3.11 AIR QUALITY

Introduction

This section considers the air quality implications of the Proposed Project in eastern Contra Costa County. The County is part of the nine-county San Francisco Bay Area Air Basin (SFBAAB). While overall air quality in the air basin is generally good, the area does not achieve state and federal standards for certain pollutants. Enhanced transit service typically offers regional air quality benefits by diverting automobiles off the roads. However, the use of diesel fuels to operate the proposed Diesel Multiple Unit (DMU) technology and the increase in local automobile congestion around station areas could result in elevated air emissions and a potential increase in cancer risk from diesel emissions. Therefore, an air quality analysis is conducted to quantify the pollutant emission changes and health risks associated with the Proposed Project and to compare these changes to thresholds established by local, state, and federal air quality agencies.

Air quality-related comments received in response to the NOPs (copies of the 2005 and 2008 NOPs are presented in Appendix A to this document) requested that the air pollutants emitted from project construction and operation be identified and quantified, particularly those associated with the DMUs and other diesel-powered alternatives. In addition, information was requested about potential health risks of diesel-generated air toxics and that mitigation plans be implemented to adequately reduce pollutant emission from construction and operational sources.

Existing Conditions

Climate and Meteorology

The primary factors that determine air quality are the locations of air pollutant sources and the amount of pollutants emitted from those sources. Meteorological and topographical conditions are also important factors. Atmospheric conditions, such as wind speed, wind direction, and atmospheric stability, interact with the physical features of the landscape to determine the movement and dispersion of air pollutants.

Bay Area Climate. The Bay Area climate is influenced by the semi-permanent high-pressure cell centered over the northeastern Pacific Ocean. This high pressure cell keeps storms from affecting the Bay Area in the summer, then weakens and shifts southward in the winter, allowing the passage of winter storm systems. The predominant winds during most of the year are out of the west.

Local Topography and Meteorology. The topographical feature that has the greatest influence on project corridor meteorology is the Carquinez Strait, which runs from Rodeo to Martinez, just west of the project corridor. The Carquinez Strait is the only sea-level gap in the mountain ranges that separate the San Francisco Bay Area from the Central Valley. During the summer and fall, high pressure offshore, coupled with low pressure in the Central Valley, causes marine air to flow from the west through the Carquinez Strait. In the late fall and winter, the wind pattern shifts with the passage of storm systems, and the predominant wind direction is from the east. During the winter stormy periods, inversions (layers of warmer air over colder air) are weak or nonexistent, winds are moderate, and air pollution potential is low.

During the summer, the wind is strongest in the afternoon; wind speeds of 15 to 20 miles per hour are common throughout the Carquinez Strait region on summer afternoons. Wind speeds range from 7 miles per hour in winter to 14 miles per hour in summer.[1] Summer mean maximum temperatures reach about 90 degrees Fahrenheit in the project corridor. Mean minimum temperatures in the winter are in the high 30s.[2] Many industrial facilities with significant air pollutant emissions, e.g., chemical plants and refineries, are upwind of the corridor, to the west. High wind speeds often moderate the pollution potential of this area. The proximity of State Route 4 (SR 4) to the project corridor also contributes to carbon monoxide, particulate matter, and diesel particulate matter emissions.

Criteria Pollutants and Local Air Quality

Federal and State Ambient Air Quality Standards. Existing air quality conditions in the project corridor can be characterized in terms of the ambient air quality standards that the State of California and the federal government have established for several different pollutants known as "criteria" pollutants. These standards have been set to protect public health. The criteria pollutants include ozone (O_3), carbon monoxide (CO), nitrogen oxides (NO_X), sulfur oxides (SO_X), inhalable particulate matter less than 10 microns in diameter (PM_{10}) and less than 2.5 microns in diameter ($PM_{2.5}$), and lead. The state is divided into air districts, which are characterized by whether their ambient pollutant levels are greater than or less than these standards. For each criteria pollutant, those areas having pollutant levels less than the standards are called attainment areas, and those with pollutant levels greater than the standards are called nonattainment areas. The attainment status of the SFBAAB is presented in Table 3.11-1 and discussed below.

The pollutants of greatest concern in the project corridor are CO, O_3, PM_{10}, and $PM_{2.5}$. The Bay Area does not attain the state or federal O_3 standard nor the state PM_{10} or $PM_{2.5}$ standards. The Bay Area does attain the state and federal CO standards; however, CO is a concern because it is the predominant pollutant from passenger vehicles. SO_X is no longer considered a

1 California Air Resources Board, *California Surface Wind Climatology*, 1984.
2 Bay Area Air Quality Management District (BAAQMD), *CEQA Guidelines,* December 1999.

Table 3.11-1
State and National Criteria Air Pollutant Standards, Effects, and Sources

Pollutant	Averaging Time	State Standard[a] Concentration	State Standard[a] Attainment Status	National Standard[b] Concentration	National Standard[b] Attainment Status	Pollutant Health and Atmospheric Effects	Major Pollutant Sources
Ozone	1-Hour 8-Hour	0.09 ppm 0.070 ppm	N N	—[c] 0.075 ppm	—[c] N	High concentrations can directly affect lungs, causing irritation. Long-term exposure may cause damage to lung tissue.	Formed when reactive organic gases and NO_x react in the presence of sunlight. Major sources include on-road motor vehicles, solvent evaporation, and commercial industrial mobile equipment.
Carbon Monoxide	1-Hour 8-Hour	20 ppm 9.0 ppm	A A	35 ppm 9 ppm	A A	Classified as a chemical asphyxiate, CO interferes with the transfer of fresh oxygen to the blood and deprives sensitive tissues of oxygen.	Internal combustion engines, primarily gasoline-powered motor vehicles.
Nitrogen Dioxide	1-Hour Annual	0.18 ppm 0.030 ppm	A A	— 0.053 ppm	A A	Irritating to eyes and respiratory tract. Colors atmosphere reddish-brown.	Motor vehicles, petroleum-refining operations, industrial sources, aircraft, ships, and railroads.
Sulfur Dioxide	1 Hour 24-Hour Annual	0.25 ppm 0.04 ppm	A A	— 0.14 ppm 0.030 ppm	 A A	Irritates upper respiratory tract; injurious to lung tissue. Can yellow the leaves of plants, destructive to marble, iron, and steel. Limits visibility and reduces sunlight.	Fuel combustion, chemical plants, sulfur recovery plants, and metal processing.
Particulate Matter (PM_{10})	24 Hour Annual	50 $\mu g/m^3$ 20 $\mu g/m^3$	N N	150 $\mu g/m^3$ 50 $\mu g/m^3$	U A	May irritate eyes and respiratory tract, decreases in lung capacity, cancer, and increased mortality. Produces haze and limits visibility.	Dust and fume-producing industrial and agricultural operations, combustion, atmospheric photochemical reactions, and natural activities (e.g., wind-raised dust and ocean sprays).

Table 3.11-1
State and National Criteria Air Pollutant Standards, Effects, and Sources

Pollutant	Averaging Time	State Standard[a] Concentration	State Standard[a] Attainment Status	National Standard[b] Concentration	National Standard[b] Attainment Status	Pollutant Health and Atmospheric Effects	Major Pollutant Sources
Fine Particulate Matter ($PM_{2.5}$)	24 Hour Annual	— 12 $\mu g/m^3$	 N	65 $\mu g/m^3$ 15 $\mu g/m^3$	A A	Increases respiratory disease, lung damage, cancer, and premature death. Reduces visibility and results in surface soiling.	Fuel combustion in motor vehicles, equipment, and industrial sources; residential and agricultural burning. Also formed from photochemical reactions of other pollutants, including NO_x, $S0_2$, and organics.
Lead	Monthly Quarterly	1.5 $\mu g/m^3$	A	— 1.5 ug/m^3	 A	Disturbs gastrointestinal system, and causes anemia, kidney disease, and neuromuscular and neurological dysfunction.	Present source: lead smelters, battery manufacturing and recycling facilities. Past source: combustion of leaded gasoline.

Source: BAAQMD internet site http://www.baaqmd.gov/pln/air_quality/ambient_air_quality.htm, accessed February 14, 2008.

Notes:

A = Attainment

N = Nonattainment

U = Unclassified (insufficient data collected to determine classification; generally indicates low concern for the pollutant levels)

ppm = parts per million

$\mu g/m^3$ = micrograms per cubic meter

a. California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, suspended particulate matter - PM_{10}, and visibility reducing particles are values that are not to be exceeded. The standards for sulfates, Lake Tahoe CO, lead, hydrogen sulfide, and vinyl chloride are not to be equaled or exceeded. If the standard is for a 1-hour, 8-hour, or 24-hour average (i.e., all standards except for lead and the PM_{10} annual standard), then some measurements may be excluded. In particular, measurements are excluded that California Air Resources Board determines would occur less than once per year on the average. The Lake Tahoe CO standard is 6.0 ppm, a level one-half the national standard and two-thirds the state standard.

b. National standards other than for ozone, particulates and those based on annual averages are not to be exceeded more than once a year. The 1-hour ozone standard is attained if, during the most recent 3-year period, the average number of days per year with maximum hourly concentrations above the standard is equal to or less than one. The 8-hour ozone standard is attained when the 3-year average of the 4th highest daily concentrations is 0.08 ppm or less. The 24-hour PM_{10} standard is attained when the 3-year average of the 99th percentile of monitored concentrations is less than 150 $\mu g/m^3$. The 24-hour $PM_{2.5}$ standard is attained when the 3-year average of 98th percentiles is less than 65 $\mu g/m^3$.

c. The federal 1-hour ozone standard was revoked on June 15, 2005.

problem pollutant in California, as the ambient levels are fairly low, and the state has attained this standard for some time. SO_X emissions have decreased substantially over the past 30 years due to improved industrial source controls and use of natural gas instead of fuel oil for electric generation. In addition, SO_X emissions from mobile sources have decreased due to lower sulfur content in fuels. Reactive organic gases (ROGs) are not criteria pollutants, but their emissions are of concern as they and NO_X are precursors to O_3. Table 3.11-1 shows the state and federal standards of all the criteria pollutants.

Ambient Concentrations. The existing air quality conditions in the project corridor can be characterized by monitoring data collected in the region. The Bay Area Air Quality Management District (BAAQMD) maintains two pollutant-monitoring stations in the project vicinity: one in the City of Pittsburg and the other on Bethel Island. These are the two stations closest to the project corridor. The Pittsburg/Bay Point BART Station is at the western boundary of the project corridor and the Bethel Island station is 6 miles east of the project corridor before it turns southward. These stations are representative of the project corridor, as there are no topographical features that would affect the project corridor differently from the monitoring stations. Data from these two stations for years 2004 through 2006 are summarized in Table 3.11-2.

The State of California has designated the SFBAAB, which includes all nine Bay Area counties, as nonattainment for O_3, PM_{10} and $PM_{2.5}$ state standards. The U.S. Environmental Protection Agency (US EPA) has designated the SFBAAB as nonattainment for the federal 8-hour O_3 standard (without classification). In June 2005, the US EPA revoked the federal 1-hour O_3 standard. The US EPA has designated the SFBAAB as attainment for the federal CO, NO_X, SO_X, PM_{10}, and $PM_{2.5}$ standards. As seen from Table 3.11-2, some violations of the state O_3 and PM_{10} standards and federal $PM_{2.5}$ standards in the project vicinity occurred during the last three years.

