Section 3.11
Air Quality

3.11.1 Introduction

This section describes existing air quality conditions in the area studied for the Proposed Project, including attainment or nonattainment of applicable air quality standards; discusses regulations pertaining to air quality that are applicable to the Proposed Project area; and analyzes the potential impacts of the Proposed Project on air quality. This section also incorporates information and analysis presented in the 1992 EIR.

Air quality in the project area has changed significantly since preparation of the 1992 EIR. In addition, as discussed in Chapter 2, the Proposed Project differs from the 1992 Adopted Project. Consequently, this section represents an update of material appearing in the 1992 EIR. Detailed analysis supporting the findings in this section can be found in the air quality technical report (Jones & Stokes 2002), included as Appendix P to this document.

3.11.2 Environmental Setting

Methodology for Assessment of Existing Conditions

For the purposes of this section, the air quality study area is the San Francisco Bay Area Air Basin (SFBAAB). Cumulative impacts are assessed on the basis of the air basin. Information on existing air quality conditions in the study area was based on data collected by the Bay Area Air Quality Management District (BAAQMD) at the Chapel Way monitoring station in Fremont (California Air Resources Board 2002).

Existing Conditions

Topography and Climate

Air quality conditions in a given area are characterized by the concentrations of various pollutants in that area. The concentration of a given pollutant in the atmosphere is determined by the amount of the pollutant released and the atmosphere's ability to transport and dilute it. Air pollution transport and dilution are mostly determined by wind, atmospheric stability, terrain, and insolation (solar energy). Information on these factors as they relate to southwestern Alameda County is available in BAAQMD's CEQA Guidelines (Bay Area Air Quality Management District 1999) and on the BAAQMD web site (Bay Area Air Quality Management District 1996).

The climate in southwestern Alameda County is affected indirectly by marine air flow. The East Bay hills block marine air entering through the Golden Gate, forcing the air to diverge into northerly and southerly paths. The southerly flow is directed down the Bay, parallel to the hills, and eventually passes over southwestern Alameda County, creating sea breezes that are strongest in the afternoon. The farther from the ocean the marine air travels, the more the ocean's effect is diminished. Therefore, although the climate in the Proposed Project area and surrounding region is affected by sea breezes, it is affected less than the regions closer to the Golden Gate.

The climate of southwestern Alameda County is also affected by its proximity to San Francisco Bay. In warm weather, the Bay cools the air with which it comes in contact, whereas in cold weather the Bay warms the air. The normal northwesterly wind pattern then carries this air onshore. During periods of flat pressure gradients, the Bay can generate its own circulation system, producing what is called a "Bay breeze." A Bay breeze, much like a sea breeze, pushes cool air onshore during the day and draws air from the land offshore at night. Bay breezes are common in the morning, before the sea breeze begins.

Air temperatures are moderated by southwestern Alameda County's proximity to the Bay and to the sea breeze. Temperatures are slightly cooler in winter and slightly warmer in summer than in East Bay cities to the north. During summer, average maximum temperatures (in °F) are in the mid 70s. Average maximum winter temperatures are in the high 50s to low 60s. Average minimum temperatures are in the low 40s in winter and mid 50s in summer.

Pollution potential is relatively high in southwestern Alameda County during summer and fall. When high pressure dominates, low mixing depths [1] and Bay and ocean wind patterns can concentrate and carry pollutants from other cities to this area, adding to the pollutants that are already emitted within the area. The polluted air is then pushed up and trapped against the East Bay hills by prevailing winds. In winter, the air pollution potential in southwestern Alameda County is moderate. Generally in winter, the Pacific high pressure cell weakens and shifts southward, winds tend to flow offshore, upwelling ceases, and storms occur. During winter rainy periods, inversions are weak or nonexistent, winds are usually moderate, and air pollution potential is low.

Regional Attainment Status

Air pollutant concentrations in various regions called air basins are monitored at stations throughout the state. The state is divided into 15 air basins characterized by similar meteorological and geographic conditions. Measured air pollutant concentrations are compared to federal and state standards to determine the "attainment status" of particular air basins. *Attainment status* is a classification of regional air quality.

The federal and state governments—specifically, the U.S. Environmental Protection Agency (EPA) and California Air Resources Board (CARB)—each establish ambient air quality standards for several criteria pollutants. These are referred to as the National Ambient Air Quality Standards

[1] *Mixing depth* is the vertical depth in the atmosphere available for diluting air contaminants near the ground. A low mixing depth means that mixing (and hence dilution of pollutants) is confined to the portion of the atmosphere near the ground. In this case, pollutants are less effectively diluted, and air quality near the ground is decreased.

(NAAQS) and California Ambient Air Quality Standards (CAAQS), respectively. The current standards are listed in Table 3.11-1. Most of the standards have been set to protect public health, although some are based on other values (e.g., protection of crops, protection of materials, or avoidance of nuisance conditions). For some pollutants, separate standards have been set for different periods of time (averaging times).

When an air basin exceeds the NAAQS or CAAQS for a given pollutant more times than allowed under the established violation criteria, it is generally designated as a nonattainment area for that pollutant by EPA or CARB. A nonattainment classification may be used to specify what air pollution reduction measures an area must adopt and when the area must reach attainment. Areas designated as nonattainment areas that subsequently achieve attainment of federal or state standards must develop and implement plans as necessary to maintain their attainment status. Such areas are referred to as "maintenance areas."

The Proposed Project area is located within the San Francisco Bay Area Air Basin (SFBAAB). The SFBAAB includes all of San Francisco, San Mateo, Santa Clara, Alameda, Contra Costa, Marin, and Napa Counties, and parts of Sonoma and Solano Counties. It is currently a nonattainment area for the CAAQS for particulate matter and for the CAAQS and the NAAQS 1-hour standards for ozone. It is an attainment area for the NAAQS for particulate matter ≤10 microns in diameter (PM10), for the CAAQS and NAAQS for nitrogen dioxide and sulfur dioxide, and for the CAAQS for carbon monoxide (CO); and a maintenance area for the NAAQS for CO. It has not yet been classified for the recently established NAAQS for fine particulate matter (PM2.5), the federal 8-hour ozone standard, or a CAAQS for PM2.5 that was recently adopted by CARB but has not yet become effective.

Existing Pollutant Concentrations in the Air Quality Study Area

The following sections describe the air pollutants of greatest concern in the Proposed Project area: ozone, CO, PM10, and fine particulate matter ≤2.5 microns in diameter (PM2.5). Monitoring data for these pollutants are listed in Table 3.11-2 and discussed further in the following sections.

Ozone

Ozone is a respiratory irritant and an oxidant that increases susceptibility to respiratory infections. It is also a severe eye, nose, and throat irritant. Ozone can cause substantial damage to vegetation and other materials; plants exposed to ozone can experience leaf discoloration and cell damage. Ozone also attacks synthetic rubber and textiles.

Ozone is not emitted directly into the air; it is formed by a photochemical reaction in the atmosphere. Ozone precursors, which include reactive organic gases (ROG) and oxides of nitrogen (NO_x), react in the atmosphere in the presence of sunlight to form ozone. Because photochemical reaction rates depend on the intensity of ultraviolet light and on air temperature, ozone is primarily a summer air pollution problem. The ozone precursors ROG and NO_x are emitted by mobile sources and by various types of stationary equipment.

Table 3.11-1. Federal and State Ambient Air Quality Standards

Pollutant	Averaging Time	State Standard	Federal Standard
Ozone	8 hours	—	0.08 ppm
	1 hour	0.09 ppm (180 µg/m^3)	0.12 ppm (235µg/m^3)
Carbon Monoxide	8 hours	9.0 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)
	1 hour	20 ppm (23 mg/m^3)	35 ppm(40 mg/m^3)
Nitrogen Dioxide	annual average	—	0.053 ppm (100 µg/m^3)
	1 hour	0.25 ppm (470 µg/m^3)	—
Sulfur Dioxide	annual average	—	80 µg/m^3 (0.03 ppm)
	24 hours	0.04 ppm (105 µg/m^3)	365 µg/m^3 (0.14 ppm)
	1 hour	0.25 ppm (655 µg/m^3)	—
Particulate Matter (PM10)	annual arithmetic mean	—	50 µg/m^3
	annual geometric mean	20 µg/m^3	—
	24 hours	50 µg/m^3	150 µg/m^3
Particulate Matter—Fine (PM2.5)	annual arithmetic mean	12 µg/m^3	15 µg/m^3
	24 hours	—	65 µg/m^3
Sulfates	24 hours	25 µg/m^3	—
Lead	calendar quarter	—	1.5 µg/m^3
	30-day average	1.5 µg/m^3	—
Hydrogen Sulfide	1 hour	0.03 ppm (42 µg/m^3)	—
Vinyl Chloride (chloroethene)	24 hours	0.010 ppm (26 µg/m^3)	—
Visibility-Reducing Particles(VRP)	8 hours (1000–1800 PST)	*	—

Notes: ppm = parts per million mg/m3 = milligrams per cubic meter µg/m3 = micrograms per cubic meter

* Statewide VRP Standard (except Lake Tahoe Air Basin): Particles in sufficient amount to produce an extinction coefficient of 0.23 per km when relative humidity is less than 70%. Standard is intended to limit frequency and severity of visibility impairment from regional haze and is equivalent to 10-mile nominal visual range.

