chromatography method.

Hydrogen Sulfide. Hydrogen sulfide is a colorless, flammable, poisonous compound having a characteristic rotten-egg odor. It is used in industrial processes and may be emitted into the air. The 1-hour standard is 0.03 part per million (42 micrograms per cubic meter) as determined by ultraviolet fluorescence.

Vinyl Chloride. Vinyl chloride (chloroethene), a chlorinated hydrocarbon, is a colorless gas with a mild, sweet odor. Most vinyl chloride is used to make polyvinyl chloride plastic and vinyl products. Vinyl chloride has been detected near landfills, sewage plants, and hazardous waste sites, due to microbial breakdown of chlorinated solvents. The 24-hour standard is 0.01 part per million (26 micrograms per cubic meter) as determined by gas chromatography.

Toxic Air Pollutants

Mobile Source Air Toxics. These toxics are a subset of the 188 air toxics defined in the Clean Air Act. They are now federally regulated under 40 *Code of Federal Regulations* 1502.22 by the United States Environmental Protection Agency. Mobile source air toxics are 21 compounds emitted from highway vehicles and non-road equipment. The main toxics, called priority mobile source air toxics, are diesel particulate matter, benzene, 1-3 butadiene, acrolein, naphthalene, formaldehyde, and polycyclic organic matter. The Federal Highway Administration issued interim guidance in 2006 and an update to the guidance on September 30, 2009, for analysis in National Environmental Policy Act documents. There are no existing ambient air standards for the priority mobile source air toxics. Currently, the available technical tools do not enable predictions of the project-specific health impacts, so only a qualitative analysis is conducted.

Affected Environment

The information in this section is derived from the *Air Quality Study Report* (2013) prepared for this project.

The project area is within the North Central Coast Air Basin, which is an area of more than 5,100 square miles comprising Monterey, Santa Cruz, and San Benito counties. The factors affecting local air quality within the basin include meteorological and topographical conditions. Atmospheric conditions, such as wind speed, wind direction, and air temperature gradients, interact with the physical features of the landscape to determine the movement and dispersal of air pollutants.

In the fall, surface winds become weak, and the marine layer grows shallow, dissipating completely on some days. Air flow is occasionally reversed in a weak offshore movement, and the relatively stationary air mass allows pollutants to build up over a period of a few days. During this season, north or east winds develop to transport pollutants from either the San Francisco Bay Area or the Central Valley into the North Central Coast Air Basin.

During the winter, the Pacific High migrates southward and has less influence on the air basin. Air frequently flows in a southeasterly direction out of the Salinas and San Benito valleys, especially during night and morning hours. Northwest winds are most dominant in winter, but easterly flow is more frequent. The general absence of deep, persistent inversions and the occasional storm systems usually result in overall good air quality in winter and early spring.

In Santa Cruz County, coastal mountains exert strong influence on atmospheric circulation and result in generally good air quality. Small inland valleys, such as Scotts Valley with low mountains on two sides, have poorer circulation and more air pollutants than the areas of Santa Cruz on the coastal plain.

The annual average temperature in the project area is approximately 56.9 degrees Fahrenheit. The area experiences an average winter temperature of approximately 50.4 degrees Fahrenheit and an average summer temperature of approximately 62.5 degrees Fahrenheit. The semi-permanent high-pressure cell in the eastern Pacific is the basic controlling factor in the climate of the North Central Coast Air Basin. In the summer, the high-pressure cell is dominant and causes persistent west and northwest winds over the entire California coast. Air descends, forming a stable temperature inversion of hot air over a cool coastal layer of air. Onshore air currents pass over cool ocean waters to bring fog and relatively cool air into the coastal valleys. The warmer air above acts as a lid to inhibit vertical air movement. The northwest-southeast orientation of mountainous ridges tends to restrict and channel the summer onshore air currents. Surface heating in the interior portion of the Salinas and San Benito valleys creates weak low pressure, which intensifies the onshore air flow during the afternoon and evening. Annual average wind speed in the project area is approximately 4.1 miles per hour.

Total precipitation in the proposed project area averages approximately 29.3 inches annually. Precipitation occurs mostly during the winter and relatively infrequently during the summer. The amount of precipitation can vary greatly from one season to another. Precipitation averages approximately 16.8 inches during the winter, approximately 7 inches during the spring, approximately 5.1 inches during the fall, and less than 1 inch during the summer.

The Monterey Bay Unified Air Pollution Control District monitors air quality conditions at various locations throughout the North Central Coast Air Basin. The Santa Cruz-Soquel Monitoring Station is located approximately 3 miles southwest of the project corridor at 2544 Soquel Avenue in the city of Santa Cruz. Historical data from the Santa Cruz-Soquel Monitoring Station were used to characterize baseline conditions in the vicinity of the project area for ozone, $PM_{2.5}$, and PM_{10}. The nearest monitoring station to the project site for carbon monoxide, nitrogen dioxide, and sulfur dioxide is the Davenport Monitoring Station. The Davenport Monitoring Station is located approximately 15 miles west of the project corridor at Marine View and Center Avenue in the city of Davenport.

