4.5 Air Quality

This section examines the affected environment related to air quality. The existing air quality conditions are addressed within the project corridor, as well as potential impacts resulting from the project alternatives, design options, and operations and maintenance facility sites.

4.5.1 Pollutants and Effects

Criteria air pollutants are defined as pollutants for which the federal and state governments have established ambient air quality standards, or criteria, for outdoor concentrations to protect public health. The federal and state standards have been set at levels above which concentrations could be harmful to human health and welfare. These standards are designed to protect the most sensitive persons from illness or discomfort. Pollutants of concern include: carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter 2.5 microns or less in diameter ($PM_{2.5}$), particulate matter ten microns or less in diameter (PM_{10}), and lead (Pb). These pollutants are discussed below.

4.5.1.1 Carbon Monoxide

CO is a colorless and odorless gas formed by the incomplete combustion of fossil fuels. CO is emitted almost exclusively from motor vehicles, power plants, refineries, industrial boilers, ships, aircraft, and trains. In urban areas, such as the study area, automobile exhaust accounts for the majority of CO emissions. CO is a non-reactive air pollutant that dissipates relatively quickly, so ambient CO concentrations generally follow the spatial and temporal distributions of vehicular traffic. CO concentrations are influenced by local meteorological conditions—primarily wind speed, topography, and atmospheric stability. CO from motor vehicle exhaust can become locally concentrated when surface-based temperature inversions are combined with calm atmospheric conditions, a typical situation at dusk in urban areas between November and February.[6] The highest levels of CO typically occur during the colder months of the year when inversion conditions are more frequent. In terms of health, CO competes with oxygen, often replacing it in the blood, thus reducing the blood's ability to transport oxygen to vital organs. The results of excess CO exposure can be dizziness, fatigue, and impairment of central nervous system functions.

4.5.1.2 Ozone

O_3 is a colorless gas that is formed in the atmosphere when reactive organic gases (ROGs), which include volatile organic compounds (VOCs), and nitrogen oxides (NO_x) react in the presence of ultraviolet sunlight. O_3 is not a primary pollutant; it is a secondary pollutant formed by complex interactions of two pollutants directly emitted into the atmosphere. The primary sources of ROGs, NO_x, and the components of O_3, are automobile exhaust and industrial sources. Meteorology and terrain play major roles in O_3 formation. Ideal conditions occur during summer and early autumn, on days with low wind speeds or stagnant air, warm temperatures, and cloudless skies. The greatest

[6] Inversion is an atmospheric condition in which a layer of warm air traps cooler air near the surface of the earth, preventing the normal rising of surface air.

source of smog-producing gases is the automobile. Short-term exposure (lasting for a few hours) to O_3 at levels typically observed in Southern California can result in breathing pattern changes, reduction of breathing capacity, increased susceptibility to infections, inflammation of the lung tissue, and some immunological changes.

4.5.1.3 Nitrogen Dioxide

NO_2, like O_3, is not directly emitted into the atmosphere but is formed by an atmospheric chemical reaction between nitric oxide (NO) and atmospheric oxygen. NO and NO_2 are collectively referred to as NO_X and are major contributors to O_3 formation. NO_2 also contributes to the formation of PM_{10}. High concentrations of NO_2 can cause breathing difficulties and result in a brownish-red cast to the atmosphere with reduced visibility. There is some indication of a relationship between NO_2 and chronic pulmonary fibrosis. Some increase of bronchitis in children (two and three years old) has also been observed at concentrations below 0.3 parts per million.

4.5.1.4 Sulfur Dioxide

SO_2 is a colorless, pungent gas formed primarily by the combustion of sulfur-containing fossil fuels. Main sources of SO_2 are coal and oil used in power plants and industries. Generally, the highest levels of SO_2 are found near large industrial complexes. In recent years, SO_2 concentrations have been reduced by the increasingly stringent controls placed on stationary source emissions of SO_2 and limits on the sulfur content of fuels. SO_2 is an irritant gas that attacks the throat and lungs. It can cause acute respiratory symptoms and diminished ventilator function in children. SO_2 can also yellow plant leaves and erode iron and steel.

4.5.1.5 Particulate Matter

Particulate matter pollution consists of very small liquid and solid particles floating in the air which can include smoke, soot, dust, salts, acids, and metals. Particulate matter also forms when gases emitted from industries and motor vehicles undergo chemical reactions in the atmosphere. $PM_{2.5}$ and PM_{10} represent different sizes of particulate matter. Fine particulate matter, or $PM_{2.5}$ (particulate matter 2.5 microns or 2.5×10^{-6} millimeters or less in diameter), is roughly 1/28 the diameter of a human hair. $PM_{2.5}$ results from fuel combustion (e.g., motor vehicles, power generation, and industrial facilities), residential fireplaces, and wood stoves. In addition, $PM_{2.5}$ can be formed in the atmosphere from gases such as SO_2, NO_X, and VOCs. Inhalable particulate matter, or PM_{10} (particulate matter 10 microns or 10×10^{-6} millimeters or less in diameter), is about 1/7 the thickness of a human hair. Major sources of PM_{10} include crushing or grinding operations; dust stirred up by vehicles traveling on roads; wood burning stoves and fireplaces; dust from construction, landfills, and agriculture; wildfires and burning of brush or waste; industrial sources; windblown dust from open lands; and atmospheric chemical and photochemical reactions.