Table 3.11-2. Ambient Air Quality Monitoring Data from Chapel Way Monitoring Station, Fremont

Pollutant Standards	1998	1999	2000	2001
Ozone (O_3)				
Maximum 1-hour concentration (ppm)	0.115	0.133	0.102	0.109
Maximum 8-hour concentration (ppm)	0.077	0.086	0.075	0.081
Number of Days Standard Exceeded				
NAAQS (1-hour) > 0.12 ppm	0	1	0	0
NAAQS (8-hour) > 0.08 ppm	0	1	0	0
CAAQS (1-hour) > 0.09 ppm	7	3	2	3
Carbon Monoxide (CO)				
Maximum 8-hour concentration (ppm)	2.8	3.1	2.7	2.7
Number of Days Standard Exceeded				
NAAQS (8-hour) ≥ 9.0 ppm	0	0	0	0
NAAQS (1-hour) ≥ 35 ppm	0	0	0	0
CAAQS (8-hour) ≥ 9.0 ppm	0	0	0	0
CAAQS (1-hour) ≥ 20 ppm	0	0	0	0
Particulate Matter (PM10)				
Maximum 24-hour concentration (µg/m^3)	62.7	87.9	58.1	57.6
2nd highest 24-hour concentration (µg/m^3)	45.1	51.5	50.0	56.3
Average arithmetic mean concentration (µg/m^3)	21	24	21	23
Average geometric mean concentration (µg/m^3)	20	21	19	20
Number of Days Standard Exceeded				
NAAQS (24-hour) > 150 µg/m^3*	0	0	0	0
CAAQS (24-hour) > 50 µg/m^3*	1	2	1	3
Particulate Matter (PM2.5)				
Maximum 24-hour concentration (µg/m^3)	N/A	56.5	44.8	56.8
2nd highest 24-hour concentration (µg/m^3)	N/A	45.2	42.2	51.0
Average concentration (µg/m^3)	N/A	13.9	10.6	12.2
Number of days federal 24-hour standard exceeded	N/A	0	0	0
Federal annual standard exceeded?	N/A	No	No	No
California annual standard exceeded?	N/A	Yes	No	Yes

Notes:
*Recorded every 6 days.
ppm = parts per million
µg/m^3 = micrograms per cubic meter
N/A = not available (monitoring not conducted)
Source: California Air Resources Board 2002

For ozone, the Fremont monitoring station recorded 15 violations of the CAAQS, one violation of the 1-hour NAAQS, and one violation of the 8-hour NAAQS between 1998–2001.[2]

Carbon Monoxide

CO is essentially inert to plants and materials, but it 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 to nausea to death.

Motor vehicles are the dominant source of CO emissions in most areas. High CO levels develop primarily during the winter, typically from the evening through early morning, when periods of light winds combine with the formation of ground-level temperature inversions.[3] These conditions result in reduced dispersion of vehicle emissions. Motor vehicles also exhibit increased CO emission rates at low air temperatures.

For CO, the Fremont monitoring station recorded no violations of the NAAQS or CAAQS during the four most recent years for which data are available (1998–2001).

PM10 and PM2.5

Health concerns associated with suspended particulate matter focus on particles that are small enough to reach the lungs when inhaled. Particulates can damage human health and retard plant growth. Particulates also reduce visibility, soil buildings and other materials, and corrode materials.

Emissions of PM10, also called inhalable particulate matter, are generated by a wide variety of sources, including agriculture, industry, suspension of dust by vehicle traffic, and formation of secondary aerosols by reactions in the atmosphere.

For PM10, the monitoring station recorded seven violations of the 24-hour CAAQS, one violation of the annual CAAQS, and no violations of the 24-hour and annual NAAQS during the four most recent years for which data are available (1998–2001).

Emissions of PM2.5, also called fine particulate matter, are generated primarily by combustion sources, including stationary and mobile sources, and by formation of secondary aerosols by reactions in the atmosphere. PM2.5 is a particular concern because it can reach deep into the lungs when inhaled.

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[2] Data from the nearest monitoring station are used to show air quality concentrations in the project vicinity. Data from any one monitoring station, however, are not used to establish the attainment/nonattainment status of the air basin. The Bay Area as a whole is designated as attainment or nonattainment for particular pollutants based on whether exceedances occur at any monitoring station within the basin.

[3] *Temperature inversion* refers to a condition where the air near the ground is cooler than overlying air; this is an inversion because it is the reverse of the typical condition. Because cooler air is denser, it remains trapped near the ground; inversions represent a challenge from an air quality standpoint because they prevent the natural dispersion and dilution of air contaminants (Bay Area Air Quality Management District 1997).

PM2.5 monitoring in Fremont began in 1999. The Fremont monitoring station recorded no violations of the annual or 24-hour NAAQS for 1999–2001. The annual CAAQS, adopted in June 2002, but not yet effective, would have been exceeded in two of the three years during that period.

Toxic Air Contaminants (TACs)

Although ambient air quality standards exist for criteria pollutants, no ambient standards exist for toxic air contaminants (TACs) (also known as hazardous air pollutants [HAPs]). Many pollutants are identified as TACs because of their potential to increase the risk of developing cancer or because of the acute or chronic health risks that may result from exposure to these substances. For TACs that are known or suspected carcinogens, CARB has consistently found that there are no levels or thresholds below which exposure is risk free. Individual TACs vary greatly in the risk they present. At a given level of exposure, one TAC may pose a hazard that is many times greater than another. For certain TACs, a unit risk factor can be developed to evaluate cancer risk. For acute and chronic health risks, a similar factor called a Hazard Index is used to evaluate risk.

Several TACs are emitted during combustion of gasoline and diesel fuel by motor vehicles. Those TACs include benzene, formaldehyde, 1,3-butadiene, and particulate matter from diesel exhaust. Of these TACs, particulate matter from diesel exhaust represents the greatest health risk. On August 27, 1998, CARB formally identified particulate matter emitted by diesel-fueled engines as a TAC. Since by weight the vast majority of diesel exhaust particles are very small (94% of their combined mass consists of particles less than 2.5 micrometers in diameter), they are easily inhaled into the lungs. The CARB action will lead to additional control by CARB of diesel exhaust in coming years. The EPA has also begun an evaluation of both the cancer and noncancer health effects of diesel exhaust.

Greenhouse Gases

Greenhouse gases absorb heat in the atmosphere. Since the industrial revolution, concentrations of greenhouse gases in the earth’s atmosphere have been gradually increasing. Many scientists believe that recently recorded increases in the earth’s average temperature are the result of increases in concentrations of greenhouse gases.

Naturally occurring greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Certain human activities, however, add to the levels of most of these naturally occurring gases. Carbon dioxide is released to the atmosphere when solid waste, fossil fuels (oil, natural gas, and coal), and wood and wood products are burned. Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of solid waste and fossil fuels. Carbon dioxide and nitrous oxide are the two greenhouse gases released in greatest quantities from mobile sources burning gasoline and diesel fuel.

3.11.3 Regulatory Setting

Air Quality Legislation

Air quality regulation is controlled primarily by the federal Clean Air Act (CAA) and California Air Pollution Control Laws in the Health and Safety Code. The federal CAA was originally enacted in the 1970s; the CAA Amendments of 1990 represented a substantial update of the act. The California Air Pollution Control Laws are amended almost every year and include a significant set of air quality planning requirements, called the California Clean Air Act (CCAA), enacted in 1988.

Agency Roles and Responsibilities

At the federal level, EPA has authority to require states to reduce emissions of CO, ozone precursors, and PM10 in nonattainment areas. Recent federal and state standards have been established for PM2.5. EPA must also approve State Implementation Plans submitted by CARB. At the state level, CARB has traditionally established CAAQS, maintained oversight authority in air quality planning, developed programs for reducing emissions from motor vehicles, developed air emission inventories, collected air quality and meteorological data, and approved locally adopted state implementation plans for submission to EPA. At a regional level, California's air districts are responsible for planning to attain federal and state air quality standards, overseeing stationary source emissions, approving permits, maintaining emissions inventories, maintaining air quality stations, overseeing agricultural and forestry burn permits, and reviewing air quality-related sections of environmental documents required under CEQA. BAAQMD is responsible for administering federal, state, and local air quality regulations in the Proposed Project area and vicinity.