A summary of the data recorded in the project vicinity during the 2006 to 2011 period is shown in Table 2.2.6-1. The California Ambient Air Quality Standards and National Ambient Air Quality Standards for the criteria pollutants are also shown in the table. The criteria pollutants ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, $PM_{2.5}$, and PM_{10} did not exceed the standards during the 2006 through 2011 period.

Table 2.2.6-1: 2006-–2011 Ambient Air Quality Data in Project Vicinity

Pollutant	Pollutant Concentrations and Days Exceeding Standards (Federal and State)	2006	2007	2008	2009	2010	2011
Ozone[1]	Maximum 1-hour Concentration (ppm)	0.07	0.07	0.09	0.07	0.08	0.07
	Days > 0.09 ppm (State 1-hour standard)	0	0	0	0	0	0
	Days>0.12 ppm (Federal 1-hour standard	0	0	0	0	0	0
Carbon Monoxide[2]	Maximum 8-hour concentration (ppm)	0.8	1.0	1.3	5.2	0.6	*
	Days > 9.0 ppm (State 8-hour standard)	0	0	0	0	0	*
	Days > 9 ppm (Federal 8-hour standard)	0	0	0	0	0	*
Nitrogen Dioxide[2]	Maximum 1-hour Concentration (ppm)	0.03	0.03	0.03	0.02	0.03	*
	Days > 0.18 ppm (State 1-hour standard)	0	0	0	0	0	*
	Days > 0.10 ppm (Federal 1-hour standard)	0	0	0	0	0	*
PM_{10}[1]	Maximum 24-hour concentration ($\mu g/m^3$)	37	34	45	36	31	22
	Days > 50 $\mu g/m^3$ (State 24-hour standard)	0	0	0	0	0	0
	Days > 150 $\mu g/m^3$ (Federal 24-hour standard)	0	0	0	0	0	0
$PM_{2.5}$[1]	Annual Arithmetic Mean ($\mu g/m^3$)	6.8	6.3	6.8	5.7	*	
	Exceed State Standard (12 $\mu g/m^3$)	No	No	No	No		
	Exceed Federal Standard (15.0 $\mu g/m^3$)	No	No	No	No		
Sulfur Dioxide[2]	Maximum 24-hour Concentration (ppm)	0.01	<0.01	<0.01	0.01	<0.01	*
	Days > 0.04 ppm (State 24-hour standard)	0	0	0	0	0	*
	Days>0.075 ppm (Federal 24-hour-standard)	0	0	0	0	0	*

[1] Data obtained from the Santa Cruz-Soquel Monitoring Station.
[2] Data obtained from the Davenport Monitoring Station.
ppm – parts per million; $\mu g/m^3$ – micrograms per cubic meter
Source: CARB, Historical Data by Year, 2012; * Insufficient data.

The sensitive receptors or people most likely to be affected by air pollution, as identified by the California Air Resources Board, include children under 14, the elderly over 65, athletes, and people with cardiovascular and chronic respiratory diseases. Locations that may contain a high concentration of these sensitive population groups are called sensitive receptors and include residential areas, hospitals, child-care facilities, elder-care facilities, elementary schools, athletic facilities, playgrounds, and parks. Sensitive receptors that were identified in and near the project corridor include residential units, schools, a college, two tennis clubs, and a state beach.

The state and federal air quality attainment status for the North Central Coast Air Basin is shown in Table 2.2.6-2.

Table 2.2.6-2: State and Federal Criteria Air Pollutant Standards, Effects, and Sources

Pollutant	Averaging Time	State [8] Standard	Federal [8] Standard	Principal Health and Atmospheric Effects	Typical Sources	Project Area Attainment Status
Ozone (O_3) [2]	1 hour 8 hours	0.09 ppm 0.070 ppm	--- [4] 0.075 ppm (4th highest in 3 years)	High concentrations irritate lungs. Long-term exposure may cause lung tissue damage and cancer. Long-term exposure damages plant materials and reduces crop productivity. Precursor organic compounds include many known toxic air contaminants. Biogenic VOC may also contribute.	Low-altitude ozone is almost entirely formed from reactive organic gases/volatile organic compounds (ROG or VOC) and nitrogen oxides (NOx) in the presence of sunlight and heat. Common precursor emitters include motor vehicles and other internal combustion engines, solvent evaporation, boilers, furnaces, and industrial processes.	Federal: Attainment State: Nonattainment (both 1 hour and 8 hour)
Carbon Monoxide (CO)	1 hour 8 hours 8 hours (Lake Tahoe)	20 ppm 9.0 ppm [1] 6 ppm	35 ppm 9 ppm ---	CO interferes with the transfer of oxygen to the blood and deprives sensitive tissues of oxygen. CO also is a minor precursor for photochemical ozone. Colorless, odorless.	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.	Federal: Attainment (both 1 hr and 8 hr) State: Attainment (both 1 hr and 8 hr)
Respirable Particulate Matter (PM_{10}) [2]	24 hours Annual	50 µg/m^3 20 µg/m^3	150 µg/m^3 --- [2] (expected number of days above standard < or equal to 1)	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 toxic & other aerosol and solid compounds are part of PM_{10}.	Dust- and fume-producing industrial and agricultural operations; combustion smoke & vehicle exhaust; atmospheric chemical reactions; construction and other dust-producing activities; unpaved road dust and re-entrained paved road dust; natural sources.	Federal: Attainment State: Nonattainment (both 1 hr and 8 hr)