$PM_{2.5}$ and PM_{10} pose a greater health risk than larger-size particles. When inhaled, these tiny particles can penetrate the human respiratory system's natural defenses and damage the respiratory tract. $PM_{2.5}$ and PM_{10} can increase the number and severity of asthma attacks, cause or aggravate bronchitis and other lung diseases, and reduce the body's ability to fight infections. Very small particles of substances such as lead, sulfates, and

nitrates can cause lung damage directly. These substances can be absorbed into the blood stream and cause damage elsewhere in the body. These substances can transport absorbed gases such as chlorides or ammonium into the lungs and cause injury. Whereas PM_{10} tends to collect in the upper portion of the respiratory system, $PM_{2.5}$ is so tiny that it can penetrate deeper into the lungs and damage lung tissues. Suspended particulates also damage and discolor surfaces on which they settle, as well as produce haze and reduce regional visibility.

4.5.1.6 Lead

Pb in the atmosphere occurs as particulate matter. Sources of lead include leaded gasoline, battery manufacturing, paint, ink, ceramics, ammunition, and secondary lead smelters. Prior to 1978, mobile emissions were the primary source of atmospheric lead. Between 1978 and 1987, the phase-out of leaded gasoline reduced the overall inventory of airborne lead by nearly 95 percent. With the phase-out of leaded gasoline, secondary lead smelters, battery recycling, and manufacturing facilities are becoming lead emission sources of greater concern.

Prolonged exposure to atmospheric lead poses a serious threat to human health. Health effects associated with exposure to lead include gastrointestinal disturbances, anemia, kidney disease, and in severe cases, neuromuscular and neurological dysfunction. Low-level lead exposures during infancy and childhood are of particular concern. Such exposures are associated with decrements in neurobehavioral performance including intelligence quotient performance, psychomotor performance, reaction time, and growth.

4.5.1.7 Toxic Air Contaminants

A substance is considered toxic if it has the potential to cause adverse health effects in humans. A toxic substance released into the air is considered a toxic air contaminant (TAC). TACs are identified by state and federal agencies based on a review of available scientific evidence. In the State of California, TACs are identified through a two-step process that was established in 1983 under the Toxic Air Contaminant Identification and Control Act, Assembly Bill 1807 (AB 1807). This two-step process of risk identification and risk management was designed to protect residents from the health effects of toxic substances in the air.

The South Coast Air Quality Management District (SCAQMD) has a long and successful history of reducing air toxics and criteria emissions in South Coast Air Basin (SCAB). SCAQMD has an extensive control program including traditional and innovative rules and policies. These policies can be viewed in SCAQMD's *Air Toxics Control Plan for the Next Ten Years* (March 2000).

To date, the most comprehensive study on air toxics in SCAB is the *Multiple Air Toxics Exposure Study* (MATES-III), conducted by the SCAQMD. The monitoring program measured more than 30 air pollutants, including both gases and particulates. The monitoring study was accompanied by a computer modeling study in which SCAQMD estimated the risk of cancer from breathing toxic air pollution throughout the region based on emissions and weather data. MATES-III found that the average cancer risk in

the region from carcinogenic air pollutants ranges from about 870 in a million persons to 1,400 in a million persons, with an average regional risk of about 1,200 in a million.

4.5.1.8 Greenhouse Gases

Greenhouse gas (GHG) emissions refer to a group of emissions that are generally believed to affect global climate conditions. Simply put, the greenhouse effect compares the Earth and the atmosphere surrounding it to a greenhouse with glass panes. The glass panes in a greenhouse let heat from sunlight in and reduce the amount of heat that escapes. GHGs, such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), keep the average surface temperature of the Earth close to 60 degrees Fahrenheit (°F). Without the greenhouse effect, the Earth would be a frozen globe with an average surface temperature of about 5°F.

In addition to CO_2, CH_4, and N_2O, GHGs include hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and water vapor. Of all the GHGs, CO_2 is the most abundant pollutant that contributes to climate change through fossil fuel combustion. CO_2 comprised 81 percent of the total GHG emissions in California in 2002 and non-fossil fuel CO_2 comprised 2.3 percent. The other GHGs are less abundant but have higher global warming potential than CO_2. To account for this higher potential, emissions of other GHGs are frequently expressed in the equivalent mass of CO_2, denoted as CO_2e. The CO_2e of CH_4 and N_2O represented 6.4 and 6.8 percent, respectively, of the 2002 California GHG emissions. Other high global warming potential gases represented 3.5 percent of these emissions. In addition, there are a number of man-made pollutants, such as CO, NO_X, non-methane VOC, and SO_2, that have indirect effects on terrestrial or solar radiation absorption by influencing the formation or destruction of other climate change emissions.

4.5.2 Regulatory Framework

4.5.2.1 Federal

The Federal Clean Air Act and Amendments (CAAA) regulate air quality in the United States. At the federal level, the CAAA is administered by the U.S. Environmental Protection Agency (USEPA).

U.S. Environmental Protection Agency

USEPA is responsible for enforcing the federal CAAA. USEPA is also responsible for establishing the National Ambient Air Quality Standards (NAAQS). NAAQS are required under the 1977 Clean Air Act and subsequent amendments. USEPA regulates emission sources that are under the exclusive authority of the federal government, such as aircraft, ships, and certain types of locomotives. The agency has jurisdiction over emission sources outside State waters (e.g., beyond the outer continental shelf) and establishes various emission standards, including those for vehicles sold in states other than California. Automobiles sold in California must meet the stricter emission standards established by California Air Resources Board (CARB).

State Implementation Plans

Federal clean air laws require areas with unhealthy levels of ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, and inhalable particulate matter, to develop plans known as State Implementation Plans (SIPs) which describe how they would attain NAAQS. The amendments to the federal Clean Air Act set new deadlines for attainment based on the severity of the pollution problem and launched a comprehensive planning process for attaining the NAAQS.