Air Quality Management Programs

The CCAA requires the air district with jurisdiction to prepare an air quality attainment plan for any air basin that violates CAAQS for CO, sulfur dioxide, nitrogen dioxide, or ozone. These plans include control measures for stationary sources as well as transportation control measures (TCMs) for mobile sources. Locally prepared attainment plans are not required by state law for areas that violate the CAAQS for PM10. Hence, an attainment plan for the SFBAAB is not required even though the basin is classified as a nonattainment area for that state PM10 standard. For CEQA purposes, local PM10 issues, which result primarily from construction dust, are addressed by BAAQMD through a list of construction-related mitigation measures described in its CEQA guidelines (Bay Area Air Quality Management District 1999). All applicable measures from that list must be incorporated into the design of construction projects that occur within BAAQMD's jurisdiction.

As discussed in *Regional Attainment Status* above, SFBAAB is a nonattainment area for the CAAQS and NAAQS for ozone. Air pollution problems within SFBAAB are primarily the result of locally generated emissions. However, SFBAAB has been identified as a source of ozone precursor emissions that occasionally contribute to air quality problems in the Monterey Bay area, northern San Joaquin Valley, and southern Sacramento Valley. Therefore, in addition to correcting local air pollution problems, air quality management efforts for SFBAAB must also reduce the area's impact on downwind air basins.

BAAQMD has prepared both state and federal air quality plans to bring SFBAAB into attainment with ozone standards. The 2000 Clean Air Plan (2000 CAP), adopted by BAAQMD on December 20, 2000, addresses the CAAQS for ozone; the 2001 Ozone Attainment Plan (2001 OAP), adopted by BAAQMD on October 24, 2001, addresses the NAAQS for ozone. On February 21, 2002, EPA published its determination that the motor vehicle emissions budgets submitted with the 2001 OAP are adequate for transportation conformity purposes. Once a budget has been determined to be adequate, those emission levels must not be exceeded in any regional transportation plan or transportation improvement program. However, the remainder of the 2001 OAP has not yet been approved. EPA's adequacy determination on the motor vehicle emission budgets was challenged in litigation. The court stayed the effectiveness of EPA's adequacy finding on July 23, 2002, leading to a freeze on approval of transportation plans and projects beginning October 6, 2002. The court dismissed the case on November 13, 2002. EPA thereafter requested that the court lift the stay and allow the emission budgets to take effect, but the remaining plaintiffs have requested reconsideration and the case is still pending.

Conformity Rules

The CAA requires that federally funded or approved transportation plans, programs, and projects in nonattainment or maintenance areas conform with the state implementation plan for meeting the NAAQS. Transportation conformity must be assessed for all nonattainment area 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. Transportation projects also generate CO, which is considered a localized pollutant. CO microscale analysis is required to determine whether a transportation project would cause or contribute to localized violations of the NAAQS for CO.

Typically, conformity for a federally funded individual transportation project is assessed by evaluating whether the project is included in a conforming regional transportation plan (RTP) and transportation improvement program (TIP). Also, projects that are included in Transportation Control Measures (TCMs) in the state implementation plan by definition conform to the plan that contains them. If the air pollutant emissions associated with the RTP and TIP are within the allowable ozone precursor budgets, then no further assessment of the individual project or plan's contribution to regional ozone levels is needed. However, the conformity regulations require that transportation projects be evaluated to determine whether they would cause or contribute to violations of the federal CO or PM10 ambient standards in areas designated as nonattainment for these pollutants.

3.11.4 Impact Assessment and Mitigation Measures

Methodology for Impact Analysis

The Proposed Project would generate construction-related emissions and operational emissions. The emissions assessment was based on motor vehicle trip projections from the analysis in Section 3.9 (*Transportation*). The methodology used to evaluate construction and operational impacts is described below.

Operational Impact Assessment Methodology

The primary operational emissions associated with the project include CO, PM10, and ozone precursors (ROG, NO_x) emitted as vehicle exhaust. Ozone precursors and PM10 operational emissions for with-project conditions in both 2010 and 2025 were estimated by multiplying EMFAC 2001 model emission factors by the vehicle miles traveled (VMT) information provided by DKS Associates (DKS Associates 2002). EMFAC 2001 is an emission inventory model that calculates emission factors (grams/mile) for motor vehicles operating on roads in California. An emission inventory can be summarized as the product of a vehicle emission factor (e.g. grams of pollutant emitted over a mile) and vehicle activity (e.g. miles driven per day). CO concentrations were also estimated for sensitive receptors located near intersections in the vicinity of the Proposed Project corridor. CO concentrations were estimated using the CALINE4 dispersion model, described in detail in Appendix P.

Construction Impact Assessment Methodology

BAAQMD's CEQA guidelines do not require estimates of emissions created by construction activities but does require implementation of all feasible control measures that will limit emissions of PM10 generated by construction activities (Bay Area Air Quality Management District 1999). Quantities of PM10 emitted during construction activities vary greatly depending on the level of activity, the nature of specific operations, the equipment operated, local soils, and weather conditions. Experience indicates that despite the variability in emissions, a number of control measures can be reasonably implemented to reduce PM10 emissions during construction. These measures have been incorporated into the mitigation identified under Impact AIR6 (construction-related impact).

Construction equipment also emits CO and ozone precursors. Construction-related emissions of these pollutants were not estimated, however, because they are already included in the emission inventory that forms the basis for the BAAQMD's regional air quality plans and because those emissions are not expected to impede attainment or maintenance of ozone and CO standards in the Bay Area (Bay Area Air Quality Management District 1999).

Criteria for Determining Significance of Impacts

Based on the standards of significance from the CEQA Guidelines and professional standards, a project would result in a significant impact on air quality if it would result in any of the following.

- Conflict with or obstruction of implementation of the applicable air quality management plan.
- Violation of any air quality standard or substantial contribution to an existing or projected air quality violation.
- Cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors).

- Exposure of sensitive receptors to substantial pollutant concentrations.
- Objectionable odors affecting a substantial number of people.

Additional emission thresholds are contained in the BAAQMD's CEQA Guidelines for Assessing the Air Quality Impacts of Projects and Plans (Bay Area Air Quality Management District 1999). A project would also result in a significant impact on air quality if it would result in either of the following.

- Net increase in pollutant emissions of 80 pounds per day (ppd) or 15 tons per year (tpy) of ROG, NO_x, or PM10.
- Net increase in carbon monoxide emissions exceeding 550 ppd, reduction of roadway level of service (LOS) of intersections operating at LOS E or F, reduction of intersection LOS to E or F, or increase in traffic volumes on nearby roadways by 10% or more, and violation of state CO concentration standards as determined by the modeling of CO emissions. (For this analysis, the level of significance of CO emissions from mobile sources is determined by modeling the ambient CO concentration under project conditions and comparing the resultant 1- and 8-hour concentrations to the respective state CO standards of 20.0 and 9.0 parts per million [ppm].)

Impacts and Mitigation Measures

Impacts Related to Warm Springs Extension

Operational Impacts

Impact AIR1 – Effects of Proposed Project on ROG, NO_x, and PM10 emissions from mobile sources during project operation. As indicated in Tables 3.11-3 and 3.11-4, the Proposed Project would decrease ROG, NO_x and PM10 emissions in 2010 and 2025 as compared to no project conditions. Emissions would decrease because the Proposed Project would result in a decrease in regional auto and bus VMT as compared to no project conditions. Therefore, the Proposed Project would result in a regional air quality benefit. *(Beneficial.)*

Mitigation – None required.

Impact AIR2 – Increase in local CO or PM10 emissions. CO modeling was conducted to determine whether the Proposed Project would cause or contribute to localized exceedances of the state or federal ambient standards at sensitive receptors in the vicinity of the Proposed Project. The Transportation Project-Level Carbon Monoxide Protocol (Garza et al. 1997) stated that for a single project with multiple intersections, only the three intersections representing the worst LOS ratings of the project need to be analyzed. CO modeling was therefore performed at three existing intersections that are at LOS F plus the intersection at the Warm Springs Station for the 2010 and 2025 cumulative conditions. Project conditions were not modeled for 2025 because the result would approximate 2025 cumulative conditions. The modeled intersections (existing) included the intersections of Osgood Road/Durham Road/Auto Mall Parkway, Osgood Road/Warm Springs Boulevard/South Grimmer Boulevard, and Warm Springs Boulevard/Mission Boulevard. The proposed Warm Springs

Station north entrance was also modeled. Modeled results as presented in Table 3.11-5 show no violation of either the 1-hour or the 8-hour CO state standard.