Table 2.2.6-2: State and Federal Criteria Air Pollutant Standards, Effects, and Sources

Pollutant	Averaging Time	State [8] Standard	Federal [8] Standard	Principal Health and Atmospheric Effects	Typical Sources	Project Area Attainment Status
Fine Particulate Matter ($PM_{2.5}$) [2]	24 hours	---	35 μg/m^3	Increases respiratory disease, lung damage, cancer, and premature death. Reduces visibility and produces surface soiling. Most diesel exhaust particulate matter – a toxic air contaminant – is in the $PM_{2.5}$ size range. Many toxic & other 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 and photochemical reactions involving other pollutants including NOx, sulfur oxides (SOx), ammonia, and ROG.	Federal: Attainment (Annual and 24 hr) State: Attainment
	Annual	12 μg/m^3	12.0 μg/m^3			
	24 hours (conformity process [5])	---	65 μg/m^3			
	Secondary Standard (annual; also for conformity process [5])	---	12 μg/m^3 (98th percentile over 3 years)			
Nitrogen Dioxide (NO_2)	1 hour	0.18 ppm	0.100 ppm [6] (98th percentile over 3 years)	Irritating to eyes and respiratory tract. Colors atmosphere reddish-brown. Contributes to acid rain & nitrate contamination of stormwater. Part of the "NOx" group of ozone precursors.	Motor vehicles and other mobile or portable engines, especially diesel; refineries; industrial operations.	Federal: Attainment (1 hr and annual) State: Attainment (1 hr and annual)
	Annual	0.030 ppm	0.053 ppm			
Sulfur Dioxide (SO_2)	1 hour	0.25 ppm	0.075 ppm [7] (99th percentile over 3 years)	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; some natural sources like active volcanoes. Limited contribution possible from heavy-duty diesel vehicles if ultra-low sulfur fuel not used.	Federal: Attainment (1 hr) State: Attainment (24 hour and 1 hr)
	3 hours	---	0.5 ppm [9]			
	24 hours	0.04 ppm				
Lead (Pb)[3]	Monthly	1.5 μg/m^3	---	Disturbs gastrointestinal system. Causes anemia, kidney disease, and neuromuscular and neurological dysfunction. Also a toxic air contaminant and water pollutant.	Lead-based industrial processes like battery production and smelters. Lead paint, leaded gasoline. Aerially deposited lead from older gasoline use may exist in soils along major roads.	Federal: Attainment State: Attainment
	Rolling 3-month average	---	0.15 μg/m^3 [11]			

Table 2.2.6-2: State and Federal Criteria Air Pollutant Standards, Effects, and Sources

Pollutant	Averaging Time	State [8] Standard	Federal [8] Standard	Principal Health and Atmospheric Effects	Typical Sources	Project Area Attainment Status
Sulfate	24 hours	25 µg/m^3	---	Premature mortality and respiratory effects. Contributes to acid rain. Some toxic air contaminants attach to sulfate aerosol particles.	Industrial processes, refineries and oil fields, mines, natural sources like volcanic areas, salt-covered dry lakes, and large sulfide rock areas.	Federal: n/a State: Attainment
Hydrogen Sulfide (H_2S)	1 hour	0.03 ppm	---	Colorless, flammable, poisonous. Respiratory irritant. Neurological damage and premature death. Headache, nausea. Strong odor.	Industrial processes such as: refineries and oil fields, asphalt plants, livestock operations, sewage treatment plants, and mines. Some natural sources like volcanic areas and hot springs.	Federal: n/a State: Attainment
Visibility Reducing Particles (VRP)	8 hours	Visibility of 10 miles or more (Tahoe: 30 miles) at relative humidity less than 70%	---	Reduces visibility. Produces haze. NOTE: not directly related to the Regional Haze program under the Federal Clean Air Act, which is oriented primarily toward visibility issues in National Parks and other “Class I” areas. However, some issues and measurement methods are similar.	See particulate matter above. May be related more to aerosols than to solid particles.	Federal: n/a State: Attainment
Vinyl Chloride[3]	24 hours	0.01 ppm	---	Neurological effects, liver damage, cancer. Also considered a toxic air contaminant.	Industrial processes	Federal: n/a State: Attainment

Environmental Consequences

Regional Air Quality Conformity

The project is located in an attainment/unclassified area for all current National Ambient Air Quality Standards. Therefore, conformity requirements do not apply.