SIPs are not single documents; rather, they are a compilation of new and previously submitted plans, programs (such as monitoring, modeling, permitting, etc.), district rules, state regulations, and federal controls. Many of California's SIPs rely on the same core set of control strategies including emission standards for cars and heavy trucks, fuel regulations, and limits on emissions from consumer products. State law makes CARB the lead agency for all purposes related to the SIP. Local air districts and other agencies, such as the Bureau of Automotive Repair, prepare SIP elements and submit them to CARB for review and approval. CARB forwards SIP revisions to USEPA for approval and publication in the Federal Register. The CFR Title 40, Chapter 1, Part 52, Subpart F, Section 52.220 lists all of the items that are included in the California SIP. Many additional California submittals are pending USEPA approval.

4.5.2.2 State

In addition to being subject to the requirements of the CAAA, air quality in California is also governed by more stringent regulations under the California Clean Air Act (CCAA). In California, the CCAA is administered by the CARB at the state level and by the air quality management districts at the regional and local levels.

California Air Resources Board

CARB, which became part of the California Environmental Protection Agency (CalEPA) in 1991, is responsible for meeting the State requirements of the federal CAAA, administering the CCAA, and establishing the California Ambient Air Quality Standards (CAAQS). The CCAA, as amended in 1992, requires all air districts in California to endeavor to achieve and maintain the CAAQS. CAAQS are generally more stringent than the corresponding federal standards and incorporate additional standards for sulfates, hydrogen sulfide, vinyl chloride and visibility-reducing particles. CARB regulates mobile air pollution sources, such as motor vehicles. CARB is responsible for setting emission standards for vehicles sold in California and for other emission sources, such as consumer products and certain off-road equipment. CARB established passenger vehicle fuel specifications, which became effective in March 1996. CARB oversees the functions of local air pollution control districts and air quality management districts, which in turn administer air quality management functions at the regional and county levels.

South Coast Air Quality Management District

SCAQMD monitors air quality within the study area. SCAQMD has jurisdiction over an area of approximately 10,743 square miles, consisting of Orange County; the non-desert portions of Los Angeles, Riverside, and San Bernardino Counties; and the Riverside County portion of the Salton Sea Air Basin and Mojave Desert Air Basin. The 1977 Lewis Air Quality Management Act created SCAQMD to coordinate air quality planning efforts

throughout Southern California. This Act merged four county air pollution control agencies into one regional district to better address the issue of improving air quality in Southern California. Under the Act, renamed the Lewis-Presley Air Quality Management Act in 1988, SCAQMD is the agency principally responsible for comprehensive air pollution control in SCAB. SCAB is a subregion of the SCAQMD and covers an area of 6,745 square miles. SCAB includes all of Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino counties. SCAB is bounded by the Pacific Ocean to the west; the San Gabriel, San Bernardino and San Jacinto Mountains to the north and east; and the San Diego County line to the south (Figure 4-20).

Specifically, SCAQMD is responsible for monitoring air quality, as well as planning, implementing, and enforcing programs designed to attain and maintain state and federal ambient air quality standards within the district. Programs that were developed include air quality rules and regulations that regulate stationary source, area source, point source and certain mobile source emissions. SCAQMD is also responsible for establishing stationary source permitting requirements and for ensuring that new, modified, or relocated stationary sources do not create net emission increases.

Air Quality Management Plan

All areas designated as nonattainment under the CCAA are required to prepare plans showing how the area would meet the state air quality standards by its attainment dates. The Air Quality Management Plan (AQMP) is the region's plan for improving air quality in the region. It addresses CAAA and CCAA requirements and demonstrates attainment with state and federal ambient air quality standards. The AQMP is prepared by SCAQMD and the SCAG. The AQMP provides policies and control measures that reduce emissions to attain both state and federal ambient air quality standards by their applicable deadlines. Environmental review of individual projects within the SCAB must analyze whether the proposed project's daily construction and operational emissions would exceed thresholds established by SCAQMD. The environmental review must also analyze whether individual projects would increase the number or severity of existing air quality violations.

The 2007 AQMP was adopted by SCAQMD on June 1, 2007. The 2007 AQMP proposes attainment demonstration of the federal $PM_{2.5}$ standards through a more focused control of SO_X, directly emitted $PM_{2.5}$, and NO_X supplemented with VOCs by 2015. The eight-hour ozone control strategy builds upon the $PM_{2.5}$ strategy, augmented with additional NO_X and VOC reductions to meet the standard by 2024. The 2007 AQMP also addresses several federal planning requirements and incorporates significant new scientific data, primarily in the form of updated emissions inventories, ambient measurements, new meteorological episodes, and new air quality modeling tools. The 2007 AQMP is consistent with and builds upon the approaches taken in the 2003 AQMP.

Global Climate Change

Global climate change refers to historical variance in Earth's meteorological conditions, which are measured by wind patterns, storms, precipitation, and temperature. There is general scientific agreement that the Earth's average surface temperature has increased by 0.3 to 0.6 degrees Celsius over the past century. The reasons behind the increase in temperature are not well understood and are the subject of intense research activity. Many

Figure 4-20. South Coast Air Basin

Source: California Air Resources Board, *State and Local Air Monitoring Network Plan*, October 1998

scientific studies have been completed to determine the extent that GHG emissions from human sources (e.g., fossil fuel combustion) affect the Earth's climate. The interrelationships between atmospheric composition, chemistry, and climate change are very complex. For example, historical records indicate a natural variability in surface temperature. Historical records also indicate that atmospheric concentrations of a number of GHG have increased significantly since the beginning of the industrial revolution. As such, significant attention is being given to anthropogenic (human) GHG emissions.