Pollutants of Concern. As noted above, the four criteria pollutants of most concern are O_3, PM_{10}, $PM_{2.5}$, and CO. The SFBAAB does not attain either the O_3, PM_{10}, or $PM_{2.5}$ state standards or the O_3 federal standard. CO is a pollutant of concern because its main sources in the project corridor are gasoline-fueled vehicles. Although the SFBAAB is in attainment of both state and federal CO standards, the number of motor vehicles and vehicle miles traveled in the area continue to grow, and the potential for elevated levels of CO remains. Greenhouse gases are a concern due to their effect on the earth's climate.

Ozone. O_3 is a respiratory irritant and oxidant that increases susceptibility to respiratory infections and can cause substantial damage to vegetation and other materials. O_3 is a severe eye, nose, and throat irritant. It also attacks synthetic rubber, textiles, and other materials. O_3 causes extensive damage to plants by leaf discoloration and cell damage.

Table 3.11-2
Ambient Air Quality in the Vicinity of the Project Corridor
(from the Pittsburg and Bethel Island Air Quality Monitorings)

	Pittsburg			Bethel Island		
Pollutant	**2004**	**2005**	**2006**	**2004**	**2005**	**2006**
Ozone (O_3)						
Maximum 1-hour concentration (ppm)	0.090	0.094	0.105	0.103	0.089	0.116
No. Days > CAAQS (1-hour) of 0.09 ppm	0	0	0	1	0	9
Maximum 8-hour concentration (ppm)	0.081	0.078	0.093	0.081	0.077	0.09
No. Days > NAAQS (1-hour) of 0.08 ppm	0	0	1	0	0	0
Carbon Monoxide (CO)						
Maximum 1-hour concentration (ppm)	4.1	3.3	3.3	1.2	1.1	1.3
No. Days > CAAQS (1-hour) of 20 ppm	0	0	0	0	0	0
Maximum 8-hour concentration (ppm)	1.91	1.73	1.92	0.91	0.91	1.04
No. Days > NAAQS and CAAQS (8-hour) of 9.0 ppm	0	0	0	0	0	0
Nitrogen Dioxide (NO_2)						
Maximum 1-hour concentration (ppm)	0.048	0.058	0.052	0.034	0.038	0.044
No. Days > CAAQS (1-hour) of 0.25 ppm[a]	0	0	0	0	0	0
Annual Average Concentration (ppm)	0.011	0.010	0.011	0.008	0.007	0.008
Particulate Matter (PM_{10})						
Maximum 24-hour concentration ($\mu g/m^3$)	**64.0**	**57.0**	**58.9**	**42.3**	**63.5**	**84.3**
Average arithmetic mean concentration ($\mu g/m^3$)	21.1	19.5	19.4	18.9	17.9	18.8
Average geometric mean concentration ($\mu g/m^3$)	21.7	20.1	19.9	19.5	18.5	19.4
No. Days > NAAQS (24-hour) of 150 $\mu g/m^3$	0	0	0	0	0	0
No. Days > CAAQS (24-hour) of 50 $\mu g/m^3$	1	1	2	1	0	1
Particulate Matter ($PM_{2.5}$)[b]						
Maximum 24-hour concentration ($\mu g/m^3$)	73.7	48.9	62.1	N/A	N/A	N/A
Average arithmetic mean concentration ($\mu g/m^3$)	11.5	9.3	10.0	N/A	N/A	N/A
No. Days > NAAQS (24-hour) of 65 $\mu g/m^3$	1	0	0	N/A	N/A	N/A

Source: California Air Resources Board, *Summaries of Air Quality Data*, 2004, http://www.arb.ca.gov/adam/cgi-bin/db2www /adamtop4b.d2w/start; EPA Air Data, accessed January 29, 2008, *http://www.epa.gov/air/*data/geosel.html.

Notes:

Values in **bold** exceed the air quality standard.

N/A = data not available.

a. The CAAQS for NO_2 were updated in February 2007 to 0.18 ppm for the 1-hour averaging period and 0.03 ppm for the annual averaging period, as indicated in Table 3.11-1. The monitored ambient NO_2 values in this table are for the three-year period prior to the standards being updated; therefore, they are being compared to the NO_2 standards that existed when the concentrations were monitored. Data from the year 2007 are not yet available; 2006 is the most recent year data are summarized.

b. Monitored at the Concord station.

O_3 is not emitted directly into the air, but is formed by a photochemical reaction in the atmosphere. O_3 precursors, which include ROG and NO_X, react in the atmosphere in the presence of sunlight to form O_3. Because photochemical reaction rates depend on the intensity of ultraviolet light and air temperature, O_3 is primarily a summer air pollution problem. ROG and NO_X are emitted by mobile sources and by stationary combustion equipment.

Inhalable Particulate Matter. Particulates can damage human health and retard plant growth. Health concerns associated with suspended particulate matter focus on those particles small enough to reach the lungs when inhaled, causing respiratory disease and lung damage. Particulates also reduce visibility and corrode materials. The federal and state ambient air quality standards for particulate matter apply to two classes of particulates: $PM_{2.5}$ and PM_{10}.

Carbon Monoxide. CO is a gas that is essentially inert to plants and materials but can have significant effects on human health. CO is a public health concern because it combines readily with hemoglobin and thus reduces the amount of oxygen transported in the bloodstream. Effects on humans range from slight headaches and nausea to death. CO is formed as the result of incomplete combustion of fuels such as gasoline, diesel, and wood. Motor vehicles generate most of the CO emissions, and the emissions levels are highest at lower temperatures due to less efficient combustion at lower temperatures.

Greenhouse Gases. The earth's climate is changing because human activities, primarily the combustion of fossil fuels, are altering the chemical composition of the atmosphere through the build up of greenhouse gases. Greenhouse gases allow the sun's radiation to penetrate the atmosphere and warm the earth's surface but do not let the infrared radiation emitted from the earth to escape back into outer space. As a result, global temperatures are predicted to increase over the century. In particular, global warming is predicted to increase statewide annual temperatures between 3 to 10 degrees Fahrenheit by the end of the century depending on the assumed increases in greenhouse gas emissions. Not only would higher temperatures directly affect the health of individuals through greater risk of dehydration, heat stroke, and respiratory distress, the higher temperatures may increase ozone formation, thereby worsening air quality. Rising temperatures would also reduce the snowpack which would increase the risk of water shortages. Higher temperatures along with reduced water supplies would reduce the quantity and quality of agricultural products. In addition, there would be an increase in wildfires and a shift in distribution of natural vegetation throughout California. Global warming would also increase sea levels and coastal storms resulting in greater risk of flooding.[3]

Emissions of carbon dioxide (CO_2) are the leading cause of global warming, with other pollutants such as methane, nitrous oxide, and hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride also contributing. The magnitudes of impact on global warming differ

[3] California Energy Commission (CEC), 2006, *Our Changing Climate Assessing the Risks to California: The 2006 Summary Report from the California Climate Change Center*.

between the greenhouse gases. For example, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride have a greater "global warming potential" than carbon dioxide. In other words, these other greenhouse gases have a greater contribution to global warming than carbon dioxide on a per mass basis. However, carbon dioxide has the greatest impact on global warming because of the relatively large quantities of carbon dioxide emitted into the atmosphere. For example, BAAQMD estimates that carbon dioxide made up almost 90 percent by mass of the total emission of the six gases listed above in 2002 in the Bay Area.

In the Bay Area, these emissions are mainly from combustion of fossil fuels such as gasoline, diesel, and natural gas used in mobile sources and energy generation related activities. In particular, BAAQMD estimated that transportation, industrial/commercial, and power plants made up 51 percent, 26 percent, and 7 percent, respectively, of the total greenhouse gas emissions in the Bay Area. Thirty percent of these emissions originate in Contra Costa County. Based on current trends, greenhouse gas emissions in the Bay Area will increase at a rate of approximately 1.4 percent per year.

Nationally, according to the Fourth U.S. Climate Action Report,[4] total U.S. emissions rose by 15.8 percent from 1990 through 2004, with fossil fuel combustion being the largest source of CO_2. This increase is in part due to a significant growth in emissions from transportation activities and electricity generation. The U.S Climate Action report provided projections of greenhouse gas emissions under a Full Implementation of Climate Programs and Measures scenario (an optimistic scenario). Under this scenario, the total CO_2 emissions from 2000 to 2020 are projected to increase by 17 percent. However, nitrous oxide emissions are expected to decline during this period under this scenario.

Globally, CO_2 concentrations, which ranged from 265 parts per million (ppm) to 280 ppm over the last 10,000 years, only began rising in the last 200 years to current levels of 365 ppm, a 30 percent increase.

Toxic Air Contaminants (TACs). TACs are pollutants that may result in an increase in mortality or serious illness or that may pose a potential hazard to human health. Health effects of TACs include cancer, birth defects, neurological damage, damage to the body's natural defense system, and diseases that lead to death. TACs do not have ambient standards below which no adverse health effects are assumed. BAAQMD Regulation 2, Rule 5, regulates TAC emissions, but only from stationary sources requiring permits to operate from the BAAQMD.

Significant sources of TACs in the environment are industrial processes, such as petroleum refining, chemical manufacturing, electric utilities, metal mining/refining and chrome plating; commercial operations, such as gasoline stations and dry cleaners; and transportation activities,

[4] Office of Global Change, US Department of State. Fourth U.S Action Climate Report to the UN Framework Convention on Climate Change, 2006 (EPA internet site: http://www.state.gov/documents/organization/89652.pdf).

particularly diesel-powered vehicles, including trains, buses, and trucks. In 1998, the California Air Resources Board (CARB) identified particulate matter from diesel-powered engines as a TAC. Compared to other air toxics that the CARB has identified and controlled, diesel particulate matter (DPM) emissions are estimated to be responsible for about 70 percent of the total ambient air toxics risk. On a statewide basis, the average potential cancer risk associated with these emissions is over 500 potential cases per million.[5]

The BAAQMD measures ambient levels of TACs at several air quality monitoring stations in the region. The two stations nearest the project corridor are in the City of Pittsburg and on Bethel Island. Table 3.11-3 summarizes monitored concentrations of carcinogenic TACs for 2002, the most recent year for which data are available, and the carcinogenic health risks from exposure to these concentrations. In addition, three-station averages for certain compounds not measured at the BAAQMD stations are also listed below, as measured at the CARB monitoring locations in Fremont, San Francisco, and San Jose, California.

A large portion of the cancer risk is due to benzene and 1,3-butadiene, which are emitted principally from motor vehicle exhaust. These risks can be compared with the Bay Area average of 162 chances in 1 million.[6] However, the risks do not represent the total risk associated with TACs, principally due to the fact that not all components contained in DPM are considered. There is growing evidence that exposure to emissions from diesel-fired engines (about 95 percent of which come from mobile diesel sources) may result in cancer risks that exceed those attributed to the measured TACs.

The BAAQMD has estimated that the carcinogenic health risks from exposure to DPM in 2002 in the Bay Area region was about 440 in one million.[7] Most of the DPM risks are from exposure to exhaust from diesel trucks where the emission sources can be relatively close to receptors at businesses and residences near freeways.