The proposed project is in the Metropolitan Transportation Plan/Sustainable Communities Strategy, which was found to conform to the State Implementation Plan for achieving the goals of the Clean Air Act requirements related to the National Ambient Air Quality Standards by the Association of Monterey Bay Area Governments on June 11, 2014. The project is also included in the Association of Monterey Bay Area Governments financially constrained 2014 Metropolitan Transportation Improvement Program, which was also found to conform by the Federal Highway Administration and the Federal Transportation Administration on December 15, 2014. The project is described as “Highway 1 HOV Lanes (In the City of Santa Cruz, on Route 1 between Morrissey and San Andreas and Larkin Valley Road. Add HOV lanes, pedestrian overcrossings, and operational improvements).” The design concept and scope of the proposed project is consistent with the project description in the 2014 Metropolitan Transportation Plan, 2014 Metropolitan Transportation Improvement Program, and the assumptions used in the Association of Monterey Bay Area Governments regional emissions analysis.

Project-Level Conformity

Under Clean Air Act requirements, areas are designated as either attainment or nonattainment for each criterion pollutant based on whether the National Ambient Air Quality Standards have been achieved. Areas are designated as nonattainment for a pollutant if air quality data show that a federal standard for the pollutant was violated at least once during the previous three calendar years. Under the Clean Air Act, the Santa Cruz County portion of the North Central Coast Air Basin is designated as an attainment area under federal standards for all criteria pollutants, which is reflected in Table 2.2.6-2.

Project-Level Operational Emissions

Project-level operational emissions were quantified based on the vehicle miles traveled calculated for the proposed project using transportation models. Automobile emissions were quantified using light-duty emission factors obtained from the California Air Resources Board EMFAC2011 Motor Vehicle Emissions Inventory Model.

Vehicles generally have lower emissions rates in free-flow conditions compared to stop-and-go conditions; however, as shown below, peak-hour and annual emissions would increase for certain pollutants within the various scenarios and analysis years. The EMFAC2011 model cannot directly estimate the impacts of changes in acceleration and deceleration patterns. Instead, the emission factors were developed for average speeds. The result is a "U-shape" relationship between emission factors and vehicle speeds, which varies by pollutant. For example, emission factors for particulate matter may decrease with speeds up to 35 miles per hour but increase above 35 miles per hour. The emission rate of nitrogen oxides increases per mile with speeds between 42 and 52 miles per hour, while emission rate of carbon monoxide decreases per mile with speeds between 42 and 52 miles per hour. As a result, increasing vehicle speeds from 35 miles per hour to a free-flow speed of 65 miles per hour would potentially increase emissions of carbon monoxide, particulate matter ($PM_{2.5}$) and nitrogen oxides. This is evident in the modeling results shown in Table 2.2.6-3. In addition, increasing vehicle speeds allows more vehicles to travel the project alignment during the peak-hour period, resulting in higher mass emissions.

Table 2.2.6-3 presents emissions for the Tier I Alternatives for the year 2035 as well as baseline conditions. The baseline conditions values are based on traffic volumes and emission factors in 2003, at the time that the Notice of Preparation for the proposed project was published. This is consistent with the 2010 decision by the California Court of Appeal (6th District) in Sunnyvale West Neighborhood Association v. City of Sunnyvale City Council, which clarified that California Environmental Quality Act analyses of future traffic and traffic-related impacts must be compared against a baseline of existing conditions when the Notice of Preparation is published.

Tier I Corridor HOV Lane Alternative

A regional emissions analysis was completed based on AM and PM peak-hour traffic volumes and speeds. The proposed project is designed to decrease congestion and increase vehicle speeds during the heavily congested peak hours. The HOV lanes will not greatly affect freeway speeds and flow during uncongested time periods; therefore, the peak-hour analysis is an accurate representation of how the proposed project will change regional emissions. Project-level peak-hour emissions are presented in Table 2.2.6-3. The Tier I Corridor HOV Lane Alternative would generally reduce peak-hour emissions when compared to baseline conditions. In comparison to the No-Build Alternative, in 2035, the Tier I Corridor HOV Lane Alternative would result in peak-period reductions in three criteria pollutants, and minor increases in three criteria pollutant emissions.

Table 2.2.6-3: Peak-Hour Emissions – Tier I Corridor HOV Lane Alternative

Scenario	Corridor Emissions (Pounds per AM and PM Peak Hours)					
	Carbon Monoxide	**Reactive Organic Gas**	**Nitrogen Oxides**	**Sulfur Oxides**	**PM_{10}**	**$PM_{2.5}$**
Baseline Condition*	2,128	100	357	1.9	18	8.9
2035						
No Build	312	17	46	1.9	12	6.8
HOV	330	13	55	1.7	5.9	8.8
HOV versus Baseline	(1,798)	(87)	(303)	(0.2)	(12)	(0.1)
HOV versus No Build	18	(4)	9	(0.2)	(6.4)	2.0

* Baseline Condition is based on 2003 traffic volumes and emission factors.
Note: Parenthesis indicates a negative number.
Note: Emissions based on vehicle miles traveled and speeds obtained from the Traffic Operations Report (2012); Emission factors obtained from EMFAC2011.
Note: Due to rounding, the numbers presented may not add up precisely to the totals provided.
Source: Air Quality Study Report, 2013.