Many chemical compounds found in the Earth's atmosphere act as GHGs. These gases allow sunlight to enter the atmosphere freely. When sunlight strikes the Earth's surface, some of it is reflected back towards space as infrared radiation (heat). GHGs absorb this infrared radiation and trap the heat in the atmosphere. Over time, the amount of energy sent from the sun to the Earth's surface should be approximately equal to the amount of energy radiated from Earth back into space, leaving the temperature of the Earth's surface roughly constant. Some GHGs are emitted naturally (water vapor, CO_2, CH_4, and NO_2), while others are exclusively human-made (e.g., gases used for aerosols). According to the California Energy Commission (CEC), emissions from fossil fuel consumption represent approximately 81 percent of GHG emissions and transportation creates 41 percent of GHG emissions in California.

The State of California has traditionally been a pioneer in efforts to reduce air pollution, dating back to 1963 when the California New Motor Vehicle Pollution Control Board adopted the nation's first motor vehicle emission standards. Likewise, California has a history of actions undertaken in response to the threat posed by climate change. AB 1493, signed by California's governor in July 2002, requires passenger vehicles and light duty trucks to achieve maximum feasible reduction of GHG emissions by model year 2009. AB 1493 was enacted based on recognition that passenger cars are significant contributors to the State's GHG emissions.

Following the passage of AB 1493, the issue was turned over to CARB to determine the reduction targets, based on the CARB's analysis of available and near-term technology and cost. After evaluating the options, the CARB established limits that will result in approximately a 22-percent reduction in GHG emissions from new vehicles by 2012, and approximately a 30-percent reduction by 2016. The CAAA reserves the control of emissions from motor vehicles for the federal government—with the exception of California, due to its early activity and special conditions (i.e., high density of motor vehicles, topography conducive to pollution formation in heavily populated basins—e.g., Los Angeles and the San Joaquin Valley), and any states that opt for the California regulations. For California to implement a modification such as that represented in AB 1493, it must, per the language of the Federal Clean Air Act, request a waiver (Sec. 209 (b)1). The USEPA has not ruled on California's request for a waiver, thereby possibly delaying the CARB's proposed implementation schedule.

On September 27, 2006, AB 32, the California Global Warming Solutions Act of 2006, was enacted by the State of California. The legislature stated that "global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California." AB 32 caps California's GHG emissions at 1990 levels by 2020. AB 32 defines GHG emissions as all of the following gases: CO_2, CH_4, NO_2,

hydrofluorocarbons, perfluorocarbons and sulfur hexaflouride. This bill represents the first enforceable statewide program in the United States to cap all GHG emissions from major industries and include penalties for non-compliance. While acknowledging that national and international actions will be necessary to fully address the issue of global warming, AB 32 lays out a program to inventory and reduce GHG emissions in California and from power generation facilities located outside the State that serve California residents and businesses.

AB 32 charges the CARB with the responsibility to monitor and regulate the sources of GHG emissions in order to reduce those emissions. On June 1, 2007, CARB adopted three discrete early action measures to reduce GHG emission. These measures involved complying with a low carbon fuel standard, reducing refrigerant loss from motor vehicle air conditioning maintenance, and increasing methane capture from landfills. On October 25, 2007, the CARB tripled the set of previously approved early action measures. The newly approved measures include Smartway truck efficiency (i.e., reducing aerodynamic drag), port electrification, reducing perfluorocarbons from the semiconductor industry, reducing propellants in consumer products, promoting proper tire inflation in vehicles, and reducing sulfur hexaflouride emission from the non-electricity sector. AB 32 also required CARB to define the 1990 baseline emissions for California and adopt that baseline as the 2020 statewide emissions cap. The CARB has determined that the total statewide aggregated greenhouse gas 1990 emissions level and 2020 emissions limit is 427 million metric tons of carbon dioxide equivalent.

The CARB is also tasked with establishing a set of rules by January 1, 2011, for reducing GHG emissions to achieve the emissions cap by 2020. These rules must take effect no later than 2012. In designing emission reduction measures, the CARB must aim to minimize costs, maximize benefits, improve and modernize California's energy infrastructure, maintain electric system reliability, maximize additional environmental and economic co-benefits for California, and complement the State's efforts to improve air quality.

California Senate Bill (SB) 375 provides a means for achieving AB 32 goals from cars and light trucks. The bill aligns three critical policy areas of importance to local government: (1) regional long-range transportation plans and investments; (2) regional allocation of the obligation for cities and counties to zone for housing; and (3) a process to achieve greenhouse gas emissions reductions targets for the transportation sector. The new law establishes a process for CARB to develop the GHG emissions reductions targets for each region (as opposed to individual local governments or households). SB 375 relies upon regional planning processes already underway in the 17 MPOs in the state to accomplish its objectives. Most notably, the measure requires the MPO to prepare a Sustainable Communities Strategy (SCS) within the Regional Transportation Plan, which sets forth a vision for growth for the region taking into account the transportation, housing, environmental, and economic needs of the region. The SCS is the blueprint by which the region will meet its GHG emissions reductions target if there is a feasible way to do so. Additionally, SB 375 uses CEQA streamlining as an incentive to encourage residential projects, which help achieve AB 32 goals to reduce GHG emissions.