Sensitive Receptors. Sensitive receptors are individuals with increased sensitivity to the health effects of air pollutants, such as children, hospital patients, and the elderly. Generally, an air quality analysis pays particular attention to land uses where these receptors are present, such as day-care centers, schools, nursing homes, and hospitals. Section 3.3, Land Use, contains a figure showing the land uses adjacent to the project corridor. The air quality analysis evaluates impacts at the worst-case locations, which are the residences closest to SR 4 and its median. Sensitive receptors are farther from the roadway than the locations analyzed in the air quality modeling; thus impacts at those locations would be lower than what is reported from the modeling.

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5 California Air Resources Board, *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles,* October 2000.

6 BAAQMD, *Toxic Air Contaminants 2002 Annual Report,* 2004.

7 BAAQMD, *Toxic Air Contaminants 2002 Annual Report*, 2004.

Table 3.11-3
Ambient Concentrations of Carcinogenic TACs
Measured in the Project Vicinity by the BAAQMD and CARB in 2002

Compound	Concentration (ppb)	Concentration ($\mu g/m^3$)	Unit Risk[a] (per $\mu g/m^3$)	Cancer Risk (Chances in 1 million)
Pittsburg - BAAQMD Station				
Benzene	0.4	1.30	2.90E-05	37.7
Carbon Tetrachloride	0.12	0.77	4.20E-05	32.3
Chloroform	0.02	0.10	5.30E-06	0.5
Methylene Chloride	0.55	1.94	1.00E-06	1.9
Ethylene Dibromide	0.01	0.08	7.10E-05	5.5
Ethylene Dichloride	0.05	0.21	2.10E-05	4.3
MTBE	0.77	2.82	2.60E-07	0.7
Perchloroethylene	0.06	0.41	5.90E-06	2.4
Trichloroethylene	0.04	0.22	2.00E-06	0.4
Vinyl Chloride	0.15	0.39	7.80E-05	30.4
Bethel Island - BAAQMD Station				
Benzene	0.33	1.07	2.9E-05	31.1
Carbon Tetrachloride	0.11	0.70	4.2E-05	29.6
Chloroform	0.01	0.05	5.3E-06	0.3
Methylene Chloride	0.26	0.92	1.0E-06	0.9
Ethylene Dibromide	0.01	0.08	7.1E-05	5.5
Ethylene Dichloride	0.05	0.21	2.1E-05	4.3
MTBE	0.45	1.65	2.6E-07	0.4
Perchloroethylene	0.02	0.14	5.9E-06	0.8
Trichloroethylene	0.04	0.22	2.0E-06	0.4
Vinyl Chloride	0.15	0.39	7.8E-05	30.4
CARB Three-Station Average[b]				
Acetaldehyde	N/A	1.08	2.7E-06	2.9
1,3-Butadiene	N/A	0.28	1.7E-04	47.6
Formaldehyde	N/A	2.67	6.0E-06	16.0
Chromium (Hexavalent)	N/A	1.0E-04	1.5E-02	1.5
PAHs[c]	N/A	4.2E-04	1.1E-03	0.5
Nickel	N/A	3.8E-03	2.6E-04	1.0
Lead	N/A	9.2E-03	1.2E-05	0.1

Source: BAAQMD, *Toxic Air Contaminants 2002 Annual Report*, 2004.

Notes:

ppb = parts per billion.

$\mu g/m^3$ = micrograms per cubic meter.

N/A = particulate toxics are measured in terms of $\mu g/m^3$ rather than ppb.

a. Unit Risk is the probability of contracting cancer if one is continually exposed to an average concentration of 1 $\mu g/m^3$ of the specific substance over a period of 70 years, i.e., an average person's lifetime. Multiplying the Unit Risk of a compound by its concentration in $\mu g/m^3$ gives its cancer risk per million.

b. The three CARB monitoring locations are Fremont, San Francisco, and San Jose.

c. PAHs are polycyclic aromatic hydrocarbons, and represent the sum of the following species collected as PM_{10}: benzo(a)pyrene, benzo(b)f1uoranthene, benzo(k)f1uoranthene, dibenzo(a,h)anthracene, and indeno(l,2,3-cd)pyrene.

Applicable Policies and Regulations

Federal Clean Air Act. The Clean Air Act, enacted in largely its current form in 1970 and amended in 1977 and 1990, establishes the framework for federal air pollution control. The act directed the US Environmental Protection Agency (US EPA) to establish the ambient air standards described in Table 3.11-1. An area that does not meet the federal standard for a pollutant, as shown in Table 3.11-1, is called a "nonattainment" area for that pollutant. For federal nonattainment areas, the federal Clean Air Act requires states to develop and adopt State Implementation Plans (SIPs), which are air quality plans showing how air quality standards will be attained. The SIP, which is reviewed and approved by the US EPA, must demonstrate how the federal standards will be achieved. Failing to submit an SIP or secure approval could lead to denial of federal funding and permits for improvements such as highway construction. In cases where the SIP is submitted by the state but fails to demonstrate achievement of the standards, the US EPA is directed to prepare a Federal Implementation Plan. In California, SIPs are prepared and adopted by the local or regional air districts and are reviewed and submitted to the US EPA by the CARB.

Federal Transportation Air Conformity. The federal Clean Air Act outlines requirements for ensuring that federal transportation plans, programs, and projects conform to the SIP's purpose of eliminating or reducing the severity and number of violations of the national ambient air quality standards. This means that transportation plans, programs, or projects cannot be approved unless projected emissions from these activities are within the emissions budget contained in the SIP. Regional Transportation Plans (RTPs) and Transportation Improvement Programs (TIPs) include highway or transit improvement projects that require funding or approval from the Federal Highway Administration (FHA) or the Federal Transit Administration (FTA). The RTPs and TIPs have an emissions budget for all the projects they include; that emissions budget is incorporated in the SIP.

California Clean Air Act. The California Clean Air Act (CAA) of 1988 focuses on attainment of the state ambient air quality standards, which, for certain pollutants and averaging periods, are more stringent than the comparable federal standards. Responsibility for achieving California's standards is placed on the CARB and local air pollution control districts through district-level air quality management plans.

The California CAA requires designation of attainment and nonattainment areas with respect to state ambient air quality standards. The California CAA also requires that local and regional air districts expeditiously adopt and prepare an air quality attainment plan if the district violates state air quality standards for CO, SO_X, NO_X, or O_3. These Clean Air Plans are specifically designed to attain these standards and must achieve an annual 5 percent reduction in district-wide emissions of each nonattainment pollutant or its precursors. No locally prepared attainment plans are in place for areas that violate the state PM_{10} standards. Attainment plans

are not required for areas that violate the state PM_{10} standards. This is discussed further below.

The California CAA requires that the state air quality standards be met as expeditiously as practicable, but, unlike the federal CAA, does not set precise attainment deadlines. Instead, the act established increasingly stringent requirements for areas that will require more time to achieve the standards.

The role of the CARB is to establish state air quality standards, maintain oversight authority in air quality planning, develop programs for reducing emissions from motor vehicles, develop air emission inventories, collect air quality and meteorological data, and approve SIPs.

Local Air Quality Management Programs. The BAAQMD has jurisdiction over air quality issues within the SFBAAB. Responsibilities of air districts include permitting stationary sources, maintaining emissions inventories, maintaining air quality monitoring stations, overseeing agricultural burning permits, and reviewing air quality-related sections of environmental documents required by the California Environmental Quality Act (CEQA).

The California CAA substantially added to the authority and responsibilities of air districts. The act designates air districts as lead air quality planning agencies, requires air districts to prepare air quality plans, and grants air districts authority to implement transportation control measures.

The BAAQMD prepares air quality plans with control measures for nonattainment pollutants. It prepares updates to O_3 attainment plans, which are plans designed to attain the federal O_3 standard, and it prepares triennial updates to Clean Air Plans, which are designed to attain state standards.

The BAAQMD has prepared both federal and state air quality plans to bring the SFBAAB into attainment with federal and state O_3 standards. The Bay Area does not attain either the federal or state O_3 standards. Currently, there are two plans for the Bay Area:

- 2001 Ozone Attainment Plan, which describes the Bay Area's strategy for compliance with the federal 1-hour O_3 standard. Although the US EPA revoked the federal 1-hour O_3 standard on June 15, 2005, the emission reduction commitments in the plan are still being carried out by the BAAQMD.
- The Bay Area 2005 Ozone Strategy, which is the Bay Area's current, adopted plan describing the strategy for compliance with the state 1-hour O_3 standard and is the most current triennial update to the 1991 Clean Air Plan.

The Bay Area also does not attain the state PM_{10} standard. There is currently no PM_{10} plan in place, but there is a schedule for bringing the Bay Area into compliance with the standards. Compliance was mandated by SB 656, which was enacted by the California Legislature in 2003

and codified as Health and Safety Code Section 39614. SB 656 seeks to reduce public exposure to PM_{10} and $PM_{2.5}$ (collectively referred to as PM). It requires the CARB, in consultation with local air pollution control and air quality management districts (air districts), to develop and adopt, by January 1, 2005, a list of the most readily available, feasible, and cost-effective control measures that could be used by the CARB and the air districts to reduce PM. The goal is to make progress toward attainment of state and national PM standards.

The proposed control measures are to be based on rules, regulations, and programs existing in California as of January 1, 2004 to reduce emissions from new, modified, and existing stationary, area, and mobile sources. SB 656 requires the CARB and air districts to adopt implementation schedules for appropriate CARB and air district measures. Finally, no later than January 1, 2009, the CARB must prepare a report describing actions taken to fulfill the requirements of the legislation as well as recommendations for further actions to assist in achieving the state PM standards. The bill requirement will sunset on January 1, 2011, unless extended.[8]

Toxic Air Contaminants. TACs do not have ambient standards below which no adverse health effects are assumed. TACs from mobile sources are regulated by the CARB and the US EPA. The CARB has responsibility for control of emissions from most mobile sources. All new diesel-powered, on- and off-road motor engines and vehicles sold in California are required to meet both federal and state emissions certification requirements. Heavy-duty diesel vehicles that travel in California but are registered in other states are subject only to federal emissions certification standards.[9]

The US EPA and CARB have developed regulations for diesel engines and diesel fuel. The regulations that could be applicable to the Proposed Project are listed below:

- **Federal Off-Road Diesel Engine Emissions Control Program (40 CFR Part 89).** This program applies to diesel-powered engines. This is a tiered approach established by the US EPA to lower the emissions standards for several categories of off-road engines (e.g., diesel-powered trains), in which each tier is phased in over several years by engine power category – Tier 1: 1996-2005, Tier 2: 2001-2010, Tier 3: 2006-2010, and Tier 4: 2008-2015.
- **State Heavy-Duty Off-Road Compression Ignition Engine Program (13 CCR Chapters 1956.1 – 1956.4, 1956.8).** This state rule established exhaust emissions standards for off-road heavy-duty diesel engines that have become increasingly more stringent based on the horsepower and model year, and complements the US EPA program described above.

[8] BAAQMD, http://www.baaqmd.gov/pln/pm/, accessed June 23, 2008.

[9] California Air Resources Board (CARB), *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles*, October 2000.

- **State – CARB Diesel Requirements (13 CCR 2281, 13 CCR 2282, 13 CCR 2456[e]2).** All diesel fuel sold or supplied in California for motor-vehicle use must meet or exceed formulation requirements including a sulfur content no greater than 500 parts per million by weight (ppmw). The average sulfur content of diesel is between 100 and 120 ppmw.