Annual emissions are presented in Table 2.2.6-4. When comparing the Tier I Corridor HOV Lane Alternative annual emissions to baseline conditions, in 2035, mobile source emissions would substantially decrease. Annual emissions in 2035 would realize a minor decrease when comparing the Tier I Corridor HOV Lane Alternative to the No Build Alternative. This difference in emissions between the No Build and the Tier I Corridor HOV Lane Alternative is primarily related to volume. In 2035, the general purpose lanes would become more congested, while the HOV lane operates at higher speeds, which leads to an improvement in emissions. While 2035 peak period emissions for certain pollutants would show a minor increase when compared to the No Build Alternative, all 2035 annual emissions under the Tier I Corridor HOV Lane Alternative would be less than the No Build Alternative. Both peak-period and annual emissions under the Tier I Corridor HOV Lane Alternative would be less than the baseline (2003) emissions.

Because local monitoring data show that the study area has not exceeded ambient air quality standards since 2006, it is unlikely that the standards would be exceeded in the future when total emissions are lower. Therefore, the Tier I Corridor HOV Lane Alternative would not result in an adverse impact related to annual project-level emissions.

Table 2.2.6-4: Annual Emissions – Tier I Corridor HOV Lane Alternative

Scenario	Corridor Annual Emissions (Tons per Year)					
	CO	**ROG**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
Baseline Condition*	38,600	1,694	7,340	34	297	146
2035						
No Build	3,901	190	691	21	85	103
HOV Lane	2,448	108	440	13	45	68
HOV versus Baseline	(36,153)	(1,587)	(6,900)	(21)	(251)	(78)
HOV versus No Build	(1,453)	(83)	(251)	(8)	(40)	(35)

* Baseline Condition is based on 2003 traffic volumes and emission factors.
CO – carbon monoxide; ROG – reactive organic gas; NO_X – nitrogen oxide; SO_X – sulfur oxide; PM_{10} – particulate matter less than 10 microns in diameter; $PM_{2.5}$ – particulate matter less than 2.5 microns in diameter.
Note: Parenthesis indicates a negative number.
Note: Due to rounding, the numbers presented may not add up precisely to the totals provided.
Source: Based on vehicle miles traveled and speeds obtained from the Traffic Operations Report (2012); Emission factors obtained from EMFAC2011.

Tier I Corridor TSM Alternative

Project-level peak-hour emissions are presented in Table 2.2.6-5. When compared to baseline (2003) conditions, in 2035, the Tier I Corridor TSM Alternative would reduce peak-hour emissions for all pollutants except sulfur oxides. When compared with the No Build Alternative, in 2035, the TSM Alternative would show minor increases in all criteria pollutants. Although emissions for certain pollutants would increase when compared to the No Build Alternative, all emissions under the Tier I Corridor TSM Lane Alternative would be similar and, in some cases, would be substantially less than baseline emissions. Because local monitoring has shown that the study area has not recently exceeded ambient air quality standards, it is unlikely that the standards would be exceeded in the future when total emissions are lower. Therefore, the Tier I Corridor TSM Lane Alternative would not result in an adverse impact related to annual project-level emissions.

Table 2.2.6-5: Peak-Hour Emissions – Tier I Corridor TSM Alternative

Scenario	Corridor Peak-Hour Emissions (Pounds per AM and PM Peak Hours)					
	CO	ROG	NO_X	SO_X	PM_{10}	$PM_{2.5}$
Baseline Condition*	2,128	100	357	1.9	18.1	8.9
2035						
No Build	312	17	46	1.9	12.3	6.8
TSM	359	18	56	2.0	15.5	8.4
TSM versus Baseline	(1,769)	(81)	(302)	0.1	(2.5)	(0.6)
TSM versus No Build	47	1	10	0.2	3.2	1.5

* Baseline Condition is based on 2003 traffic volumes and emission factors.
CO – carbon monoxide; ROG – reactive organic gas; NO_X – nitrogen oxide; SO_X – sulfur oxide; PM_{10} – particulate matter less than 10 microns in diameter; $PM_{2.5}$ – particulate matter less than 2.5 microns in diameter.
Note: Parenthesis indicates a negative number.
Note: Due to rounding, the numbers presented may not add up precisely to the totals provided.
Source: Based on vehicle miles traveled and speeds obtained from the Traffic Operations Report (2012); emission factors obtained from EMFAC2011.

Annual emissions are presented in Table 2.2.6-6. When compared to baseline conditions, the Tier I Corridor TSM Alternative would reduce or have a minor effect on mobile source emissions in 2035. When compared to the No Build Alternative, the Tier I Corridor TSM Alternative results in increases in annual emissions. These emissions increases in certain pollutants are due to emission rates increasing as vehicles approach free-flow speed.

No ambient air quality standards have been exceeded in the study area since 2006, as indicated in Table 2.2.6-1. Although emissions for certain pollutants would increase when compared to the No Build Alternative, all emissions under the Tier I Corridor TSM Lane Alternative would be similar and, in some cases, would be substantially less than baseline emissions. Because the study area has not recently exceeded ambient air quality standards, it is unlikely that the standards would be exceeded in the future when total emissions are lower. Therefore, the Tier I Corridor TSM Lane Alternative would not result in an adverse impact related to annual project-level emissions.