California Senate Bill 97, passed in August 2007, is designed to work in conjunction with CEQA and AB 32. CEQA requires the State Office of Planning and Research (OPR) to prepare and develop proposed guidelines for the implementation of CEQA by public agencies. SB 97 requires OPR, by July 1, 2009, to prepare, develop, and transmit to the State Resources Agency guidelines for the feasible mitigation of GHG emissions, as required by CEQA, including, but not limited to, effects associated with transportation or energy consumption. The Resources Agency would be required to certify and adopt the guidelines by January 1, 2010 and OPR would be required to periodically update the guidelines to incorporate new information or criteria established by the CARB pursuant to the California Global Warming Solutions Act of 2006. SB 97 would apply retroactively to any environmental impact report, negative declaration, mitigated negative declaration, or other document under CEQA that has not been certified or adopted by the CEQA lead agency. In addition, SB 97 exempts transportation projects funded under the Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act of 2006, or projects funded under the Disaster Preparedness and Flood Prevention Bond Act of 2006.

The OPR CEQA guidelines will provide regulatory guidance on the analysis and mitigation of GHG emissions in CEQA documents. In the interim, OPR has published informal guidance regarding the steps lead agencies should take to address climate change in their CEQA documents. According to the OPR, lead agencies should determine whether GHGs may be generated by a proposed project, and if so, quantify or estimate the GHG emissions by type and source. The lead agency must assess whether those emissions are individually or cumulatively significant. When assessing whether a project's effects on climate change are "cumulatively considerable" even though its GHG contribution may be individually limited, the lead agency must consider the impact of the project when viewed in connection with the effects of past, current, and probable future projects. Finally, if the lead agency determines that the GHG emissions from the proposed project are potentially significant, it must investigate and implement ways to avoid, reduce, or otherwise mitigate the impacts of those emissions.

The SCAQMD has convened a GHG CEQA Significance Threshold Working Group to provide guidance to local lead agencies on determining significance for GHG emissions in their CEQA documents. Members of the working group include government agencies implementing CEQA and representatives from various stakeholder groups that will provide input to the SCAQMD staff on developing GHG CEQA significance thresholds. The working group is currently discussing multiple methodologies for determining project significance. These methodologies include categorical exemptions, consistency with regional GHG budgets in approved plans, a numerical threshold, performance standards, and emissions offsets.

In addition to the state regulations, the City of Los Angeles has issued guidance promoting green building to reduce GHG emissions. The goal of the Green LA Action Plan (Plan) is to reduce greenhouse gas emissions 35 percent below 1990 levels by 2030. The Plan identifies objectives and actions designed to make the City a leader in confronting global climate change. The measures would reduce emissions directly from municipal facilities and operations, and create a framework to address citywide GHG emissions. The Plan lists various focus areas in which to implement GHG reduction strategies. Focus areas listed in the Plan include energy, water, transportation, land use,

waste, port, airport, and ensuring that changes to the local climate are incorporated into planning and building decisions. The Plan discusses the City's goals for each focus area as follows:

Energy

- Increase the generation of renewable energy;
- Encourage the use of mass transit;
- Develop sustainable construction guidelines;
- Increase citywide energy efficiency; and
- Promote energy conservation.

Water

- Decrease per capita water use to reduce electricity demand associated with water pumping and treatment.

Transportation

- Power the City's vehicle fleet with alternative fuels; and
- Promote alternative transportation (e.g., mass transit and rideshare).

Other Goals

- Create a more livable City through land use regulations;
- Increase recycling, reducing emissions generated by activity associated with the Port of Los Angeles and regional airports;
- Create more city parks promoting the environmental economic sector; and
- Adapt planning and building policies to incorporate climate change policy.

At this time, the USEPA does not regulate GHG emissions. In April 2007, the USEPA issued an important ruling in its first case on global warning. In the case of *Massachusetts v. USEPA*, the United States Supreme Court reviewed a USEPA decision not to regulate GHG emissions from cars and trucks under the Clean Air Act. The Court found that Massachusetts was injured by global warming. The lawsuit focused on Section 202 of the CAAA. The case resolved the following legal issues: (1) the CAAA grants the USEPA authority to regulate GHG, and (2) USEPA did not properly exercise its lawful discretion in deciding not to promulgate regulations.

4.5.2.3 National and State Ambient Air Quality Standards and Attainment Status

As required by the federal CAAA, NAAQS have been established for seven major air pollutants: CO, NO_2, O_3, $PM_{2.5}$, PM_{10}, SO_2, and Pb. The CAAA requires USEPA to designate areas as attainment, nonattainment, or maintenance (previously nonattainment and currently attainment) for each criteria pollutant based on whether the NAAQS have been achieved. The federal standards are summarized in Table 4-20. The USEPA has classified SCAB as maintenance for CO and nonattainment for O_3, $PM_{2.5}$, and PM_{10}.