Greenhouse Gas Emissions. On June 1, 2005, Governor Schwarzenegger signed Executive Order S-3-05 which established the following greenhouse gas emission reduction targets:

- By 2010, reduce emissions to 2000 emission levels
- By 2020, reduce emissions to 1990 Emission levels
- By 2050, reduce emissions to 80 percent below 1990 levels

A Climate Action Team (CAT) was formed to implement greenhouse gas emission reduction programs and to report on progress made to meet the emission reduction targets. CAT is led by the Secretary of California Environmental Protection Agency and consists of representatives from the Secretary of Business, Transportation and Housing Agency, Secretary of the Department of Food and Agriculture, Resources Agency, the CARB, Energy Commission, and Public Utilities Commission. A report on progress on meeting the targets is issued every two years starting with the report issued in March 2006.

Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006, was signed into law by Governor Schwarzenegger and codifies the state's goal to reduce California's global warming emissions to 1990 levels by the year 2020. This reduction will be accomplished through an enforceable statewide cap on global warming emissions that will be phased in starting in 2012. To effectively implement the cap, AB 32 directs the CARB to develop appropriate regulations and establish a mandatory reporting system to track and monitor global warming emissions levels.

Under AB 32, greenhouse gases are defined as carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. The regulatory steps established in AB 32 require the CARB to adopt early action measures to reduce greenhouse gases; establish a statewide greenhouse gas emissions cap for 2020, based on 1990 emissions; adopt mandatory reporting rules for significant sources of greenhouse gases; and adopt a scoping plan indicating how emission reductions will be achieved via regulations, market mechanisms, and other actions.

AB 32 required the CARB, by January 1, 2008, to determine the statewide greenhouse gas emissions inventory that existed in 1990 and to approve an equivalent statewide greenhouse gas emissions limit, to be achieved by 2020. On December 6, 2007, the CARB approved a 1990 statewide greenhouse gas emission level of 427 million metric tons of carbon dioxide equivalent. The CARB estimated that without any reduction measures, 2020 emission levels

would be 600 million metric tons of carbon dioxide. Therefore, greenhouse houses gases need to be reduced by about 173 million metric tons of carbon dioxide equivalent.[10]

To help achieve these reductions, the CARB has identified several early action measures classified as either discrete or non-discrete. Discrete early action measures are regulations that would be adopted and enforceable by January 1, 2010. The other early action measures must be initiated between 2007 and 2012 and may be regulatory or non-regulatory. The CARB evaluated over 100 possible measures and on October 25, 2007 and approved nine discrete action measures and 35 additional measures. These measures are expected to reduce greenhouse gases by 42 million metric tons of carbon dioxide equivalent by 2020, which is about 25 percent of the needed reduction. Examples of transportation related discrete action measures are identified below:

- Require the use of technologies to improve the efficiency of certain heavy-duty vehicles;
- Develop requirements to ensure tire pressures on older vehicles are properly maintained;
- Reduce carbon intensity of transportation fuels in California by at least 10 percent by 2020; and
- Strengthen light-duty vehicle standards.

AB 32 also requires that the CARB adopt a scoping plan by January 1, 2009, indicating how emissions reductions will be achieved via regulations, voluntary actions, monetary and non-monetary incentives, market mechanisms, and other actions. On June 26, 2008, the CARB issued its draft scoping plan. Among other measures to achieve the targeted GHG emission reductions by 2020, the scoping plan identifies reductions of approximately 2 million metric tons of CO_2 equivalent from local and regional government actions, including regional level transportation planning to establish preferred land use and transportation scenarios that meet the recommended targets while addressing housing needs and other goals. The CARB will consider adoption of the scoping plan in November 2008.

AB 1493, enacted in 2002, directs the CARB to develop and implement regulations that achieve the "maximum feasible reduction" of greenhouse gas emissions from passenger vehicles, light-duty trucks, and other noncommercial vehicles. Pursuant to AB 1493, in 2004 the CARB approved regulations limiting the amount of greenhouse gases released from motor vehicles. On March 6, 2008, the US EPA published a notice in the Federal Register of its decision denying California's request for waiver of preemption of its state motor vehicle

[10] CARB website, http://www.arb.ca.gov/cc/inventory/1990level/1990level.htm, accessed June 18, 2008.

emission control standards pursuant to the federal CAA. California has sued US EPA seeking reversal of that decision.

Senate Bill (SB) 97, signed in August 2007, acknowledges that climate change is an important environmental issue that requires analysis under CEQA. This bill requires the Governor's Office of Planning and Research (OPR) to prepare and develop guidelines for the feasible mitigation of greenhouse gas emissions, or the effects of greenhouse gas emissions, by July 1, 2009. The guidelines would then need to be certified and adopted by January 1, 2010.

SB 97 also provides that, for certain projects, the failure of an EIR to adequately analyze the effect of greenhouse gas emissions otherwise required to be reduced under AB 32 cannot be challenged in court as a violation of CEQA. The projects covered by this provision include transportation projects funded under the Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act of 2006, commonly referred to as "Proposition 1B" (see CEQA Section 21097). As discussed in Section 2.7 of this EIR, the Proposed Project has secured substantial funding from Proposition 1B funds and therefore is subject to this provision. Nevertheless, for informational purposes, BART wishes to disclose to the public and to decision-makers the climate change considerations – and in particular the greenhouse gas reduction benefits – associated with the Proposed Project.

Impact Assessment and Mitigation Measures

Standards of Significance

The Proposed Project would have a significant air quality impact if it were to:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- Expose sensitive receptors to substantial pollutant concentrations;
- Create objectionable odors affecting a substantial number of people;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the region or subregion in which the project is located is in non-attainment under an applicable federal or state ambient air quality standard; or
- Expose the public to TACS that would increase the probability of contracting cancer for the maximally exposed individual that exceeds 10 in one million.

Criteria Air Pollutants. The BAAQMD has defined numerical significance criteria for air quality impacts.[11] The following quantifiable criteria are used here to define significance:

- Project-specific emissions of NO_x, ROG, or PM_{10} exceed 15 tons per year or 80 pounds per day.
- Project's contribution to ambient CO concentration leads to an exceedance of the California Ambient Air Quality Standards (CAAQS) of 9 ppm averaged over 8 hours or 20 ppm averaged over 1 hour, or the National Ambient Air Quality Standards (NAAQS) of 9 ppm averaged over 8 hours or 35 ppm averaged over 1 hour.

Greenhouse Gases. The state has not yet identified significance thresholds for greenhouse gas emissions from projects. The California Air Pollution Control Officers' Association (CAPCOA) published guidance on addressing greenhouse gas emissions from CEQA projects. The purpose of the guidance is to serve as a resource for public agencies as they establish procedures for reviewing greenhouse gas emissions from projects under CEQA. The CAPCOA guidance presents three approaches for thresholds to determine whether greenhouse gas emissions are significant: (1) no threshold, (2) threshold set to zero, and (3) threshold at some value greater than zero. The CAPCOA guidance discusses the advantages and disadvantages of each but does not conclusively present a threshold that should be used in all CEQA analyses.

Construction Emissions. A significant air quality construction impact would occur if construction-related best management practices for construction activities, as recommended by the BAAQMD, were not implemented.

Impact Classification. To classify impacts for each impact topic analyzed below, a level of significance is determined and reported in the italicized summary impact statement that precedes the analysis of each impact topic. Conclusions of significance are defined as follows: significant (S), potentially significant (PS), less than significant (LTS), no impact (NI), and beneficial (B). If the mitigation measures would not diminish potentially significant or significant impacts to a less-than-significant level, the impacts are classified as "significant and unavoidable effects (SU)." For the purposes of this section, AQ refers to Air Quality.

Methodology

Carbon Monoxide Hot Spot Analysis. CO modeling was performed for intersections that would be affected by the Proposed Project, as required for demonstration of conformity with the SIP. Year 2015 and 2030 traffic volumes obtained from the traffic analysis for this project were used to model future CO levels near the most congested intersections in the project

[11] BAAQMD, *Assessing the Air Quality Impacts of Projects and Plans, BAAQMD*, April 1996, revised 1999.

corridor. The CALINE4 model was used for the analysis, following the guidelines contained in the Transportation Project-Level Carbon Monoxide Protocol.[12] In general, this protocol states that for projects in areas that have been re-designated as CO attainment areas, intersections experiencing congestion at level of service (LOS) E or F must be analyzed to evaluate CO concentrations for comparison to ambient air quality standards.

The CALINE4 model is a Gaussian line-source dispersion model that was written by the California Department of Transportation. This model uses emission factors from the CARB EMFAC model, which is updated periodically and reflects changes in the vehicle fleet and emission standards. CALINE4 predicts 1-hour and 8-hour CO concentrations for comparison to the 1-hour and 8-hour state and/or federal CO standards. Peak hour vehicle volumes, conservative wind speed and atmospheric stability values are used to predict the maximum hourly concentrations, based on the wind angle that produces the highest result. Eight-hour concentrations are derived from the modeled 1-hour concentrations by applying a persistence factor of 0.7.[13]

CO concentrations were modeled at congested intersections near the proposed stations having LOS E or F, and at the largest (worst-case) proposed parking lot. Parking lots are a source of substantial cold start emissions, due to many vehicles starting cold in a short period of time.

Background ambient CO levels were added to the modeled CO concentrations to obtain total CO concentrations near the modeled intersections and parking lots. The model only calculates the portion of the total CO concentrations that result from the local traffic volumes input to the model. It does not incorporate background CO levels that are the cumulative result of CO emitted from more distant sources in the area. These 1-hour and 8-hour CO background concentrations were obtained from the most recent monitoring data at the Pittsburg monitoring station. The highest 1-hour and 8-hour background monitored values added to the modeled CO increase are 4.1 ppm and 1.9 ppm, respectively (Table 3.11-2). These are values monitored in the year 2004; ambient CO levels have decreased with time due to improvements in vehicle technology and fuels, and they are expected to continue to decrease. Nevertheless, the 2004 values were conservatively used to evaluate the impact for the years 2015 and 2030. Emission factor data and model output files are included in the Air Quality Technical Report available for review at the BART Planning Office.

PM_{10} Hotspot Analysis. The EPA and FHWA have developed guidance for analysis of PM_{10} and $PM_{2.5}$ hotspots in federal nonattainment and maintenance areas. The Proposed Project is in an area that is designated as attainment of federal PM_{10} and $PM_{2.5}$ standards. However, since the Proposed Project would create a new source of diesel particulate emissions, impacts from diesel particulate are addressed in the health risk assessment, the findings of which are presented below.

[12] UC Davis, *Transportation Project-Level Carbon Monoxide Protocol*, 1997.
[13] UC Davis, *Transportation Project-Level Carbon Monoxide Protocol*, 1997.

Greenhouse Gases and Regional Criteria Pollutants. Impacts of greenhouse gases (CO_2) and regional criteria pollutants CO, ROG, NO_x, and PM_{10} (which include ozone precursors) were evaluated by calculating emissions from vehicles under both the Proposed Project and No Project scenarios. CO_2 is the primary greenhouse gas emitted by fossil-fueled engines. CO_2 emissions for DMUs were obtained from the energy and emissions technical analysis prepared by LTK for BART.[14] CO_2 emissions and regional criteria pollutant emissions from buses and passenger vehicles were obtained from the EMFAC 2007 model. The calculations were based on miles traveled under the Proposed Project and No Project scenarios. This greenhouse gas analysis was performed even though the Proposed Project is funded by the Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act of 2006 and at present not required to analyze greenhouse gases under CEQA.