Table 3.11-3. Mobile Source Emissions (pounds/day)

	ROG	NO_x	PM10
2010 No Project	154,868	131,534	151,525
2010 Project	154,648	131,339	151,310
2010 Project with Irvington Station	154,632	131,328	151,294
2025 No Project	14,029	34,232	175,548
2025 Project	14,008	34,176	175,278
2025 Project with Irvington Station	13,995	34,156	175,113

Source: EMFAC 2001; Vehicle Miles Traveled, DKS Associates 2002

Table 3.11-4. Mobile Source Emissions (tons/year)

	ROG	NO_x	PM10
2010 No Project	33,752	28,821	27,653
2010 Project	33,703	28,779	27,614
2010 Project with Irvington Station	33,700	28,776	27,611
2025 No Project	3,089	7,229	32,038
2025 Project	3,085	7,217	31,988
2025 Project with Irvington Station	3,082	7,213	31,958

Source: EMFAC 2001; Vehicle Miles Traveled, (DKS Associates 2002)

Based on the Caltrans Guidance for PM10 hotspots, there is no reason to believe that this project would contribute to a PM10 hot spot that would cause or contribute to violations of the PM10 National Ambient Air Quality Standards (Caltrans 2000). No violations of the PM10 NAAQS have been recorded during the three most recent years at the monitoring site located nearest the project (Table 3.11-2). Recent work by U.C. Davis and others suggests that project-level PM10 impacts are insignificant beginning a short distance downwind of the project. These studies document that unless background concentrations already contribute to pollutant concentrations that exceed or are close to the NAAQS threshold, project impacts will be negligible (Asbaugh et. al., 1996; Asbaugh et. al., 1998; South Coast Air Quality Management District 1999). *(Less than significant.)*

Mitigation – None required.

Impact AIR3 – Increase in regional toxic air contaminant emissions. BAAQMD has developed a methodology to evaluate the significance of TAC emissions from stationary sources, but their approach does not apply to mobile sources. Automobiles and trucks are mobile sources of TAC in the Bay Area, and the quantity of TAC emissions from motor vehicles is directly correlated with the

Table 3.11-5. CO Modeling Results (ppm)

	Existing		2010 Project		2010 Project with Irvington		2025 Cumulative plus SVRTC		2025 Cumulative with Irvington plus SVRTC	
Intersection	1-hr	8-hr	1-hr	8-hr	1-hr	8-hr	1-hr	8-hr	1-hr	8-hr
Osgood Road/Durham Road/Auto Mall Parkway	6.3	4.4	6.1	4.3	5.8	4.1	5.9	4.1	5.5	3.8
Osgood Road/Warm Springs Boulevard/ South Grimmer Boulevard	N/A*	N/A*	5.1	3.6	5.0	3.5	5.3	3.7	5.0	3.5
Warm Springs Boulevard/Mission Boulevard	6.5	4.6	6.0	4.2	6.6	4.6	5.5	3.8	4.9	3.4
Warm Springs Boulevard/Northern Warm Springs Station Entrance	N/A*	N/A*	4.8	3.4	4.8	3.4	5.4	3.8	4.9	3.4
CO State Standards	20.0	9.0	20.0	9.0	20.0	9.0	20.0	9.0	20.0	9.0

Note:

* Need not be analyzed because LOS is at C or better.

amount of VMT. Accordingly, implementation of the Proposed Project would reduce emissions of TAC from automobiles, resulting in a beneficial effect throughout the San Francisco Bay Area Air Basin. (*Beneficial.*)

Mitigation – None required.

Impact AIR4 – Increase in localized toxic air contaminant emissions at station site. Even though the Proposed Project would decrease regional VMT and emissions of TAC, it would increase traffic volumes, traffic congestion, and TAC emissions near transit stations. Increases in local TAC concentrations would likely result from increases in emissions from light duty vehicles (automobiles, trucks, and SUVs) rather than diesel powered vehicles since light duty vehicles would be the predominate users of the BART station parking facilities. However, the increase in TAC emissions from gasoline combustion is expected to be negligible. This conclusion is based on the results of the CO modeling analysis that shows decreases in ambient concentrations at some receptors and only small increases in CO concentrations at other locations. The concentrations of TAC would be expected to follow a pattern similar to CO because the TAC of primary concern, diesel particulates, is, like CO, non reactive. Consequently, the increase in emissions of TAC locally would be a less than significant air quality impact. (*Less than significant.*)

Mitigation – None required.

Impact AIR5 – Increase in greenhouse gas contaminant emissions. The BAAQMD has not developed any significance thresholds for greenhouse gases. This is because greenhouse gases, especially carbon dioxide, do not pose any health risks at ambient concentrations. The impacts associated with greenhouse gases are long-term climatic changes, which are beyond the regulatory purview of the air district. However, automobiles are a major source of greenhouse gas emissions, and the quantity of greenhouse gas emissions from automobiles is directly correlated with the amount of VMT. Accordingly, implementation of the Proposed Project would reduce emissions of greenhouse gases from automobiles, resulting in a beneficial effect. (*Beneficial.*)

Mitigation – None required.

Construction-Related Impacts

Impact AIR6 – Temporary increase in construction-related emissions during grading and construction activities. During construction of the Proposed Project, emissions would be produced by a variety of sources. Emissions would include criteria pollutant emissions produced by construction equipment and fugitive dust created by wind and the operation of construction equipment over exposed earth. The BAAQMD's CEQA Guidelines do not require that emissions be estimated for construction activities. Instead, specific construction-related mitigation measures must be implemented to minimize dust generation. Construction-related emissions, therefore, were not estimated for the Proposed Project. Because construction activities could result in a significant increase in PM10 and construction vehicle exhaust emissions, this impact is considered significant. Implementation of Mitigation Measure AIR6 would reduce this impact to a less-than-significant level. *(Less than significant with mitigation incorporated.)*

Mitigation Measure AIR6 – Implement dust and vehicle emissions control measures. BART will implement or require the contractor to implement the following basic measures to control dust emissions during construction.

- Water all active construction areas at least twice daily, or more as required to control dust.
- 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 daily to, or apply (nontoxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites.
- Sweep (with water sweepers) all paved access roads, parking areas, and staging areas at construction sites, as needed.
- Sweep streets (with water sweepers) if soil is visible on adjacent public streets, as needed.
- Hydroseed or apply (nontoxic) soil stabilizers to inactive construction areas (previously graded areas that will be inactive for 10 days or more).
- Enclose, cover, water twice daily, or apply (nontoxic) soil binders to exposed stockpiles (dirt and sand).
- Limit traffic speeds on unpaved roads to 15 miles per hour (mph).
- Install sandbags or other erosion control measures to prevent silt runoff to public roadways, as needed.
- Reduce idling of internal combustion engines to an absolute minimum to the greatest extent feasible.
- Maintain construction equipment properly and tune engines to minimize exhaust emissions.

Impacts Specific to Optional Irvington Station

Some of the impacts and mitigation measures identified in the design option would also apply to the optional Irvington Station. As appropriate, the discussion below refers to the previous section, *Impacts Related to Warm Springs Extension*, for descriptions of those impacts and mitigation measures that apply to both the Warm Springs Extension and the optional Irvington Station.

Operational Impacts

Impact AIR7 – Effects of Proposed Project on ROG, NO_x and PM10 emissions from mobile sources during project operation related to the optional Irvington Station. This impact is similar to Impact AIR1, as described above, but would apply to operation of the optional Irvington Station. This is a beneficial impact. Therefore, the optional Irvington Station would result in a regional air quality benefit. *(Beneficial.)*

Mitigation – None required.

Impact AIR8 – Increase in local CO emissions related to the optional Irvington Station. The analysis described above under Impact AIR2 would also apply to the Irvington Station. The CO modeling results are presented above in Table 3.11-5. Modeled results showed no violation of either the 1-hour or the 8-hour CP standard. *(Less than significant.)*

Mitigation – None required.

Impact AIR9 – Increase in regional toxic air contaminant emissions related to the optional Irvington Station. This impact is similar to Impact AIR3, as described above, but would apply to operation of the optional Irvington Station. This is a beneficial impact. Therefore, the optional Irvington Station would result in an air quality benefit. (*Beneficial.*)

Mitigation – None required.