Table 4-20. State and National Ambient Air Quality Standards

Pollutant	Averaging Period	Federal		California	
		Standards	Attainment Status	Standards	Attainment Status
Ozone (O_3)	1-hour	--	--	0.09 ppm (180 µg/m^3)	Nonattainment
	8-hour	0.075 ppm (147 µg/m^3)	Nonattainment	0.070 ppm (137 µg/m^3)	N/A
Respirable Particulate Matter (PM_{10})	24-hour	150 µg/m^3	Nonattainment	50 µg/m^3	Nonattainment
	Annual Arithmetic Mean	--	--	20 µg/m^3	Nonattainment
Fine Particulate Matter ($PM_{2.5}$)	24-hour	35 µg/m^3	Nonattainment	--	--
	Annual Arithmetic Mean	15 µg/m^3	Nonattainment	12 µg/m^3	Nonattainment
Carbon Monoxide (CO)	8-hour	9 ppm (10 mg/m^3)	Maintenance	9.0 ppm (10 mg/m^3)	Attainment
	1-hour	35 ppm (40 mg/m^3)	Maintenance	20 ppm (23 mg/m^3)	Attainment
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.053 ppm (100 µg/m^3)	Attainment	0.030 ppm (56 µg/m^3)	Attainment
	1-hour	--	--	0.18 ppm (338 µg/m^3)	Attainment
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	0.030 ppm (80 µg/m^3)	Attainment	--	--
	24-hour	0.14 ppm (365 µg/m^3)	Attainment	0.04 ppm (105 µg/m^3)	Attainment
	3-hour	--	--	--	--
	1-hour	--	--	0.25 ppm (655 µg/m^3)	Attainment
Lead (Pb)	30-day average	--	--	1.5 µg/m^3	Attainment
	Calendar Quarter	0.15 µg/m^3	Attainment	--	--

- = No standard; N/A = Not Available; ppm – parts per million; µg/m^3 = Micrograms per Cubic Meter of Air
Source: USEPA, *Greenbook*, 2008; CARB, *Ambient Air Quality Standards*, November 17, 2008.

As discussed above, the CAAQS are generally more stringent than the corresponding federal standards (NAAQS) and, as such, are used as the comparative standard in the air quality analysis contained in this report. The state standards are summarized in Table 4-20.

The CCAA requires the CARB to designate areas within California as either attainment or non-attainment for each criteria pollutant based on whether the CAAQS have been achieved. Under the CCAA, areas are designated as nonattainment for a pollutant if air

quality data shows that a state standard for the pollutant was violated at least once during the previous three calendar years. Exceedances that are affected by highly irregular or infrequent events are not considered violations of a state standard and are not used as a basis for designating areas as nonattainment. Under the CCAA, the Los Angeles County portion of the SCAB is designated as a nonattainment area for O_3, $PM_{2.5}$, and PM_{10}.

4.5.3 Existing Conditions/Affected Environment

4.5.3.1 Regional Setting

The study area is located within the Los Angeles County portion of SCAB. Ambient pollution concentrations recorded in Los Angeles County are among the highest in the four counties comprising SCAB. SCAB is an area of high air pollution potential due to its climate and topography. SCAB experiences warm summers, mild winters, infrequent rainfalls, light winds, and moderate humidity. In addition, the mountains and hills within the area contribute to the variation of rainfall, temperature, and winds throughout the region. The region experiences frequent temperature inversions. Under inversion conditions, temperature increases as altitude increases and prevents air close to the ground from mixing with the air above it. As a result, air pollutants are trapped near the ground. During the summer, air quality problems are created due to the interaction between the ocean surface and lower layer of the atmosphere, which creates a moist marine layer. An upper layer of warm air mass forms over the cool marine layer, preventing air pollutants from dispersing upward.

In addition, hydrocarbons and NO_2 react under strong sunlight creating pollution, commonly referred to as "smog." Light, daytime winds predominantly from the west further aggravate the condition by driving the air pollutants inland toward the mountains.

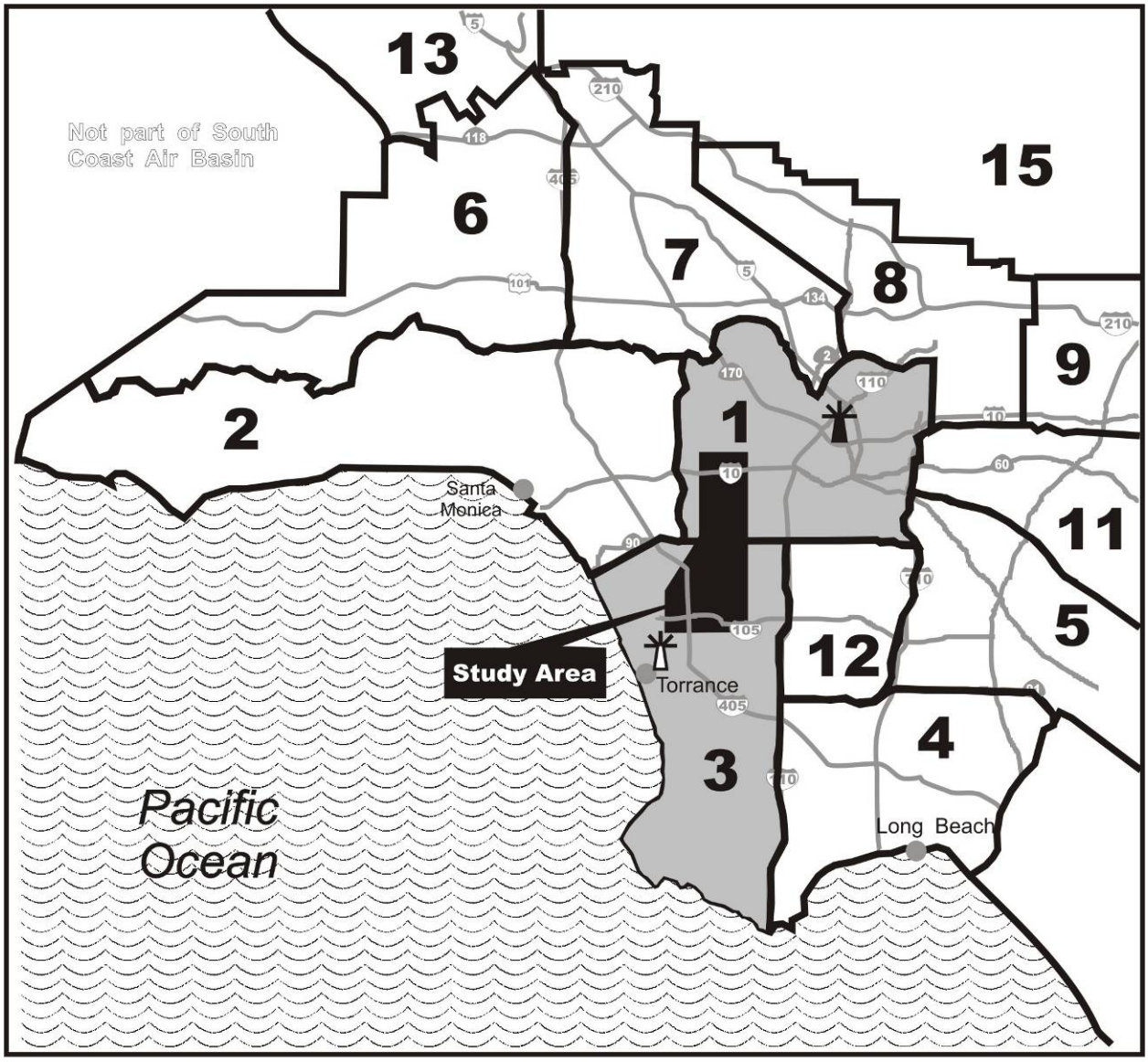
During the fall and winter, air quality problems are created due to CO and NO_2 emissions. High NO_2 levels usually occur during autumn or winter on days with summer-like conditions. Since CO is produced almost entirely from automobiles, the highest CO concentrations in the SCAB are associated with heavy traffic.