Tier I No Build Alternative

The No Build Alternative assumes no major construction on Route 1 through the project limits other than currently planned and programmed improvements and continued routine

Table 2.2.6-6: Annual Emissions – Tier I Corridor TSM Alternative

Scenario	Corridor Annual Emissions (Tons per Year)					
	CO	ROG	NO_X	SO_X	PM_{10}	$PM_{2.5}$
Baseline Condition*	38,600	1,694	7,340	34	297	146
2035						
No Build	3,901	190	691	21	85	103
TSM	4,997	235	908	26	114	135
TSM versus Baseline	(33,604)	(1,459)	(6,432)	(8)	(183)	(11)
TSM versus No Build	1,096	45	217	5	28	32

* Baseline Condition is based on 2003 traffic volumes and emission factors.
CO – carbon monoxide; ROG – reactive organic gas; NO_X – nitrogen oxide; SO_X – sulfur oxide; PM_{10} – particulate matter less than 10 microns in diameter; $PM_{2.5}$ – particulate matter less than 2.5 microns in diameter.
Note: Parenthesis indicates a negative number.
Note: Due to rounding, the numbers presented may not add up precisely to the totals provided.
Source: Based on vehicle miles traveled and speeds obtained from the Traffic Operations Report (2012); emission factors obtained from EMFAC2011.

maintenance. Other programmed improvements would undergo individual environmental review with project and construction emissions analyzed, as necessary.

No Build Alternative peak-hour and annual emissions compared to baseline emission are shown in Tables 2.2.6-7 and 2.2.6-8. Table 2.2.6-7 presents projected peak hour emissions, and Table 2.2.6-8 presents projected annual emissions. As shown in Table 2.2.6-7, in 2035, the No Build Alternative would result in the same amount of peak hour emissions for sulfur oxides (SOx) as under baseline conditions and would result in fewer peak hour emissions than baseline conditions for all other pollutants.

Table 2.2.6-7: Peak-Hour Emissions – Tier I Corridor No Build Alternative

Scenario	Corridor Peak-Hour Emissions (Pounds per Hours)					
	CO	ROG	NO_X	SO_X	PM_{10}	$PM_{2.5}$
Baseline Condition*	2,128	100	357	1.9	18.1	8.9
2035						
No Build	312	17	46	1.9	12.3	6.8
No Build versus Baseline	(1,816)	(83)	(311)	0	(5.8)	(2.1)

* Baseline Condition is based on 2003 traffic volumes and emission factors.
CO – carbon monoxide; ROG – reactive organic gas; NO_X – nitrogen oxide; SO_X – sulfur oxide; PM_{10} – particulate matter less than 10 microns in diameter; $PM_{2.5}$ – particulate matter less than 2.5 microns in diameter.
Note: Parenthesis indicates a negative number.
Source: Based on vehicle miles traveled and speeds obtained from the Traffic Operations Report (2012); emission factors obtained from EMFAC2011.

Table 2.2.6-8: Annual Emissions – Tier I Corridor No Build Alternative

Scenario	Corridor Annual Emissions (Tons per Year)					
	CO	ROG	NO_X	SO_X	PM_{10}	$PM_{2.5}$
Baseline Condition*	38,600	1,694	7,340	34	297	146
2035						
No Build	3,901	190	691	21	85	103
No Build versus Baseline	(34,699)	(1,504)	(6,649)	(13)	(212)	(43)

* Baseline Condition is based on 2003 traffic volumes and emission factors.
CO – carbon monoxide; ROG – reactive organic gas; NO_X – nitrogen oxide; SO_X – sulfur oxide; PM_{10} – particulate matter less than 10 microns in diameter; $PM_{2.5}$ – particulate matter less than 2.5 microns in diameter.
Note: Parenthesis indicates a negative number.
Note: Due to rounding, the numbers presented may not add up precisely to the totals provided.
Source: Based on vehicle miles traveled and speeds obtained from the Traffic Operations Report (2012); Emission factors obtained from EMFAC2011.

As shown in Table 2.2.6-8, the No Build Alternative would result in fewer annual emissions than baseline conditions for all pollutants evaluated for 2035. These predicted reductions in mobile source emission rates are due to improvements in engine efficiency. Because the No Build Alternative would result in the emission of fewer pollutants (or, for peak hour emissions, the same level of sulfur oxide) as occurs under baseline conditions, the No Build Alternative would not result in an adverse impact related to project-level emissions.