Transportation Conformity. The federal Clean Air Act requires that federally funded or approved transportation plans, programs, and projects in nonattainment or maintenance areas conform to the state implementation plan for meeting the NAAQS. Transportation conformity must be assessed for all nonattainment and maintenance area transportation-related pollutants classified as regional pollutants. This process involves forecasting future air pollutant emissions to determine whether the amount of pollution expected to result from the plan, program, or project would be within the allowable limit for motor vehicle emissions of ozone precursors. Transportation projects also generate CO and PM_{10}, which are considered localized pollutants. CO and PM_{10} microscale analyses are required in CO and PM_{10} nonattainment and maintenance areas, respectively, to determine whether a transportation project would cause or contribute to localized violations of the NAAQS for CO or PM_{10}.

Typically, conformity for a federally funded individual transportation project is assessed by evaluating whether the project is included in an RTP or TIP that has been shown to conform to the SIP. The conformity regulations further require that transportation projects be evaluated to determine whether they would cause or contribute to violations of the federal CO or PM_{10} ambient standards in areas designated as nonattainment or maintenance for these pollutants. Transportation conformity applies only to operational emissions associated with a project. CO and PM_{10} hot spot analyses are not required for construction-related activities. The air quality analysis must be prepared using the current US EPA-approved transportation emission model.

The Proposed Project's analysis for transportation conformity evaluated its inclusion in a recent RTP and performed a CO hot spot analysis (discussed below).

TACs Health Risk Assessment. A risk assessment of the proposed DMU technology and alignment was performed to evaluate cancer probability from exposure to diesel-powered vehicles in the project corridor. The US EPA CAL3QHCR model was used to predict diesel particulate matter concentrations at receptors (modeled locations) near the traveled corridor.

[14] LTK Engineers Services, eBART Phase I Project to Hillcrest Terminal , DMU and LRV Comparison. May 2008. This report is available for review at the BART Planning Office.

Receptors were placed at residences immediately adjacent to SR 4, where the highest impacts would occur. The number of DMUs was based on the data provided in the operational analysis for the Proposed Project.

The CAL3QHCR model is a Gaussian line-source dispersion model that is based on the CALINE3 model, a predecessor to the CALINE4 model, but it can also calculate particulate matter concentrations. The CAL3QHCR model is an update to the CAL3QHC model. The CAL3QHCR uses monitored hourly meteorological data to calculate hourly, 24-hour, and annual concentrations. CAL3QHCR is the model used by FHWA for CO and PM_{10} analyses of mobile sources.

Diesel particulate emission factors from the DMUs were obtained from the technical analysis for energy and emissions from the DMUs, prepared by LTK for BART.[15] Modeled ground-level concentrations were then multiplied by the unit risk factor for diesel particulate matter to estimate the probability of cancer from exposure to diesel particulate matter. This unit risk factor was developed by the Office of Environmental Health Hazard Assessment (OEHHA), and incorporates chemical dose, breathing rates, and exposure duration to evaluate cancer probability based on an individual's exposure to a diesel particulate matter. The exposure duration is assumed to be 70 years.

Construction. Impacts from construction activities are discussed qualitatively. The BAAQMD does not require quantification of construction emissions. Instead, it requires implementation of effective and comprehensive feasible control measures to reduce PM_{10} emissions.[16]

Project-Specific Environmental Analysis

Operational Impacts

Impact AQ-1 The Proposed Project would not conflict with or obstruct implementation of the Clean Air Plan. (B)

The Proposed Project is listed in Table 13 of the Clean Air Plan as a proposed transportation control measure in the BAAMQD Bay Area 2005 Ozone Strategy.[17] The Bay Area 2005 Ozone Strategy is the most recent "Clean Air Plan" for the region. Thus, not only is the Proposed Project accounted for in the planning to attain ambient air quality standards, it is a designated transportation control measure, which is one of the control measures that the BAAQMD has included in its planning to attain ambient air quality standards.

[15] LTK Engineers Services, Draft eBART Phase I Project to Hillcrest Terminal , DMU and LRV Comparison. March 17, 2008.
[16] BAAQMD, Assessing the Air Quality Impacts of Projects and Plans, April 1996, revised 1999.
[17] BAAQMD, *The Bay Area 2005 Ozone Strategy*, January 4, 2006.

Thus, the Proposed Project would further the Bay Area's implementation of the Clean Air Plan and its implementation would have beneficial air quality effects.

Impact AQ-2 The Proposed Project would not exceed state standards for CO. (LTS)

CO is a significant pollutant associated with automobile exhaust. Elevated CO concentrations occur near congested intersections because a large number of vehicles are moving slowly and idling, which produce higher levels of CO emissions. Ambient CO concentrations have decreased substantially over the past 30 years[18] due to improvements in fuel efficiency and reformulated gasoline, in spite of increases in regional traffic volumes. The Bay Area was re-designated to attainment in 1998 for the national 8-hour CO standard, which is equivalent to the California 8-hour CO standard.

The Proposed Project would add traffic to intersections around the station locations, increasing congestion and the potential for elevated CO levels. In addition, the Proposed Project would also add CO emissions from vehicles using parking lots at the stations. Parking lots are also a source of increased CO cold start emissions, which are generally the highest portion of CO emissions in a vehicle trip. Cold start emissions are the portion of emissions that occur when a vehicle starts after having been off for several hours.

This CO hot spot analysis modeled intersections that are predicted to operate poorly (i.e., LOS E or F, as recommended in the Protocol[19]). The LOS, traffic volumes, and approach speeds used in the modeling were obtained from the traffic analysis performed by Wilbur Smith Associates for this EIR. Traffic associated with the Median Station was modeled, as the traffic analysis found this to be the worst-case parking lot option with respect to the associated traffic at intersections near the station. Receptors placed adjacent to the proposed parking lot (regardless of current land uses at those locations) were also modeled. A parking lot capacity of 2,800 spaces was modeled to represent worst-case CO concentrations even though the actual parking lot is planned to have 2,600 spaces (as would the parking lots associated with the Hillcrest Avenue Station options discussed below).

Assumptions used in the modeling are conservative; that is, the modeled concentrations (including background) would likely not be reached. The conservative assumptions include use of the coldest temperature (CO concentrations are higher under colder ambient temperatures), low wind

[18] CARB, California Almanac of Emissions and Air Quality, http://www.arb.ca.gov/aqd/almanac/almanac07/chap307.htm, accessed on March 6, 2008.

[19] Transportation Project-Level Carbon Monoxide Protocol, UC Davis, 1997.

speeds, stable atmosphere, and use of the wind angle that produces the highest concentration regardless of the actual climatological wind patterns for the area.

In addition to the conservative assumptions used in the modeling, for the purposes of reporting total CO concentrations with ambient background added in, the highest monitored background value from the last three years was used. As discussed above, ambient CO levels have been decreasing and are expected to continue to decrease. Ambient levels in the year 2015 (Proposed Project start year) and 2030 (Proposed Project horizon year) would likely be much lower than the value used in this analysis (4.1 ppm for the 1-hour average and 1.9 ppm for the 8-hour average).

The results of the CO modeling at the intersections with LOS E and F and at the worst-case parking lot are summarized in Table 3.11-4. Predicted CO concentrations, even with the conservative assumptions, are below state ambient standards for CO, resulting in a less-than-significant impact.

Table 3.11-4
Predicted CO Concentrations at
Intersections Affected by the Proposed Project

	2015		2030	
Intersection	**1-Hour**	**8-Hour**	**1-Hour**	**8-Hour**
Railroad Avenue/Leland Road – City of Pittsburg	NA	NA	4.6	2.25
Leland Road/Freed Avenue – City of Pittsburg	4.6	2.25	4.4	2.11
California Avenue/Hwy 4 WB Ramps – City of Pittsburg	NA	NA	4.5	2.18
Harbor Street/California Avenue – City of Pittsburg	NA	NA	4.6	2.25
Hillcrest Avenue/East 18th Street – City of Antioch	5.4	2.81	4.7	2.32
Sunset Drive/Hillcrest Avenue – City of Antioch	NA	NA	4.5	2.18
Hwy 4 EB Ramps/Hillcrest Avenue – City of Antioch	5.6	2.95	4.5	2.18
Davison Dr./Hillcrest Ave. – Deer Valley Rd. – City of Antioch – AM Peak	5.4	2.81	N/A	N/A
Davison Dr./Hillcrest Ave. – Deer Valley Rd. – City of Antioch – PM Peak	5.8	3.09	4.6	2.25
Hillcrest Northside West Station Parking Lot – City of Antioch	13.6	8.55	7.5	4.28

Source: ERM, 2008.

Notes:

Concentrations include 1-hour and 8-hour background levels of 4.1 and 1.9, respectively.

Traffic associated with the Median Station was modeled, as the traffic analysis found this to be the worst case parking lot option with respect to the associated traffic at intersections near the station.

This CO hot spot analysis modeled the intersections that would be predicted to operate under LOS E or F, as recommended in the Transportation Project-Level Carbon Monoxide Protocol, *UC Davis, 1997.* Those intersections that had a LOS of D or better were not modeled and are marked as "N/A" for not analyzed.

Impact AQ-3 *The Proposed Project would result in a net air quality benefit, because there would be reductions to regional greenhouse gas and ozone precursor emissions compared to No Project conditions. (B)*

Greenhouse gas emissions are of concern because of their detrimental effect on climate and because of state directives to reduce such emissions. This analysis focuses on CO_2 emissions, since they are the predominant greenhouse gas emitted from fossil fuel combustion.[20] The Proposed Project would both increase and decrease greenhouse gas emissions. The DMU vehicles rely on diesel fuel combustion, which would increase CO_2 emissions. On the other hand, the Proposed Project is a transit project, which results in a reduction of regional vehicle miles traveled because people would drive less in favor of using the improved transit. The reduction in vehicle miles traveled would decrease CO_2 emissions. The net effect would be an overall reduction in CO_2 emissions. For the same reasons, the Proposed Project would also result in a net reduction in regional criteria pollutant emissions (including ozone precursors).

Greenhouse gas (CO_2) and criteria pollutant (ROG, NO_X, CO, and PM_{10}) emissions were calculated from DMUs and from passenger vehicle miles traveled associated with the Proposed Project. DMU-related CO_2 and criteria pollutant emissions were obtained from an LTK report[21] prepared for the Proposed Project. The emissions were specifically derived based on the operating plan and schedule for the proposed service. Table 3.11-5 shows that the Proposed Project would generate about 22,000 pounds per day of CO_2 in 2015 and about 33,000 pounds per day in 2030. In calculating DMU CO_2 emissions, the LTK report assumes that there would be two cars per train, each with its own diesel engine, in the year 2015. In the year 2030, the Proposed Project includes plans for three cars, so that the emissions from the LTK report were increased by 50 percent above the values in the LTK report. For the criteria pollutants, Tier 3 standards were used for the year 2015 emissions estimates and Tier 4 standards were used for the year 2030 estimates. Tier 3

[20] The combustion of diesel oil and other liquid fossil fuels also produces relatively small amount of methane and nitrous oxide. These are also greenhouse gases with significantly greater global warming potentials than CO_2 (i.e., they have over 20 times and over 300 times the effect of CO_2, respectively, per unit mass emitted). However, the amounts of methane and nitrous oxide emitted per gallon of fuel burned are so small relative to the CO_2 emissions that together they account for less than 5 percent of the total global warming effect.