Impact AIR10 – Increase in localized toxic air contaminant emissions at station site related to the optional Irvington Station. This impact is similar to Impact AIR4, as described above, but would apply to operation of the optional Irvington Station. This is a less-than-significant impact. (*Less than significant.*)

Mitigation – None required.

Impact AIR11 – Increase in greenhouse gas emissions related to the optional Irvington Station. This impact is similar to Impact AIR5, as described above, but would apply to operation of the optional Irvington Station. This is a beneficial impact. Therefore, the optional Irvington Station would result in an air quality benefit. (*Beneficial.*)

Mitigation – None required.

Construction-Related Impacts

Impact AIR12 – Temporary increase in construction-related emissions during grading and construction activities related to the optional Irvington Station. This impact is similar to Impact AIR6, as described above, but would apply to construction activities associated with the optional Irvington Station. This impact is considered significant. Implementation of Mitigation Measure AIR6 as described above would reduce this impact to a less-than-significant level. *(Less than significant with mitigation incorporated.)*

Mitigation Measure AIR6 – Implement dust and vehicle emissions control measures. This mitigation measure is described above.

Contribution to Cumulative Impacts

Contribution of Warm Springs Extension to Cumulative Impacts

Operational Contribution

Impact AIR-Cume1 – Effects of cumulative projects on ROG, NO_x, and PM10 emissions from mobile sources. The results of regional air quality modeling for the Proposed Project, described above under Impact AIR1, include the contributions to air quality from projected development that is incorporated into the model. Increases in transit ridership would reduce automobile VMT. Accordingly, the results in Tables 3.11-3 and 3.11-4 demonstrate that the Proposed Project would have cumulative beneficial effects on air quality, since it reduces regional air emissions.

However, the projections of general regional growth that are incorporated into the regional modeling analysis presented in Tables 3.11-3 and 3.11-4 do not include the proposed SVRTC project. Additional modeling analysis was performed in order to evaluate the potential cumulative effect on air quality of the Proposed Project together with the SVRTC project (as well as regional growth). As indicated on Tables 3.11-6 and 3.11-7, the Proposed Project along with the SVRTC improvements would decrease ROG, NO_x and PM10 emissions in 2025 as compared to the no project condition. The cumulative increase in transit ridership would further reduce automobile VMT.

Comparison of Tables 3.11-6 and 3.11-7 to 3.11-4 and 3.11-5 shows that the Proposed Project together with SVRTC would also decrease ROG and PM10 in 2025 compared to the Proposed Project alone. However, NOx emissions for the Proposed Project together with SVRTC would be similar to those for the Proposed Project alone, and would increase for the Proposed Project with optional Irvington Station together with SVRTC compared to the Proposed Project with optional Irvington Station alone. The reason for this result is that, under the cumulative scenarios with SVRTC, projected VMT for buses would increase slightly relative to VMT for automobiles (as feeder bus service is added to serve the new BART stations), and buses emit higher levels of NOx than automobiles.

In sum, the cumulative effect of the Proposed Project together with the SVRTC project, if it is adopted, would result in regional air quality benefits. *(Beneficial.)*

Mitigation – None required.

Table 3.11-6. Cumulative Mobile Source Emissions Resulting from Proposed Project plus Proposed SVRTC Project (pounds/day)

	ROG	NO_x	PM10
2025 No Project	14,029	34,232	175,548
2025 Proposed Project plus SVRTC	13,942	34,192	174,331
2025 Proposed Project with Irvington Station plus SVRTC	13,961	34,224	174,590

Source: EMFAC 2001; Vehicle Miles Traveled, DKS Associates 2002

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Table 3.11-7. Cumulative Mobile Source Emissions Resulting from Proposed Project plus Proposed SVRTC Project (tons/year)

	ROG	NO_x	PM10
2025 No Project	3,089	7,229	32,038
2025 Proposed Project plus SVRTC	3,070	7,218	31,816
2025 Proposed Project with Irvington Station plus SVRTC	3,074	7,225	31,863

Source: EMFAC 2001; Vehicle Miles Traveled, DKS Associates 2002

Construction-Related Contribution

Impact AIR-Cume2 – Potential for construction of Proposed Project to contribute to cumulatively considerable air quality impacts. Air quality impacts related to the construction of the Proposed Project would be mitigated using the required mitigation measures from BAAQMD. Other projects that may be undergoing construction in the vicinity of the Proposed Project in the same time frame (including the northern portion of the SVRTC, if that project is adopted and if construction of its northern portion overlaps with construction of the Warm Springs station) would also be required to incorporate the BAAQMD mitigation measures. Assuming BAAQMD's mitigation measures are implemented for all projects, those measures are designed to be sufficient to reduce cumulative air quality impacts to a less than significant level. Accordingly, based on implementation of Mitigation Measure AIR6 (Implement dust and vehicle control measures) throughout the construction phase, no contribution to cumulatively considerable impacts would result. (*Less than significant.*)

Mitigation – No additional mitigation required.

Contribution of Optional Irvington Station to Cumulative Impacts

Operational Contribution

Impact AIR-Cume3 – Effects of cumulative projects on ROG, NO_x, and PM10 emissions from mobile sources. Impact AIR-Cume3 as described above would also apply to potential cumulative impacts caused by operation of the optional Irvington Station. Additional increases in transit ridership associated with the Irvington Station would further reduce automobile VMT. Accordingly. the results in Tables 3.11-3 and 3.11-4 demonstrate that the Proposed Project would have cumulative beneficial effects on air quality, since it reduces regional air emissions.

As noted above, the projections of general regional growth that are incorporated into the regional modeling analysis presented in Tables 3.11-3 and 3.11-4 do not include the proposed SVRTC project. Tables 3.11-6 and 3.11-7 show that the Proposed Project with Irvington Station along with the SVRTC improvements (as well as regional growth) would further decrease ROG, $NO_{x,}$ and PM10 emissions in 2025 as compared to the no project condition. Therefore, the cumulative effect of the Proposed Project with Irvington Station, together with the SVRTC project if it is adopted, would result in regional air quality benefits. *(Beneficial.)*

Mitigation – None required.

Construction-Related Contribution

Impact AIR-Cume4 – Potential for construction of Proposed Project to result in cumulatively considerable air quality impacts related to construction of optional Irvington Station. This impact is similar to Impact AIR-Cume2, as described above, but would apply to construction activities associated with the optional Irvington Station. Air quality impacts related to the construction of the Proposed Project with Irvington Station and other projects would be mitigated using the required mitigation measures from BAAQMD. Assuming implementation of Mitigation Measure AIR6 (described above) throughout the construction phase of the Proposed Project and other projects, no contribution to cumulatively considerable impacts would result. (*Less than significant.*)

Mitigation – No additional mitigation required.

Transportation Conformity

The Proposed Project is identified in TCM 6 for ozone in the 1982 State Implementation Plan under the federal CAA. Projects that are included in TCMs by definition conform to the state implementation plan that contains them. However, the project must not cause or contribute to local CO or increase the frequency or severity of any existing NAAQS violations. As discussed above under Impact AIR2, CO modeling was conducted to determine whether the Proposed Project would cause or contribute to localized exceedances of the state or federal ambient standards at sensitive receptors in the vicinity of the Proposed Project. The modeled results are presented in 3.11-5. Modeled results showed no violation of either the 1-hour or the 8-hour CO state standard. The project consequently would be a conforming transportation project.

3.11.5 References Cited in this Section

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Section 3.12
Energy

3.12.1 Introduction

This section describes the existing energy resources and consumption patterns in the Proposed Project area, and analyzes the impacts on energy that would result from implementing the Proposed Project. Potential impacts generally pertain to consumption of nonrenewable energy sources by BART and to reduced automobile use that results from mass-transit improvements. This section incorporates information and analysis presented in the 1992 EIR, and addresses changes in energy consumption in the Proposed Project area since the 1992 EIR was prepared.

3.12.2 Environmental Setting

Methodology for Assessment of Existing Conditions

The information used in identifying the existing energy setting and conditions was obtained from existing sources, including the California Energy Commission and U.S. Department of Transportation (DOT). The boundary of the energy study area coincides with the area for which energy-related data were collected (i.e., the area where future BART extension patronage would be reflected in changes to the number of vehicle miles traveled [VMT], primarily the southern Alameda and northern Santa Clara County area).

Existing Conditions

California relies on a regional power system composed of a diverse mix of natural gas, renewable, hydroelectric, and nuclear generation resources. The state generates 70–80% of the electricity it consumes and imports the remaining 20–30% from 11 other western states, Canada, and Mexico. In 2000, the net electricity consumption of four Bay Area counties (Alameda, San Francisco, San Mateo, and Santa Clara) exceeded 36 million megawatt hours (MWh), which represented approximately 14% of the electricity consumed in the state that year (California Energy Commission 2001a). These four counties represent a typical crossection of Bay Area energy consumption patterns.