4.5.3.2 Local Setting

The SCAQMD monitors air quality conditions at 38 locations throughout SCAB. The corridor is within the Central Los Angeles and Southwest Coastal Source Receptor Areas (Figure 4-21). The Los Angeles-North Main Street monitoring station is located 6.7 miles northeast of the northern boundary of the study area at 1630 North Main Street within the Central Los Angeles Source Receptor Area. The LAX-Hastings monitoring station is located in the southwest portion of the study area at 7201 West Westchester Parkway in the Southwest Coastal Source Receptor Area.

Historical data from the LAX-Hastings and Los Angeles-North Main Street monitoring stations were used to characterize existing conditions in the vicinity of the study area, and establish a baseline for estimating future conditions, both with and without the proposed transit alternatives. Criteria pollutants monitored at both monitoring stations include O_3, CO, PM_{10}, SO_2, and NO_2. Only the Los Angeles-North Main Street station monitors $PM_{2.5}$. A summary of the data recorded at these stations is presented in Table 4-21.

Figure 4-21. Air Monitoring Areas



LEGEND:

Study Area

Los Angeles Monitoring Station

Hawthorne Monitoring Station

Air Monitoring Areas in Los Angeles County:

1. Central Los Angeles
2. Northwest Coastal
3. Southwest Coastal
4. South Coastal
5. Southeast Los Angeles County
6. West San Fernando Valley
7. East San Fernando Valley
8. West San Gabriel Valley
9. East San Gabriel Valley
10. Pomona/Walnut Valley (not shown)
11. South San Gabriel Valley
12. South Central Los Angeles
13. Santa Clarita Valley
15. San Gabriel Mountains

APPROX. SCALE

N

0 3.0 6.0 9.0 MILES

SOURCE: South Coast Air Quality Management District Air Monitoring Areas Map, 1999

Table 4-21. 2005 to 2007 Air Quality Summary for Study Area Monitoring Stations

Air Pollutant	Federal Standard Exceedance	Los Angeles-North Main Street			LAX-Hastings		
		2005	2006	2007	2005	2006	2007
Carbon Monoxide (CO)	Maximum 1-hr concentration (ppm) Days > 35 ppm (1-hr standard) Days > 9 ppm (8-hr standard)	4 0 0	3 0 0	3 0 0	3 0 0	3 0 0	3 0 0
Ozone (O_3)	Maximum 8-hr Concentration (ppm) Days > 0.075 ppm (8-hr standard)	0.098 1	0.079 0	0.102 4	0.076 0	0.066 0	0.074 0
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean (ppm) Exceed Standard (0.053 ppm Annual Arithmetic Mean)	0.028 No	0.029 No	0.030 No	0.013 No	0.016 No	0.014 No
Sulfur Dioxide (SO_2)	Maximum 24-hr Concentration (ppm) Days > 0.14 ppm (24-hr standard)	0.01 0	0.03 0	0.00 0	0.01 0	0.01 0	0.01 0
Suspended Particulate (PM_{10})	Maximum 24-hr concentration ($\mu g/m^3$) Days > 150 $\mu g/m^3$ (24-hr standard)	70 0	59 0	78 0	44 0	45 0	96 2
Suspended Particulate ($PM_{2.5}$)	Annual Arithmetic Mean Exceed Standard (15 $\mu g/m^3$ Annual Arithmetic Mean)	18.1 Yes	15.6 Yes	16.8 Yes	N/A N/A	N/A N/A	N/A N/A

N/A = Not Available; ppm = parts per million
Source: SCAQMD, http://www.aqmd.gov/smog/historicaldata.htm, 2008.

As Table 4-21 indicates, the eight-hour federal standard for O_3 was exceeded between one and four days at the Los Angeles-North Main Street monitoring station during the 2005 through 2007 period. During that same period, the eight-hour federal standard for O_3 was not exceeded at the LAX-Hastings monitoring station. Additionally, the 24-hour federal standard for PM_{10} was exceeded on two days in 2007 at the LAX-Hastings monitoring station.