[21] LTK Engineers Services, eBART Phase I Project to Hillcrest Terminal , DMU and LRV Comparison, May 2008.

Table 3.11-5
Greenhouse Gas (CO_2) and Regional Criteria Pollutant Emissions (lb/day) with the Proposed Project

	CO_2	NO_X	ROG	CO	PM_{10}
Change in emissions associated with 2015 vehicle miles traveled with Project	-168,670	-197	-39	-831	-17
2015 Project emissions	22,020	122	14	118	7
Net change in emissions	**-146,650**	**-75**	**-25**	**-713**	**-10**
Change in emissions associated with 2030 vehicle miles traveled with Project	-291,699	-128	-32	-673	-28
2030 Project emissions	33,030	20	10	177	< 1
Net change in emissions	**-258,669**	**-108**	**-22**	**-496**	**-27**

Source: ERM, 2008.

Notes:

VMT provided by WSA

2015 Reduction in VMT = 193,106 VMT/day

2030 Reduction in VMT = 340,841 VMT/day

and 4 standards are US EPA emissions standards that are intended to reduce emissions from newer diesel engines, including certain passenger trains such as the DMU.[22]

In 2015, without the Proposed Project, automobile traffic would generate 20.1 million pounds of CO_2 per day. Because of the above stated diversion from automobiles to transit, the estimate of CO_2 generated by automobile traffic with the Proposed Project would about 169,000 pounds per day less. This same benefit would increase by 2030, such that the reduction in automobile traffic would yield a reduction in CO_2 of about 291,000 pounds per day. The increase in CO_2 emissions from electricity use by the stations and maintenance facility is expected to be small (a few percent) compared to the net reduction in CO_2 emissions. Other regional benefits in 2015 stemming from implementation of the Proposed Project include (from the reduction in automobile traffic):

- reduction in NO_X of about 200 pounds per day;
- reduction in ROG of about 40 pounds per day; and
- reduction in PM_{10} of about 15 pounds per day.

[22] US EPA non-road emission standards, http://www.epa.gov/nonroad-diesel/2004fr.htm, accessed June 17, 2008.

In addition, the Proposed Project includes sustainability design features that have the added benefit of further reducing CO_2 emissions:

- High-efficiency lighting and lighting control methods to reduce electricity consumption;
- Energy efficient systems where feasible, such as solar hot water, more efficient HVAC (heating, ventilation and air conditioning) and vertical transportation; and use of meters to track energy use;
- Waste management and recycling;
- Use of recycled materials where feasible; and
- Other sustainable technologies or practices that become feasible or required by the time the system is in final design.

The Proposed Project also will consider incorporating the following sustainable features:

- Electric car charging ports;
- Photovoltaics to generate electricity and reduce reliance on the power grid;
- Lighter color aggregate for parking lots and other paved surfaces to reduce the heat island effect; and
- Other cool pavement technologies where feasible.

Impact AQ-4 Activities at the maintenance facilities would not contribute air emissions that would expose individuals to substantial pollutant concentrations. (LTS)

The maintenance facilities would be used for routine vehicle fueling, washing, and mechanical maintenance. There would not be a substantial amount of pollutant emissions associated with these activities. Diesel back-up generators would not be present at the maintenance facilities associated with the Proposed Project. The maintenance facilities could use solvents during vehicle maintenance and repair. BAAQMD permits would be required for any solvents used at a maintenance facility. The BAAQMD permit for solvent use would require volatile organic compound concentrations in solvents to be below certain levels to minimize emissions. The maintenance facility could also use a blow-down unit for undercarriage cleaning of vehicles. Dust collection controls would also be required in a BAAQMD permit for a blow-down unit. As such, impacts would be less than significant.

Impact AQ-5 *Odors from operation of the proposed DMU trains would not be expected to affect residences and businesses along the project corridor. (LTS)*

Operation of the DMUs has the potential to create odorous emissions. However, there would be a maximum of eight DMU-powered trains per hour and diesel odors from these operations would be minor additions to the existing diesel and gasoline odors associated with vehicles on SR 4 and nearby arterials. In addition, the Proposed Project would use trains with diesel engines that are compliant with EPA Tier 3 and Tier 4 standards. Tier 3-compliant engines would be used at the project opening in year 2015, and by 2030 Tier 4-compliant engines would be used. By the time Tier 4 standards are in effect (and they would be phased in beginning in 2014), PM and NO_x emissions would be reduced about 90 percent or more from engines meeting these standards, compared to engines meeting the current standards.[23] As a result, diesel emissions that result in the operational odor impacts would be substantially reduced and associated odors would be less than significant.

Impact AQ-6 *The Proposed Project complies with Transportation Conformity requirements and would therefore not conflict with the US EPA Transportation Conformity Rule. (NI)*

There are two criteria used to determine whether a transportation project is consistent with the federal rules for conformity with air quality plans. First, the project must be included in a TIP or RTP that conforms to the SIP. Second, the project cannot increase the number or severity of air quality standard violations.

Regarding the first criterion, the Proposed Project is included in the Metropolitan Transportation Commission (MTC) Transportation Air Quality Conformity Analysis[24] for the Transportation 2030 Plan and 2005 Transportation Improvement Program. This air quality conformity analysis estimated emissions from all projects included in The Transportation 2030 Plan and 2005 Transportation Improvement Program, and the resulting emissions from these plans were accounted for and are in conformity with the regional planning for achievement of federal ambient air quality standards. The Proposed Project is listed in Appendix B, page B-13 of the MTC Transportation Air Quality Conformity Analysis. Accordingly, the Proposed Project satisfies the first criterion for conformity.

[23] U.S. EPA non-road emission standards, http://www.epa.gov/nonroad-diesel/2004fr.htm, accessed June 17, 2008.

[24] MTC, Final Transportation Air Quality Analysis for the *Transportation 2030 Plan* and *2005 Transportation Improvement Plan*, February 11, 2005.

In addition, the Proposed Project would not create CO hot spots resulting in a violation of the federal CO standards (NAAQS). This assessment is presented in detail under Impact AQ-2. Because the Proposed Project would not result in an exceedance of CO standards, it also satisfies the second US EPA Transportation Conformity criterion.

Impact AQ-7 *Operation of the Proposed Project would increase exposure to individuals living near the project corridor from diesel particulate matter, causing a potential increase in cancer risk. This increase, however, would be below the significance threshold. (LTS)*

The Proposed Project would add a source of diesel particulate matter emissions, the DMUs, to the SR 4 median. Many residences and businesses are located very close to SR 4 and would be exposed to diesel particulate matter. The Proposed Project would use trains that are EPA Tier 3- and Tier 4-compliant. Tier 3 and 4 standards are US EPA emissions standards that are intended to reduce emissions from newer diesel engines. Tier 3-compliant engines would be used at the project opening in year 2015, and by 2030 Tier 4-compliant engines would be used. By the time Tier 4 standards are in effect (and they would phase in beginning in 2014), PM and NOx emissions would be reduced by about 90 percent or more from engines meeting these standards, compared to engines meeting the current standards.[25]

Modeling was performed to evaluate the health risk associated with the DMUs in the SR 4 median. The risk was analyzed at the residences closest to SR 4 where the impact would be the highest. The maximum modeled cancer risk from exposure to DMU particulate matter emissions is 3 in one million at the maximally exposed individual (MEI). The MEI is the location of highest modeled impact at a residence and assumes an individual would be present at this location for 70 years. The location of the MEI is at a residence along Belle Drive in the City of Pittsburg. The cancer risk at the MEI is below the significance threshold of 10 in one million. The model, CAL3QHCR, is an EPA model that is used by the FHWA for air quality analyses for mobile sources. CAL3QHCR is approved for modeling PM_{10} (unlike CALINE4). This modeled impact is based on 27,840 DMU trips per year, two DMU engines per trip for the year 2015, and three DMU engines per trip for the year 2030. The Air Quality Technical Report[26] includes emission factors, emission calculations, and model output files used in the health risk assessment. Because the increased exposure is below the threshold limits (as modeled),

[25] U.S. EPA nonroad emission standards, http://www.epa.gov/nonroad-diesel/2004fr.htm, accessed March 7, 2008 and June 17, 2008.

[26] ERM, eBART Corridor EIR Air Quality Technical Report, dated July 2008.

impacts to individuals living near the project corridor from diesel particular matter are less than significant.

Construction Impacts

Impact AQ-8 *Construction activities would emit exhaust pollutants (CO, ROG, NO_x, and PM_{10}) in the engine exhaust from heavy construction equipment and PM_{10}, as a component of the fugitive dust from grading and earthmoving activities. (PS)*

Construction activities would expose sensitive receptors to PM_{10} in the fugitive dust and equipment exhaust emissions, which include CO, ROG, NO_x, and PM_{10}. PM_{10} is the pollutant of greatest concern to BAAQMD with respect to construction activities. According to the BAAQMD CEQA Guidelines, CO, ROG, and NOx emissions from construction equipment are accounted for in the regional air quality plans and are not expected to impede the region's attainment status. PM_{10} emissions can result from a variety of construction activities, including excavation, grading, demolition, vehicle travel on paved and unpaved surfaces, and vehicle and equipment exhaust. Construction emissions of PM_{10} and exhaust pollutants can vary greatly depending on the level of activity, the specific operations taking place, the equipment being operated, local soils, weather conditions, and other factors. BAAQMD's approach to CEQA analyses of construction impacts is to emphasize implementation of effective and comprehensive control measures rather than detailed quantification of emissions, as indicated in the BAAQMD CEQA Guidelines. Described below are the locations and activities where construction could result in air quality impacts.

SR 4 Median Construction. The following activities would take place along the median of SR 4 and generate construction-period air quality impacts:

- modifications at the existing Pittsburg/Bay Point Station and tailtracks;
- new transfer platform east of the Pittsburg/Bay Point Station;
- new Railroad Avenue Station in the City of Pittsburg; and
- new Hillcrest Avenue Station with maintenance facility and tailtracks (the annex, off-median maintenance facility location is discussed below).

Residences and businesses in the cities of Pittsburg and Antioch are located close to the mainline of SR 4 and would be affected by fugitive dust and equipment exhaust during the construction period. Caltrans is currently widening SR 4 from the Loveridge Road interchange east to the SR 160 flyover. BART intends to coordinate construction of the Proposed Project with

Caltrans to schedule proposed work to coincide with the Caltrans SR 4 improvements of the median, interchanges, and grade separations at Loveridge Road, Century Boulevard, Somersville Road, L Street, A Street, Cavallo Road, and Hillcrest Avenue. Residents and businesses from the Pittsburg/Bay Point BART Station to Loveridge Road would experience significant construction-related air quality impacts for a 24-month duration. Residences and businesses from Loveridge Road to Hillcrest Avenue would experience significant construction-related air quality impacts for a 24-month duration. The location of the maintenance annex facility would require a tunnel to access the facility, but the tunnel is not located near any sensitive receptors and its construction would not expose individuals to pollutants. The maintenance annex facility construction activities would take place outside of the median, to the north of SR 4. This is currently a relatively undeveloped area with limited number of existing businesses and residences.