Pacific Gas and Electric Company (PG&E) is the largest publicly owned utility in California and is the electricity and natural gas provider for residential, industrial, and agency consumers within the Proposed Project area, including BART. PG&E buys power from a diverse mix of generating sources, including fossil-fueled plants, hydroelectric powerhouses, wind farms, and nuclear power plants. In addition to electrical power purchased from PG&E, BART purchases power directly from the Bonneville Power Administration (BPA), which is a federal agency headquartered in Portland, Oregon, that markets power to large portions of the Northwest, in addition to other states, including California. The majority of the power sold by BPA is hydroelectrically generated.

Natural gas supplies are derived from underground sources and brought to the surface at gas wells. Once it is extracted, gas is purified and the odorant which allows gas leaks to be detected is added to the normally odorless gas. Natural gas suppliers such as PG&E then send gas into transmission pipelines, which are usually buried underground. PG&E has more than 5,700 miles of these pipelines. Compressors propel the gas through a 35,000-mile interstate system of pipelines, which ultimately delivers the gas to homes and businesses. PG&E has 3.7 million gas customer accounts.

In 2000, unexpected developments in the electricity and natural-gas markets resulted in higher prices and increased reliability risks. These developments were related to limited supplies of electricity and natural gas throughout the western United States and the consequences of deregulation and market restructuring.

As discussed in the 1992 EIR, mass-transit systems, such as BART, can provide energy savings because they are able to transport people much more efficiently than private automobiles. According to a 1983 Caltrans report (Caltrans 1983) on energy and transportation systems, transit (including freight) consumed only 2% of the total energy utilized by California's transportation sector.

3.12.3 Regulatory Setting

Corporate Average Fuel Economy Standards

Corporate Average Fuel Economy (CAFE) standards are federal regulations that are set to reduce energy consumed by on-road motor vehicles. The standards specify minimum fuel consumption efficiency standards for new automobiles sold in the United States. The current standard for passenger cars is 27.5 miles per gallon (mpg). The 1998 standard for light trucks was 20.7 mpg (Competitive Enterprise Institute 1996). In April 2002, the National Highway Traffic Safety Administration, part of DOT, issued a final rule for CAFE standards for model-year 2004 light trucks that codified a standard of 20.7 mpg; this level is now in effect (U.S. Department of Transportation 2002a).

Transportation Equity Act for the 21st Century

The Transportation Equity Act for the 21st Century, passed in 1998, is intended to protect and enhance communities and the natural environment as development occurs in the transportation sector. It builds on the initiatives established in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), which was the previous major authorizing legislation for surface transportation. The ISTEA identified planning factors for use by Metropolitan Planning Organizations (MPOs), including the Metropolitan Transportation Commission (MTC), in developing transportation plans and programs. Under the ISTEA, MPOs are required to "[p]rotect and enhance the environment, promote energy conservation, and improve quality of life" and are required to consider the consistency of transportation planning with federal, state, and local energy goals (U.S. Department of Transportation 2002b).

California Code of Regulations, Title 24, Part 6, Energy Efficiency Standards

Title 24, Part 6 of the CCR Energy Efficiency Standards promotes efficient energy use in new buildings constructed in California. The standards regulate energy consumed for heating, cooling, ventilation, water heating, and lighting. The standards are enforced through the local building permit process.

California Assembly Bill 1X

On February 1, 2001, Governor Gray Davis signed into law California Assembly Bill 1X (AB 1X), which authorized the California Department of Water Resources to purchase electricity under long-term contracts to re-sell to two utilities: PG&E and Southern California Edison. This law was passed because, as a result of financial constraints, the two utilities were unable to obtain long-term power contracts with power generators. AB 1X is significant because it made the state government an active participant in California's power industry (California Energy Commission 2002b).

3.12.4 Impact Assessment and Mitigation Measures

Methodology for Impact Analysis

This section explains the methodology used to evaluate the impact of the Proposed Project on transportation-related energy consumption for the region in 2010 and 2025. The analysis estimates the total amount of energy expected to be consumed by the Proposed Project by considering both direct (operational) and indirect (construction-related) energy impacts. The direct energy impacts were assessed quantitatively, using the following methodology.

Direct energy consumption involves energy used by the operation of vehicles (automobile, truck, bus, or train) within the region. In assessing the direct energy impact, consideration was given to the following factors.

- Annual vehicle miles traveled (VMT) for automobiles, trucks, buses, and BART vehicles.
- Variation of fuel consumption rates by vehicle type.

The direct-energy analysis was based on projected year 2010 and 2025 regional traffic volumes and total VMT. The projected daily traffic volumes for the region were an output of the traffic model and were annualized using a factor of 320 days per year[1]. The VMT fuel consumption method used for this project is outlined in *Technical Guidance*, Section 5309 New Starts Criteria (Federal Transit

[1] Daily traffic and train volumes are projected for a typical weekday. The annualization factor of 320 allows for differences in traffic levels and levels of service for transit during weekends and holidays.

Administration, Office of Planning 1999). Energy consumption factors for the various modes identified in Table 3.12-1 were developed by Oak Ridge Laboratory and published in the 2002 *Transportation Energy Book* (Edition 22) (Oak Ridge Laboratory 2002).

Direct energy, measured in British thermal units (BTUs) was converted to the equivalent barrels of crude oil for comparison to the No-Project condition. The annual direct energy expenditure (in BTUs) was also calculated for the No Project Alternative in 2010 and 2025 and each of the Proposed Project scenarios modeled in the Transportation analysis (Proposed Project in 2010 and 2025, Proposed Project with optional Irvington Station in 2010 and 2025). In addition, for purposes of examining cumulative effects of the Proposed Project together with the proposed SVRTC, energy expenditures were calculated for the Proposed Project together with SVRTC in 2025, without and with the optional Irvington Station.

Indirect energy impacts were assessed qualitatively, with attention given to the efficiency with which construction materials and machinery are produced and the choices made with respect to the construction procedures and the adequacy of equipment maintenance.

Table 3.12-1. Energy Consumption Factors

Mode	Factor
Passenger Vehicles (auto, van, light truck)	5,815 BTUs/Vehicle Mile
Transit Bus (all vehicle types)[1]	42,955 BTUs/Vehicle Mile
Rail (light or heavy)	71,360 BTUs/Vehicle Mile

Note:
[1]A transit bus energy consumption factor of 42,955 BTUs/VMT was used for all bus types (including alternative fueled buses). Sufficient data has not been available to develop consumption factors for alternative fuels such as CNG (compressed natural gas), LNG (liquefied natural gas), and others.

Source: Oak Ridge Laboratory 2002

Criteria for Determining Significance of Impacts

The thresholds of significance for energy impacts used by BART were derived from criteria in the CEQA Guidelines, Appendix F. Based on these criteria, energy impacts would be considered significant if the Proposed Project would result in any of the following.

- Wasteful, inefficient, and unnecessary usage of energy.
- Placement of a significant demand on regional energy supply or requirement for substantial additional capacity.
- Significant increase in peak- and base-period electricity demand.
- Contribution, together with regional growth, to a collectively significant shortage of regional energy supply.

Significant construction impacts would occur if construction of the Proposed Project were judged likely to consume nonrenewable energy resources in a wasteful, inefficient, or unnecessary manner.

Impacts and Mitigation Measures

Impacts Related to Warm Springs Extension

Operational Impacts

Impact E1 – Effects of Proposed Project on overall energy usage. As indicated in Table 3.12-2, the Proposed Project would result in an overall decrease in Bay Area transportation energy consumption in 2010 and in 2025 as compared to the No-Project conditions. The annual automobile and bus VMT would decrease with the Proposed Project. In 2010, the Proposed Project would also result in a decrease in automobile and bus VMT of approximately 58.5 million miles, while the VMT for BART, including the Proposed Project, would increase by approximately 377,000 miles. The net result in 2010 would be an overall annual decrease in energy consumption of 323.3 billion BTUs, or approximately 55,748 barrels of oil. In 2025, the Proposed Project would also result in a decrease in automobile and bus VMT of approximately 73.3 million miles and an increase of 495,000 miles in BART VMT. The net result in 2025 would be an overall annual decrease in energy consumption of approximately 401.1 billion BTUs, or approximately 69,150 barrels of oil, compared to the No Project.