Tier II Auxiliary Lane Alternative

The Tier II Auxiliary Lane Alternative would reduce congestion and improve vehicle speeds during peak traffic periods on Route 1 within the Tier II Corridor (41st Avenue to Soquel Avenue). The Tier II Auxiliary Lane Alternative improvements were included in the air quality analysis of the Tier I Corridor HOV Lane Alternative shown above, based on a traffic operations analysis conducted in 2010 that prioritized the Tier II Auxiliary Lane Alternative for funding and construction, independent of the preferred alternative that is selected for the Tier I corridor. The prioritization of the Tier II Auxiliary Lane Alternative was due to its potential to relieve congestion and at the same time minimize traffic “hot spots” along the corridor. Table 2.1.5-1 (in Section 2.1.5, Traffic) shows that, under baseline conditions, the average travel speeds in the northbound direction are 30 miles per hour in the morning and 39 miles per hour in the evening. In the southbound direction, they are 60 miles per hour in the morning and 26 miles per hour in the evening. As described in Section 2.1.5, the Tier II Auxiliary Lane Alternative would improve traffic operations along the northbound corridor in the AM peak hour; slightly worsen traffic operations along the southbound corridor in the PM peak hour, but improve vehicle and person throughputs; negligibly improve the Highway 1 corridor operations in the non-peak directions of travel (southbound in the AM peak hour and northbound in the PM peak hour); and eliminate the existing bottleneck between the Soquel Avenue and 41st Avenue interchanges in the northbound direction.

As previously discussed, the relationship between emissions factors and speeds varies for each pollutant. As evident in the EMFAC2011 model, the emission rate of nitrogen oxides increases per mile with speeds between 42 and 52 miles per hour, while emission rate of carbon monoxide decreases per mile with speeds between 42 and 52 miles per hour, and particulate matter may decrease with speeds up to 35 miles per hour but may increase above 35 miles per hour. As a result, increasing vehicle speeds from the range of 26 to 39 miles per hour to the range of 42 to 52 miles per hour would potentially reduce carbon monoxide emissions, although it could result in increases of nitrogen oxides and particulate matter. Further increases to a free-flow speed of 65 miles per hour would potentially increase emissions of carbon monoxide according to EMFAC2011. These examples are based on speeds that were used in the air quality analysis. As noted previously, the EMFAC2011 model cannot directly estimate the impacts of changes in acceleration and deceleration patterns; however, reductions in congestion reduce the amount of acceleration/deceleration associated with stop-and-go traffic conditions, which offers air quality benefits that are not quantified in the model.

Project-Level Analysis

Projects located in areas that are designated as in nonattainment of federal standards for carbon monoxide or particulate matter less than 10 microns in diameter (PM_{10}) must conduct a hot-spot analysis to demonstrate that the transportation project meets federal Clean Air Act conformity requirements to support state and local air quality goals with respect to potential localized air quality impacts. As shown in Table 2.2.6-2, the project area is in attainment of the federal carbon monoxide and PM_{10} standards. Therefore, a quantitative hot-spot analysis is not required for these pollutants.

Localized Concentrations

As discussed above, carbon monoxide and particulate matter hot-spot analyses are not required to demonstrate project-level conformity for the Tier I Corridor build alternatives or the Tier II Auxiliary Lane Alternative; however, based on Caltrans guidance, a carbon monoxide hot-spot analysis was completed for the Tier I Corridor Alternatives using methodology provided in the Transportation Project-Level Carbon Monoxide Protocol (University of California Davis, December 1997). The Environmental Protection Agency CAL3QHC micro-scale dispersion model was used to calculate carbon monoxide concentrations. A worst-case representative sample of intersections was chosen based on low level of service and high traffic volumes.

Tier I Corridor HOV Lane Alternative

The project would be implemented in phases, as discussed in Section 1.8. Carbon monoxide concentrations at the analyzed intersections for this alternative are shown in Table 2.2.6-9. One-hour carbon monoxide concentrations under the Tier I Corridor HOV Lane Alternative would be approximately 1 part per million in 2035. Eight-hour carbon monoxide concentrations under project conditions would be approximately 0.6 part per million in 2035. Carbon monoxide concentrations would not exceed the federal 1- and 8-hour standards of 35 and 9 parts per million, respectively. In addition, the state 1- and 8-hour standards of 20 and 9 parts per million, respectively, would not be exceeded. Therefore, the Tier I Corridor HOV Lane Alternative would not result in an adverse impact related to carbon monoxide hot spots.

Table 2.2.6-9: Carbon Monoxide Concentrations – Tier I Corridor HOV Lane Alternative

Roadway Segment	1-Hour (ppm)	8-Hour (ppm)
2035		
41st Avenue & Route 1 southbound ramps – AM	1	0.5
Soquel Drive & Soquel Avenue & Route 1 southbound ramps – AM	1	0.5
Soquel Drive & Paul Sweet Road & Route 1 northbound ramps – PM	1	0.6
Park Avenue & Kennedy Drive – PM peak hour	1	0.4
Soquel Drive & Soquel Avenue & Route 1 southbound ramps – PM	1	0.5

Note: Based on vehicle miles traveled and speeds obtained from the Traffic Operations Report (2012); emission factors obtained from EMFAC2011.
Source: Air Quality Study Report, 2013.