Construction Staging. One of the four potential staging areas for construction equipment would be located near residences and is situated north of SR 4 on Canal Road, east of Bailey Road. There are existing homes and commercial uses near or along the access roads to all four staging areas. Thus, emissions from associated construction vehicles or idling equipment would expose individuals in nearby residences and businesses to pollutants in the exhaust. Construction equipment for the roadway and structures would include dump trucks, earth scrapers, water trucks, bulldozers, grade-alls, truck-mounted cranes, loaders, excavators, rollers, compactors, concrete ready mix trucks, lubrication/fueling service trucks, and concrete pumps, diesel driven generators, and compressed air units for construction power equipment.

A large portion of the construction activities associated with the Proposed Project would be within the median of SR 4. Thus, much of the construction equipment and trucks could access the construction sites directly from SR 4 without traveling on local streets, many of which contain residences. The four staging areas are close to SR 4. Thus, much of the equipment and truck traffic moving between the staging areas and work sites in the SR 4 median would not have to travel past homes and businesses; however, all movement of equipment and trucks past existing residences cannot be completely avoided.

MITIGATION MEASURES. BAAQMD has identified the set of feasible PM_{10} control measures for construction activities shown in Table 3.11-6. Implementation of these measures would reduce potential construction-related emissions of the Proposed Project to less than significant according to the BAAQMD. (LTS)

Table 3.11-6
Air Quality Construction Control Measures

- Water all active construction areas at least twice daily.
- Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least 2 feet of freeboard.
- Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on unpaved access roads, parking areas, and staging areas at construction sites.
- Sweep daily (with water sweepers) all paved access roads, parking areas, and staging areas at construction sites.
- Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.
- Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for 10 days or more).
- Enclose, cover, water twice daily, or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.).
- Limit traffic speeds on unpaved roads to 15 miles per hour.
- Install sandbags or other erosion-control measures to prevent silt runoff to public roadways.
- Replant vegetation in disturbed areas as quickly as possible.

Source: BAAQMD, *Assessing the Air Quality Impacts of Projects and Plans,* April 1996, revised 1999.

AQ-8.1 Incorporate control measures and best management construction practices into the construction contracts. BART shall ensure that the contractor implements the control measures identified in Table 3.11-6 during construction of the Proposed Project.

AQ-8.2 Implement a construction emissions reduction plan for heavy equipment exhaust. BART shall ensure that the contractor designs and implements a construction emissions reduction plan that incorporates specific measures to reduce heavy equipment exhaust during the Proposed Project's construction. The measures shall include, but not be limited to:

- limit idling to five minutes or less;
- prohibit engine tampering to increase power;
- install oxidation catalysts, particulate traps, or other suitable particulate matter control devices;
- use low sulfur or other, suitable alternative diesel fuel;
- tune equipment regularly;
- place truck staging areas away from sensitive receptors;

- route trucks away from sensitive receptors; and
- minimize truck trips.

Impact AQ-9 *Odors from the equipment exhaust during the construction of the Proposed Project would affect residences and businesses near the SR 4 mainline. (PS)*

Construction equipment and trucks, mostly diesel-fueled, would create odorous emissions. These odors would be a potential nuisance to the residences and businesses closest to the SR 4 mainline and staging areas. For the maintenance annex, construction of the tunnel would place construction equipment and associated odors closer to receptors (homes and businesses) to the north of SR 4, just east of Hillcrest Avenue.

MITIGATION MEASURE. Odors from construction equipment would be reduced to less-than-significant levels through the measures identified in Mitigation Measure AQ-8.2, which calls for implementation of a construction emissions reduction plan for heavy equipment exhaust. (LTS)

Impact AQ-10 *Construction of the Proposed Project would expose individuals to diesel particulate matter exhaust, which is carcinogenic, from heavy construction equipment during the construction period. (PS)*

Exposure to exhaust particulate matter from diesel-fueled heavy construction equipment is a potential health hazard that would occur during construction. Construction activities near residences and other public access areas would expose the public to diesel particulate matter emissions, specifically near the Median Station and related maintenance facility and tailtrack. The construction staging area north of SR 4 on Canal Road east of Bailey Road would expose individuals in the nearby residential area to diesel particulate matter from the heavy equipment exhaust. Since a large portion of the construction activities associated with the Proposed Project would be isolated within the median of SR 4, heavy-duty truck trips and diesel particulate matter exposure near residences would be limited.

Construction emissions would be temporary; cancer risk from exposure to carcinogens (diesel exhaust particulate matter) is evaluated based on 70 years of continuous exposure. As such, construction emissions would not substantially contribute to an increase in cancer risk.

MITIGATION MEASURE. Implementation of the Mitigation Measure AQ-8.2, which calls for implementation of a diesel particulate matter emissions reduction plan, would reduce construction period emissions and any associated cancer risk to less-than-significant levels. (LTS)

Hillcrest Avenue Station Options Analysis

Operational Impacts

Impacts from operation of the Proposed Project under the Hillcrest Avenue Station options, which include Northside West, Northside East, and Median Station East options, would generally be the same as those for the Median Station. CO concentrations around intersections would still be well below ambient air quality standards. Greenhouse gas and regional criteria pollutant emissions under any of the station options would be the same as for the Median Station, because the number of riders (and consequently their avoided private motor vehicle trips) and energy use by the Proposed Project would be independent of these options, and all options would have air emissions lower than those under the No Project Alternative. Odors and air emissions from operations and construction activity would be the same in magnitude for all station options. However, air quality and odor impacts would be dependent on maintenance facility location.

The westernmost maintenance facility for the Northside West Station option would be located farther from residences than the maintenance facility of the Median Station of the Proposed Project. Compared to the other station options, the maintenance facility for the Median Station East option would be located the farthest from residences. The remote maintenance facility for the Northside West and Northside East Station options would be located 250 to 300 feet from a residential area along Neroly Road. However, the activities and associated emissions from the maintenance facilities are expected to be minor, as described for the Proposed Project.

Under both the Northside West and Northside East Station options, the DMUs would leave the SR 4 median to access the stations, around which future residential and commercial development is planned. As with the Median Station under the Proposed Project, the DMUs for the Median Station East option would remain in the SR 4 median and would run closer to residences currently located in the area. Individuals could perceive diesel odors from the DMUs; however, the DMUs would be using clean, EPA Tier 3 and Tier 4 compliant engines, and this is expected to reduce odors to a less-than–significant level.

The probability of cancer risk was modeled under Proposed Project conditions at the residence located closest to SR 4, on Belle Drive, approximately 95 feet from the median. The risk was found to be three in one million. This location is in the City of Pittsburg and would be affected regardless of the Hillcrest Avenue Station option selected. None of the station options is proposed at a location closer to a residential unit, so the worst-case impact would be that predicted for the residence along Belle Drive. In the vicinity of Hillcrest Avenue, the Median Station of the Proposed Project and the Median Station East option have identical health risk impacts because the DMUs follow an identical alignment in the median of SR 4. Where the DMUs leave the median to access either the Northside West or Northside East Station options,

the health risk would decrease slightly for the residences directly south of SR 4 in the City of Antioch just east of Wildflower Drive.

Construction Impacts

The construction sites for all Hillcrest Avenue Station options are located in areas of limited residential development or business land uses, so construction of these station options would expose a limited number of individuals to fugitive dust, exhaust pollutants, or odors. Accordingly, these impacts would be minor and temporary.

Cumulative Analysis

Cumulative air quality impacts occur on two scales: localized and regional. Localized impacts occur immediately downwind of the source of some air pollutants, such as CO, which concentrate near congested intersections. In this instance, the geographic area for the cumulative analysis is the immediate area around the stations, where the proposed stations and development anticipated under the Ridership Development Plans would each generate trips on the local roads and contribute to localized emissions. Regional impacts occur with other pollutants, such as the ozone precursors ROG and NO_x, which form ozone (O_3) at considerable distance downwind from the sources. In this instance, the cumulative context is much larger and encompasses the entire County. ABAG regional growth forecasts,[27] as amended by the County's regional traffic model, are the sources for vehicle miles traveled and associated air emissions. The cumulative analysis also accounts for the potential development of 1,845 new residential units and 1,004,000 square feet of commercial space in the area near the Railroad Avenue Station and up to 2,500 new residential units and 2,150,000 square feet of new office and retail space near the Hillcrest Avenue Station. Finally, the Union Pacific Railroad may introduce freight service to its rail line in the project corridor; which could eventually be as high as 40 trains per day. The cumulative air quality effects from the expanded freight service were not estimated quantitatively, but are discussed qualitatively with regard to their potential impacts on diesel particulate matter levels and consequent health impacts in the project corridor.

Impact AQ-CU-11 *Cumulative CO emissions from the Proposed Project in combination with other foreseeable growth in the station areas and the region would increase but would not exceed state or federal standards. (LTS)*

The CO hot spot analysis presented in Impact AQ-2 above was based on traffic increases from both the Proposed Project and from forecasted regional traffic growth, including development around the Railroad Avenue Station and Hillcrest Avenue Station, as envisioned by the Specific Plans (Ridership Development Plans) prepared for the station areas. Table 3.11-4 summarizes

[27] Association of Bay Area Governments, *Projections 2007,* December 2006.

the predicted CO concentrations at the most congested intersections affected by the Proposed Project and regional growth. Table 3.11-4 shows that the predicted CO concentrations would not exceed ambient air quality standards. As such, cumulative conditions are presented in Table 3.11-4 and would be less than significant.

This CO hot spot analysis is representative of the cumulative impacts considering future traffic conditions with the Median Station. While the other Hillcrest Avenue options would involve more development around those stations, future CO levels would remain below the ambient air quality standards, and the cumulative impacts would be less than significant.

Impact AQ-CU-12 *The Proposed Project would result in an overall net reduction in regional air emissions, a beneficial effect consistent with the goals of the Bay Area 2005 Ozone Strategy (the BAAQMD's most recent Clean Air Plan). (B)*

The Proposed Project would result in a net reduction in regional emissions and thus has no impact and would not contribute to a cumulative impact. As discussed above under Impact AQ-3, passenger vehicle miles traveled (VMT) would decrease as a result of the Proposed Project. Under cumulative conditions, with the Proposed Project included, regional VMTs are predicted to decrease. The traffic analysis performed for the Proposed Project accounted for regional forecasted growth, including development around the Railroad Avenue Station and Hillcrest Avenue Station, as envisioned by the Specific Plans (Ridership Development Plans) prepared for the station areas. The reduction in greenhouse gas and criteria pollutant emissions attributable to this decrease in cumulative regional VMTs more than offsets the increase in greenhouse gas and criteria pollutant emissions from the proposed DMU trains, resulting in a net air quality benefit under cumulative conditions.

Table 3.11-7 summarizes greenhouse gas (CO_2) emissions, ozone precursor emissions (ROG and NO_X), and other criteria pollutant emissions (CO and PM_{10}). The table shows that there is a net decrease in emissions, offsetting the emissions from the DMUs. This net benefit results because the Proposed Project would reduce the number of vehicle trips made by automobiles in the region.