Therefore, the Proposed Project would result in an overall decrease in the consumption of energy, resulting in gains to energy efficiency, which would be a net benefit. *(Beneficial.)*

Mitigation – None required.

Impact E2 – Effects of Proposed Project on regional energy supply and capacity. As indicated in Table 3.12-2 and discussed above, the Proposed Project would result in an overall decrease in Bay Area transportation energy consumption in 2010 and in 2025 as compared to the No-Project conditions. As a result, there would be a decrease in the amount of overall energy required to meet the regional energy demands. Therefore, the Proposed Project would result in a net benefit. *(Beneficial.)*

Mitigation – None required.

Impact E3 – Effects of Proposed Project on peak- and base-period electricity demand. Peak electricity demand, expressed in megawatts (MW), measures the largest electric power requirement during a specified period of time, usually integrated over 1 hour. Peak demand is important in evaluating system reliability. On a typical day, peak demand on the electricity grid that is controlled by the California Independent System Operator[2] (Cal-ISO) normally occurs on weekdays between 3:00 p.m. and 5:00 p.m., and is highest during the hot summer months. Base-period, or off-peak demand occurs during the middle of the day and in the evening, when electricity usage patterns change. BART operates at a peak operating schedule—15-minute headways in 2010 and 12-minute headways in 2025—during the period of peak-demand on the Cal-ISO-controlled system. BART

[2] Cal-ISO operates the wholesale power grid that provides power for 82% of California, including BART.

Table 3.12-2. Annual Operational Energy Consumption

Vehicle Miles Traveled (VMT)	2010 No Project	2010 Proposed Project	2010 Proposed Project with Irvington	2025 No Project	2025 Proposed Project	2025 Proposed Project with Irvington	2025 Proposed Project (plus SVRT)	2025 Proposed Project with Irvington (plus SVRT)
Daily Auto and Truck VMT	127,685,200	127,503,300	127,490,200	149,049,800	148,821,600	148,680,400	148,006,900	148,227,600
Annual Auto VMT (millions)	40,859.2	40,801.1	40,796.9	47,695.9	47,622.9	47,577.7	47,362.2	47,432.8
Daily Bus VMT	465,490	464,636	464,636	465,490	464,636	464,636	469,502	469,502
Annual Bus VMT (millions)	149.0	148.7	148.7	149.0	148.7	148.7	150.2	150.2
Daily BART VMT[1]	30,425	31,602	31,602	39,005	40,551	40,551	44,770	44,770
Annual BART VMT (millions)	9.7	10.1	10.1	12.5	13.0	13.0	14.3	14.3
Energy Consumption (BTUs)[2] (billions)								
Annual Auto and Truck BTUs[2]	237,596	237,258	237,234	277,352	276,927	276,664	275,411	275,822
Annual Bus BTUs[2]	6,398	6,387	6,387	6,398	6,387	6,387	6,454	6,454
Annual BART BTUs[2]	695	722	722	891	926	926	1,022	1,022
Total Annual Direct BTUs (billions[3])	**244,690**	**244,366**	**244,342**	**284,641**	**284,240**	**283,977**	**282,887**	**283,298**
Total Annual Barrels of Oil[4]	**42,187,900**	**42,132,152**	**42,127,949**	**49,076,033**	**49,006,883**	**48,961,583**	**48,773,648**	**48,844,455**
Change in BTUs vs. No-Project (billions[3])		**-323**	**-348**		**-401**	**-664**	**-1,754**	**-1,343**
Change in Barrels vs. No-Project		**-55,748**	**-59,951**		**-69,150**	**-114,451**	**-302,386**	**-231,579**

Notes:
[1]Based on 15-minute headways in 2010 and 12-minute headways in 2025.
[2]One British thermal unit (BTU) is the quantity of energy necessary to raise 1 pound of water 1 degree Fahrenheit.
[3]Rounded.
[4]One barrel of crude oil is equal to 5.8 million BTUs.

Sources: Vehicle Miles Traveled (DKS 2002); Energy Consumption Factors (Oak Ridge National Laboratory 2002) operates at an off-peak operating schedule—20-minute headways in both 2010 and 2025—during the off-peak hours on the Cal-ISO-controlled system.

Two elements of the electrical system are important when determining whether electrical power demand increases are significant: generating capacity and transmission capacity.

Generating Capacity

When operating at peak frequency, the Proposed Project would increase demand on the statewide electricity supply by 0.36 MW in 2010. One MW is enough power to meet the electricity needs of 1,000 typical California homes, meaning that the Proposed Project would require the electricity of 360 homes when it is operating at peak frequency. Peak demand statewide in 2010 has been forecasted at 50,796 MW, which means that the additional load placed on the system by the Proposed Project would be 0.00007% of the Cal-ISO-controlled grid (California Independent System Operator 2002).

While it is difficult to project supply more than 2 to 3 years into the future, it is expected that total supply capacity of the Cal-ISO-controlled system will be about 53,000 MW in 2008 (California Energy Commission 2003a). Predictions of system-wide supply capacity in 2010 are not available. However, capacity in 2010 would be adequate to accommodate demand, assuming the accuracy of the projections showing that capacity projected for 2008 is in excess of demand expected in 2010 by approximately 2,200 MW. The additional 0.36-MW load placed on the system by the Proposed Project would represent approximately 0.0016% of the 2,200-MW surplus. The same comparisons cannot be drawn for 2025 because it is too speculative to make electricity supply and demand projections that far into the future.

While the Proposed Project would increase the peak demand on the power generation system, the impact would be limited due to surplus capacity and the relatively small percentage of that surplus that the additional load from the project represents.

Transmission Capacity

Transmission capacity refers to the maximum amount of power that can be carried from the generating source to the utility provider and is a key component in the electrical power delivery system. In the years since the start of the electricity crisis, the transmission capabilities of some portions of the state's electrical grid have occasionally not been adequate to transmit electricity at a rate that satisfies the quantities of electricity demanded. This phenomenon is known as transmission bottlenecks. An example of one such current bottleneck occurs through what is known as Path 15, a major transmission line between Northern and Southern California. According to the Western Area Power Administration (WAPA), PG&E plans to increase the rating of Path 15 from 3,900 MW to 5,400 MW, which is expected to be completed by 2004 (Western Area Power Administration 2002). Improvements to other transmission paths are currently planned (Cal-ISO 2002a).

The increased demand to the Cal-ISO electrical transmission grid could have a potentially significant impact, depending on how much the transmission system is improved prior to project implementation. Therefore, the impact of the Proposed Project on transmission capacity is considered potentially significant. Because no mitigation is available to reduce this impact to a less-than-significant level, it is considered significant and unavoidable. (*Significant and unavoidable*.)

Mitigation – None available.

Construction-Related Impacts

Impact E4 – Effects of Proposed Project construction on the consumption of nonrenewable energy resources. A significant energy construction impact would occur if construction activities related to the project consumed nonrenewable energy resources in a wasteful, inefficient, or unnecessary manner.

Construction-related energy consumption comprises two components: secondary facilities, and project construction. A *secondary facility* is a facility such as a factory that produces construction materials and machinery that will be used in the construction and maintenance of the Proposed Project structures and attendant facilities. The majority of the energy consumed by this component of construction-related energy consumption would be consumed at the time of construction (the exception being the amount used during maintenance activities). It is assumed that secondary facilities employ all reasonable energy conservation practices as part of their operations management plans, in the interest of minimizing the cost of doing business. In fact, industry in California reduced electricity usage (which is mostly generated by natural gas, a non-renewable fuel) from 54.7 million MWh in 2000 to 52.2 million MWh in 2001, a 4.6% reduction, even as the state's population increased by 513,352, or 1.5% (CEC 2002c). As such, it can be assumed that Project-related energy consumption by secondary facilities would not consume non-renewable energy resources in a wasteful, inefficient, or unnecessary manner. As a result, a less-than-significant impact would occur.

The project construction component of the construction-related energy consumption for the Proposed Project would result in the one-time, non-recoverable energy costs associated with construction of cut-and-cover subway, trackwork, systems/equipment, transportation-related facilities (stations, maintenance facilities), and vehicles. Details regarding energy conservation practices have not been specified, since the Proposed Project has only been designed to a conceptual level of detail. It is expected, however, that BART would require contractors to employ good construction practices and energy management techniques to ensure that nonrenewable resources are not consumed in a wasteful, inefficient, or unnecessary manner. However, in the absence of clear energy conservation guidelines for construction of the Proposed Project, it is conservatively assumed that there is the potential for significant energy impact during project construction. For example, unplanned and inefficient delivery of materials to the work sites could increase the number of truck trips required, resulting in wasteful use of energy. In addition, if the construction equipment and machinery were not in good condition, they could result in the wasteful consumption of energy. Equipment and vehicles left idling could also result in unnecessary use of energy. Therefore, this impact is considered potentially significant, but would be reduced to less than significant with the following mitigation. *(Less than significant with mitigation incorporated.)*

Mitigation Measure E4 – Develop and implement construction energy conservation plan. BART will require the contractors to adopt construction energy conservation measures including, but not limited to, those listed below.