Tier I Corridor TSM Alternative

In this section, the year 2003 is discussed as a baseline comparison. The project would be implemented in phases, as discussed in Section 1.8. Carbon monoxide concentrations for the Tier I Corridor TSM Alternative are shown in Table 2.2.6-10. One-hour carbon monoxide concentrations under the Tier I Corridor TSM Alternative would be approximately 1 part per million in 2035. Eight-hour carbon monoxide concentrations under project conditions would be approximately 0.5 part per million in 2035. Carbon monoxide concentrations would not exceed the federal 1- and 8-hour standards of 35 and 9 parts per million, respectively. In addition, the state 1- and 8-hour standards of 20 and 9 parts per million, respectively, would not be exceeded; therefore, the Tier I Corridor TSM Alternative would not result in an adverse impact related to carbon monoxide hot spots.

Table 2.2.6-10: Carbon Monoxide Concentrations – Tier I Corridor TSM Alternative

Roadway Segment	1-Hour (ppm)	8-Hour (ppm)
2035		
Morrissey Boulevard & Rooney Street – AM	<1	0.2
Northbound ramps & Rooney Street – AM	<1	0.2
Porter Street & Main Street – AM	<1	0.3
Rio Del Mar Boulevard & Soquel Drive – AM	<1	0.3
State Park Drive & northbound ramps – PM	1	0.5

Note: Based on vehicle miles traveled and speeds obtained from the Traffic Operations Report (2012); emission factors obtained from EMFAC2011.
Source: Air Quality Study Report, 2013.

Tier II Auxiliary Lane Alternative

The intersection volumes for the Tier II Auxiliary Lane Alternative would be similar to the volumes for the Tier I Corridor Alternatives. As discussed above, carbon monoxide concentrations for the Tier I Corridor Alternatives were well below the state and federal standards. Similarly, it is reasonable to assume that Tier II Auxiliary Lane Alternative carbon monoxide concentrations would be 83 to 94 percent below the standards; therefore, the Tier II Auxiliary Lane Alternative would not result in an adverse impact related to carbon monoxide concentrations.

No Build Alternative

The No Build Alternative assumes no major construction on Route 1 through the Tier I and II project limits other than currently planned and programmed improvements and continued routine maintenance. The No Build Alternative is not expected to result in an adverse impact related to carbon monoxide hot spots.

PM_{10} and $PM_{2.5}$

Tier I Corridor Alternatives and Tier II Auxiliary Lane Alternative

Particulate matter hot-spot analyses are required to demonstrate that a transportation project meets federal Clean Air Act conformity requirements to support state and local air quality goals with respect to potential localized air quality impacts. As shown in Table 2.2.6-2, the North Central Coast Air Basin is designated as in attainment for all federal criteria pollutant standards. Transportation conformity does not apply to the proposed project, and hot-spot analyses are not required for the Tier I Corridor Alternatives and the Tier II Auxiliary Lane Alternative.

Mobile Source Air Toxics

Tier I Corridor Alternatives and Tier II Auxiliary Lane Alternative

The Federal Highway Administration in its Interim Guidance issued on September 30, 2009 (Interim Guidance on Mobile Source Air Toxics Analysis in National Environmental Policy Act Documents), recommends a range of options appropriate for addressing and documenting the mobile source air toxics issue in National Environmental Policy Act documents. Based on Federal Highway Administration guidance, the Tier I and Tier II build alternatives have low potential for mobile source air toxic effects because design year annual average daily traffic will not exceed 140,000 vehicles. Therefore, a qualitative mobile source air toxic analysis was completed.

For the Tier I Corridor Alternatives and Tier II Auxiliary Lane Alternative, the amount of mobile source air toxics emitted would be proportional to the vehicle miles and vehicle hours traveled, with consideration for variables such as fleet mix. The Tier I Corridor Alternatives and Tier II Auxiliary Lane Alternative would not generate new countywide trips, and vehicles that would travel on the roadway network would travel on Route 1. Because the estimated countywide vehicle miles traveled under both Tier I Corridor Alternatives and the Tier II Auxiliary Lane Alternative would be the same, there would be no appreciable difference in overall mobile source air toxic emissions.

The additional travel lanes under the Tier I Corridor Alternatives and the Tier II Auxiliary Lane Alternative would have the effect of moving some traffic closer to homes, schools, and businesses, which may increase ambient concentrations of mobile source air toxics in localized areas along the project corridor. The localized level of mobile source air toxics emitted from the Tier I build alternatives and Tier II Auxiliary Lane Alternative could be higher than from the No Build Alternative. Additionally, peak hour emissions for both Tier I build alternatives would be higher for some criteria pollutants than under the No Build Alternative, although annual emissions for the HOV Lane Alternative would be lower for all criteria pollutants than the No Build. Localized and peak-period increases would likely be offset by the increases in travel speeds and reduction in traffic congestion, which are associated with lower mobile source air toxic emissions.

The United States Environmental Protection Agency's vehicle and fuel regulations, coupled with fleet turnover will, over time, produce substantial emissions reductions that, in almost all cases, will result in lower future mobile source air toxic levels regionwide than there are today.

Avoidance, Minimization, and/or Mitigation Measures

Tier I Corridor Alternatives and Tier II Auxiliary Lane Alternative

No adverse operational impacts were identified, and no avoidance, minimization, and/or mitigation measures are required. Construction impacts and avoidance, minimization, and/or mitigation measures are discussed in Section 2.4.4.