The Proposed Project is included as a transportation control measure in the 2005 Bay Area Ozone Strategy, the most recent BAAQMD Clean Air Plan. Its purpose is to help reduce the air basin's emissions and thus achieve attainment of ambient air quality standards. This analysis is consistent with the intent of the 2005 Bay Area Ozone Strategy in showing how the Proposed Project would help to reduce regional emissions.

Table 3.11-7
Greenhouse Gas (CO_2) and Regional Criteria Pollutant Emissions (lb/day) Under Cumulative Conditions without and with the Proposed Project

	CO_2	NO_X	ROG	CO	PM_{10}
Year 2015					
Emissions from Passenger Vehicles without the Proposed Project	**20,104,004**	**23,443**	**4,618**	**99,048**	**2,080**
Emissions from Passenger Vehicles with the Proposed Project	19,935,334	23,246	4,579	98,217	2,063
Emissions from the Proposed Project	22,020	122	14	118	7
Total Emissions with the Proposed Project	**19,957,354**	**23,369**	**4,592**	**98,335**	**2,070**
Net Emissions with the Proposed Project	**-146,650**	**-74**	**-25**	**-713**	**-11**
Year 2030					
Emissions from Passenger Vehicles without the Proposed Project	**23,820,018**	**10,431**	**2,638**	**54,917**	**2,270**
Emissions from Passenger Vehicles with the Proposed Project	23,528,319	10,303	2,606	54,245	2,243
Emissions from the Proposed Project	33,030	20	10	177	0.4
Total Emissions with the Proposed Project	**23,561,349**	**10,324**	**2,616**	**54,422**	**2,243**
Net Emissions with the Proposed Project	**-258,669**	**-107**	**-22**	**-495**	**-27**

Source: ERM, 2008.

Notes:

VMT provided by WSA

2015 Without Proposed Project=23,016,598 VMT/day

2030 Without Proposed Project=27,832,973 VMT/day

2015 With Proposed Project=22,823,492 VMT/day

2030 With Proposed Project=27,492,132 VMT/day

The forecasted VMTs on which the above estimated emissions are based include growth from development of residences and businesses around the Railroad Avenue Station and Hillcrest Avenue Station. This growth would be based on the transit-oriented development concept, where vehicle trips for shopping and work are reduced. Retail stores and services are planned within walking distance of housing, and the Proposed Project's stations are within walking, or short bus trip distance of housing, reducing driving trips to work as well. The predominant source of long-term emissions associated with retail and residential growth is traffic, so when growth is centered around transit options, such as the Proposed Project, traffic and associated emissions are reduced.

This beneficial impact is not dependent on a particular station location or maintenance option. The Proposed Project in general would reduce vehicle trips and associated ozone precursor and greenhouse gas emissions because it is a transit project.

Impact AQ-CU-13 *Emissions from diesel particulate matter sources associated with the Proposed Project would combine with other diesel particulate matter sources in the project corridor, potentially elevating the health risk. However, existing programs are in effect that would reduce future diesel particulate matter emissions so that cumulative effects would be less than significant. (LTS)*

Diesel particulate matter emissions from existing mobile diesel vehicles in the project corridor could combine with future emissions from:

- DMUs;
- additional on-road sources (e.g., heavy-duty diesel trucks traveling along SR 4, transit buses that are part of the county bus system, and various medium-duty goods delivery trucks) introduced by cumulative traffic growth; and
- freight trains associated with proposed Union Pacific expansion of operations.

Thus, there is a potential to increase cancer risk at residences and businesses along the project corridor. Air districts do not currently have an accepted method for evaluating the significance of cumulative impacts from area-wide sources such as mobile diesel sources, so that this impact is addressed qualitatively.

The project impact analysis used the threshold of 10 in one million, which is the threshold used for permitting stationary sources and also the value below which public notification of cancer risk is not required under the AB 2588 Hot Spots program.[28] This value can be considered a de minimis value, below which no control technology is required for stationary sources and a cumulative impact would not be expected. The Proposed Project's impacts would be below the 10 in one million threshold, and so it would contribute a very minor amount to the impacts from other sources. Nevertheless, there is increased concern over health risks near sources of diesel particulate matter emissions, and the combined exposure from multiple sources could exceed the 10 in one million threshold.

The US EPA and CARB both have existing regulations that are intended to control existing diesel emissions and further reduce future diesel emissions. These programs, which are required and currently in effect, will reduce future diesel emissions and associated health risks. These programs, identified earlier in the "Applicable Plans and Regulations," are summarized below with salient features that will reduce future diesel emission exposure. With respect to the diesel particulate matter sources associated with the Proposed Project, the DMUs would use engines that are compliant with the US and State EPA regulations discussed below (specifically, Tier 3 and 4).

- **Federal Off-Road Diesel Engine Emissions Control Program (40 CFR Part 89).** This program of the US EPA would lower the emissions standards for several categories of off-road engines, including diesel-powered trains. DMU projects would be subject to the standards for Tier 3 and Tier 4.
- **State Heavy-Duty Off-Road Compression Ignition Engine Program (13 CCR Chapters 1956.1 – 1956.4, 1956.8).** This state rule established exhaust emissions standards for off-road heavy-duty diesel engines that become increasingly more stringent based on the horsepower and model year.
- **Federal – Sale or Supply of Diesel Fuel for Use in On-Road Motor Vehicles (40 CFR 80.29).** This rule prohibits the sale or supply of diesel fuel for use in on-road motor vehicles, unless the diesel fuel meets or exceeds formulation requirements including a sulfur content, by weight, no greater than 500 parts per million by weight.

[28] Assembly Bill 2588, the Air Toxics Hot Spots Information and Assessment Act of 1987, requires public notification if modeled cancer risk exceeds 10 in one million.

- **Carl Moyer Memorial Air Quality Standards Attainment Program.** The Carl Moyer program provides grant funding to applicants (e.g., trucking companies, vehicle fleets, school buses, etc.) to replace old diesel engines with newer, cleaner-than-required diesel engines. The Carl Moyer program accelerates the turnover of old highly-polluting engines, reduces the costs to the regulated community, and speeds the commercialization of advanced emission controls.

The combined effectiveness of these programs would be expected to reduce cumulative diesel emissions impacts of the Proposed Project and other foreseeable development to less than significant.

Impact AQ-CU-14 *Construction of the Proposed Project in combination with development around the Railroad Avenue and Hillcrest Avenue Stations would temporarily increase air pollutant emissions. However, the cumulative effects would be less than significant. (LTS)*

Growth in the station areas, as envisioned by the Specific Plans (Ridership Development Plans) would involve construction of new buildings and structures, roads, and other infrastructure which would increase fugitive dust and heavy equipment exhaust emissions during the construction period. Development around the station areas is anticipated to occur concurrently or after construction of the Proposed Project. The approach recommended by the BAAQMD to evaluate the significance of construction impacts is to focus on the mitigation measures implemented. The BAAQMD includes heavy construction equipment emissions out to the year 2020 in its planning.[29]

BAAQMD has identified the set of feasible PM_{10} control measures for construction activities shown in Table 3.11-6. According to the BAAQMD CEQA Guidelines, if these mitigation measures are implemented, construction impacts would be reduced to less than significant. Since every project undergoing CEQA analysis would also be required to impose the same PM_{10} mitigations to avoid significant construction PM_{10} impacts, other developments in the station areas could also assure that they would not have significant construction PM_{10} impacts individually. Further, other developments around the station areas would not all occur simultaneously with station construction. Thus, the Proposed Project's construction air quality impact would be neither individually significant nor contribute considerably to a cumulative air quality problem and the cumulative construction impact would be less than significant.

[29] BAAQMD, *The Bay Area 2005 Ozone Strategy*, January 4, 2006.

This cumulative impact would be similar with the Northside West, Northside East, and Median Station East options.

Impact AQ-CU-15 *Cumulative increases in greenhouses gases and the resulting climate change may increase periodic service disruptions caused by more frequent heat waves and floods, but this would not significantly affect the overall operations of the Proposed Project. (LTS)*

The increase in greenhouse gas emissions from natural and man-made sources are affecting worldwide and regional climatology. These climate changes may have direct effects on the Proposed Project by increasing average temperatures that affect the tracks and by increasing sea levels and flooding hazards.

Heat Waves. As a result of global increases in greenhouse gases, by 2065, California's annual average temperatures are predicted to increase between 2 to 5 degrees Fahrenheit.[30] It is reasonable to expect that increasing average temperatures may lead to increasingly frequent and severe heat waves, which can adversely affect electronic equipment. Newer technologies and the increased heat dissipation rates for above-ground installations should make the Proposed Project less susceptible to heat-related problems. Malfunctions as a result of higher temperatures may not be completely avoidable, but they would not likely affect the overall operation of the proposed service. Heat waves also lead to increases in wildfire risk and intensity, which are expected to rise in California.[31] However, as described in Section 3.12, Public Health and Safety, the areas surrounding the project corridor are primarily developed with residential and commercial buildings, and the proposed corridor is not zoned as a state fire hazard zone. Therefore, significant risks from increased wildland fires are not expected. Overall, the cumulative impacts from the increased average temperature in the project corridor are expected to be less than significant.

Flooding. Section 3.8, Hydrology and Water Quality, of this EIR identifies three major watersheds traversed by the project corridor: the Kirker Creek, the East Antioch Creek, and the West Antioch Creek watersheds. The flooding risk associated with these and other area drainages is discussed in that section. The increase in temperature through the end of this century is expected to result in rising sea levels (predicted to increase by up to 35 inches by the end of the Century), increasingly severe winter storms (particularly during El Nino

[30] CEC, 2006, *Our Changing Climate Assessing the Risks to California: The 2006 Summary Report from the California Climate Change Center.*

[31] Fried, J.S., M.S. Torn and E. Mills, 2004: *The Impact of Climate Change on Wildfire Severity: A Regional Forecast of Northern California*, Climatic Change, 64(1-2), pp. 169-191.

winters), and earlier snowmelt runoff. These factors are likely to increase flooding risk.[32] Flooding in portions of the project corridor would delay or halt normal operations. Given that the increasing severity and duration of flooding is probable in the project corridor, such periods during which operations could be halted could increase. However, the Proposed Project would be designed to reduce flood risks by elevating the alignment above the 100-year flood zone; see Impacts HY-4, HY-10, and HY-CU-15. Also, the potential 35-inch rise in sea levels would not be enough to flood the project corridor since the bayfront is over one mile to the north and intervening development and topography would preclude rising waters in the Sacramento-San Joaquin Delta from reaching the project corridor. Thus, while increased service disruptions due to periodic flooding could occur, the Proposed Project would continue to provide transit service to east Contra Costa County, and cumulative impacts from flooding as a result of climate change are expected to be less than significant.

By significantly decreasing the projected GHG emissions from automobile use, as discussed under Impacts AQ-3 and AQ-CU-12, the Proposed Project would have a net benefit on climate change and so would help to limit climate change. In addition, BART would implement various design features to conserve energy and increase sustainability which would future help to reduce the severity of climate change. These features are identified in Section 2, Project Description.

[32] Hayhoe, K., et al, 2004: *Emissions Pathways, Climate Change, and Impacts on California*, Proceedings of the National Academy of Sciences, 101(34), pp. 12422-12427.