- Use energy-efficient equipment and incorporate energy-saving techniques in the construction of the Proposed Project.
- Avoid unnecessary idling of construction equipment.
- Consolidate material delivery as much as possible to ensure efficient vehicle utilization.

- Schedule delivery of materials during non-rush hours to maximize vehicle fuel efficiency.
- Encourage construction workers to carpool.
- Maintain equipment and machinery, especially those using gasoline and diesel, in good working condition.

Impacts Related to Optional Irvington Station

Some of the impacts and mitigation measures identified in the design option would also apply to the optional Irvington Station. As appropriate, the discussion below refers to the previous section, *Impacts Related to Warm Springs Extension*, for descriptions of those impacts and mitigation measures that apply to both the Warm Springs Extension and the optional Irvington Station.

Operational Impacts

Impact E5 – Effects of the Proposed Project with Irvington Station on overall energy usage. As indicated in Table 3.12-2, the Proposed Project with Irvington Station would result in an overall decrease in Bay Area transportation energy consumption in 2010 and in 2025 as compared to the No-Project and to the Proposed Project without Irvington Station conditions. The annual automobile and bus VMT would decrease more with the optional Irvington Station because of more patrons would make the mode change from automobile to transit. In 2010, the Proposed Project with Irvington Station would result in a decrease in automobile and bus VMT of approximately 62.7 million miles compared to the No Project and approximately 4.2 million miles compared to the Proposed Project without Irvington Station, while the VMT for BART would increase by approximately 377,000 miles compared to the No Project and remain the same when compared to the Proposed Project without Irvington. In 2010, the net result of building the Proposed Project with Irvington Station would be an overall annual decrease in energy consumption of about 347.7 billion BTUs, or approximately 59,951 barrels of oil, compared to the No Project, and 24.4 billion BTUs, or approximately 4,203 barrels of oil, compared to the Proposed Project without Irvington.

In 2025, the Proposed Project with Irvington Station would also result in a decrease in automobile and bus VMT of approximately 118.5 million miles and an increase of 495,000 miles in BART VMT, compared to the No Project, which would result in an overall annual decrease in energy consumption of about 663.8 billion BTUs, or approximately 114,451 barrels of oil. The optional Irvington Station automobile and bus VMT would decrease by about 45.2 million miles compared to the Proposed Project without Irvington, resulting in a annual energy savings of 263 billion BTUs (with BART VMT having remained the same as with the Proposed Project). The Proposed Project with Irvington Station would result in an overall decrease in the consumption of transportation-related energy over the No Project and Proposed Project, resulting in gains to energy efficiency, a net benefit. *(Beneficial.)*

Mitigation – None required.

Impact E6 – Effects of the Proposed Project with Irvington Station on regional energy supply and capacity. As indicated in Table 3.12-2 and discussed above, the Proposed Project with Irvington Station would result in an overall decrease in Bay Area transportation energy consumption in 2010 and in 2025 as compared to the No-Project and the Proposed Project without Irvington Station conditions. As a result, there would be a decrease in the amount of overall energy necessary to meet the regional energy demands. The Proposed Project with Irvington Station would result in a decrease in the overall consumption of energy compared to the No Project and the Proposed Project without Irvington, resulting in a decrease in the amount of energy required by the region, a net benefit. *(Beneficial.)*

Mitigation – None required.

Impact E7 – Effects of the Proposed Project with Irvington Station on peak- and base-period electricity demand. The effects on peak- and base-period electricity demand for the Proposed Project with Irvington Station would be the same as for the Proposed Project without Irvington Station, described above. As such, impacts to peak-demand on the electricity generating system are anticipated to be less than significant, but impacts to peak-demand on the transmission system are potentially significant and unavoidable, as discussed above in the analysis conducted for Impact E3.

The increased demand to the Cal-ISO electrical transmission grid could have a potentially significant impact, depending on how much the transmission system is improved prior to project implementation. Therefore, the impact of the Proposed Project with optional Irvington Station on transmission capacity is considered potentially significant. Because no mitigation is available to reduce this impact to a less-than-significant level, it is considered significant and unavoidable. (*Significant and unavoidable.*)

Mitigation – None available.

Construction-Related Impacts

Impact E8 – Effects of Proposed Project construction on the consumption of nonrenewable energy resources. Although construction impacts on energy consumption would increase slightly over the Proposed Project without Irvington Station because of the additional station, Impact E4 as described above would also apply to construction activities associated with the optional Irvington Station. Impact E4 is considered potentially significant. Implementation of Mitigation Measure E4 as described above would reduce this impact to a less-than-significant level. (*Less than significant with mitigation incorporated.)*

Mitigation Measure E4 – Develop and implement construction energy conservation plan. This mitigation measure is described above.

Contribution to Cumulative Impacts

Operational Contribution

Impact E-Cume1 - Contributions of Proposed Project (without and with the optional Irvington Station) to overall energy usage. The results of regional energy budget modeling for the Proposed Project (without and with the optional Irvington Station), described above under Impacts E1 and E5, include the contribution to energy consumption from projected development that is incorporated into the model. Increases in transit ridership would reduce automobile VMT. Accordingly, both the

Proposed Project and the Project with Irvington Station would have a beneficial effect on the overall regional energy budget, as shown by the discussion of Impacts E1 and E5. Therefore, neither the Proposed Project nor the Project with the optional Irvington Station would contribute to cumulative energy impacts in the region. This is a benefit of the Proposed Project, and no analysis is required of the Proposed Project's contribution to the cumulative energy budget.

The projections of general regional growth that are incorporated into the regional modeling analysis presented under Impacts E1 and E5 do not include the proposed SVRTC project. Additional modeling analysis was performed to evaluate the potential cumulative effect on the regional energy budget by the Proposed Project in conjunction with the SVRTC project (as well as regional growth). As indicated on Table 3.12-2, the Proposed Project in addition to the SVRTC improvements would further decrease regional energy consumption, as compared to the no project condition, because the cumulative increase in transit ridership would further reduce automobile VMT. Compared to the No Project, the Proposed Project together with SRVTC project would save approximately 1.75 trillion BTUs. Compared to the No Project, the SRVTC project with the optional Irvington Station included would save approximately 1.34 trillion BTUs. Therefore, together with the SVRTC project, the cumulative effect of the Proposed Project (without and with the optional Irvington Station), if adopted, would result in a regional energy benefit. *(Beneficial.)*

Mitigation – None required.

Impact E-Cume2 – Contributions of the Proposed Project (without and with the optional Irvington Station) to peak- and base-period electricity demand. As discussed in the analysis conducted above for Impact E3 and E7, the increased demand the Proposed Project (without and with the optional Irvington Station) puts on the Cal-ISO electrical transmission grid could have a potentially significant impact, depending on how much the transmission system is improved prior to project implementation. Therefore, the impact of the Proposed Project on transmission capacity is considered potentially significant. Because no mitigation is available to reduce this impact to a less-than-significant level, it is considered significant and unavoidable. In addition, this project in conjunction with other projects in the area, including those listed in Section 3.1, would have the potential to exceed projected electricity supply. Therefore, the Proposed Project could contribute to cumulative effects on electricity demand, and could, in conjunction with other growth in the area, potentially exceed energy supply, which would be a significant and unavoidable impact. (*Significant and unavoidable.)*

Mitigation – None available.

Construction-Related Contribution

Impact E-Cume3 – Effects of Proposed Project construction on the consumption of nonrenewable energy resources. The total construction time for the Proposed Project (without and with the optional Irvington Station) and the cumulative projects listed in Section 3.1 is anticipated to extend beyond 4 years. Construction impacts on energy consumption would be temporary and would be spread over several years. The energy consumed during construction of the Proposed Project would not result in consumption of nonrenewable energy resources in a wasteful, inefficient, or unnecessary manner with implementation of Mitigation Measure E4 (Develop and implement construction energy conservation plan) as described above. It is also assumed that other projects will adopt best practices for energy conservation. Therefore, the Proposed Project in conjunction with the projects listed in Section 3.1 would not contribute to a cumulative effect on the consumption of nonrenewable energy resources. *(Less than significant with mitigation incorporated.)*

Mitigation – No additional mitigation required.

3.12.5 References Cited in this Section

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