The annual federal standard for $PM_{2.5}$ was exceeded each year from 2005 through 2007. CO, NO_2, and SO_2 did not exceed the federal standards at either monitoring station from 2005 to 2007.

Background Carbon Monoxide Concentrations

CO concentrations are typically used as an indicator of conformity with CAAQS because CO is the primary component of automobile exhaust (tailpipe emissions), and it does not readily react with other pollutants. In other words, operational air quality impacts associated with a project are generally best reflected through estimated changes in CO concentrations.

For purposes of this assessment, the ambient, or background, CO concentration is first established. SCAQMD defines the background level as the highest reading over the past three years. A review of data from the Los Angeles-North Main Street monitoring station for the 2005 to 2007 period indicates that the one- and eight-hour background concentrations are approximately 4 and 3.1 parts per million (ppm), respectively. Data

from the LAX-Hastings monitoring station for the 2005 to 2007 period indicates that the one- and eight-hour background concentrations are approximately 3 and 2.4 ppm, respectively. Accordingly, the existing one- and eight-hour background concentrations at both stations do not exceed the federal CO standard of 35 ppm and 9 ppm, respectively.

Carbon Monoxide Concentrations at Sensitive Receptor Locations

Some land uses are considered more sensitive to changes in air quality than others depending on the types of population groups and the activities involved. CARB has identified the following people as the most likely to be affected by air pollution: children less than 14 years of age, elderly over 65 years of age, athletes, and people with cardiovascular and chronic respiratory diseases. These groups are classified as sensitive receptors. Locations that may contain a high concentration of these sensitive population groups include hospitals, daycare facilities, elder care facilities, schools, and parks. Several of these types of land uses are located within the study area.

There is a direct relationship between traffic, circulation, congestion, and CO impacts since exhaust fumes from vehicular traffic are the primary source of CO. CO is a localized gas that dissipates very quickly under normal meteorological conditions. Therefore, CO concentrations decrease substantially as distance from the source increases. The highest CO concentrations are typically found along sidewalk locations directly adjacent to congested roadway intersections.

Existing CO concentrations adjacent to ten study intersections were modeled for daily conditions. The study intersections were selected to be representative of the project area and were based on traffic volume to capacity (V/C) ratio and the traffic level of service (LOS) as indicated in the traffic analysis.[7,8]

The selected intersections are as follows:

- Aviation Boulevard/Century Boulevard - AM Peak Hour
- Crenshaw Boulevard/Adams Boulevard - AM Peak Hour
- Crenshaw Boulevard/Jefferson Boulevard - PM Peak Hour
- Crenshaw Boulevard/Slauson Avenue - AM Peak Hour
- Crenshaw Boulevard/Stocker Street - PM Peak Hour
- Crenshaw Boulevard/Washington Boulevard - AM Peak Hour
- La Brea Avenue/Jefferson Boulevard - PM Peak Hour
- La Brea Avenue/Rodeo Road - PM Peak Hour
- La Brea Avenue/Slauson Avenue - PM Peak Hour
- Wilton Place/Wilshire Boulevard - AM Peak Hour

[7] Level of service is used to indicate the quality of traffic flow on roadway segments and at intersections. Level of service ranges from LOS A (free flow, little congestion) to LOS F (forced flow, extreme congestion).

[8] See Section 3.0 Transportation Impacts and Mitigation.

At each intersection, traffic-related CO contributions were added to background CO conditions. Traffic CO contributions were estimated using the USEPA CAL3QHC dispersion model, which utilizes traffic volume inputs and CARB EMFAC2007 emissions factors. Consistent with the California Department of Transportation (Caltrans) CO protocol, model receptors were located three meters (approximately ten feet) from each intersection corner. Existing traffic conditions at the study intersections are shown in Table 4-22. One-hour CO concentrations at the analyzed intersections are approximately 5 ppm and eight-hour CO concentrations range from approximately 3.6 to 3.9 ppm. Presently, none of the study intersections exceed the federal one- and eight-hour CO standards of 35 and 9 ppm, respectively.

Table 4-22. Existing Carbon Monoxide Concentrations /a/

Intersection	Parts per Million (ppm)	
	1-hour	8-hour
Aviation Blvd/Century Blvd - AM Peak Hour	5	3.8
Crenshaw Blvd/Adams Blvd - AM Peak Hour	5	3.9
Crenshaw Blvd/Jefferson Blvd - PM Peak Hour	5	3.9
Crenshaw Blvd/Slauson Ave - AM Peak Hour	5	3.8
Crenshaw Blvd/Stocker St - PM Peak Hour	5	3.9
Crenshaw Blvd/Washington Blvd - AM Peak Hour	5	3.8
La Brea Ave/Jefferson Blvd - PM Peak Hour	5	3.6
La Brea Ave/Rodeo Rd - PM Peak Hour	5	3.9
La Brea Ave/Slauson Ave - PM Peak Hour	5	3.9
Wilton Pl/Wilshire Blvd - AM Peak Hour	5	3.9

/a/ All concentrations include 2008 one- and eight-hour ambient concentrations of 4 and 3.1 ppm, respectively.
Source: TAHA, 2008.

Future Baseline Air Quality

Traffic volume is typically measured in vehicle miles traveled (VMT). Existing 2008 VMT in Los Angeles County is expected to increase by 14 percent in 2030. Overall, CO concentrations in 2030 are expected to be lower than existing conditions because of stringent state and federal mandates for lowering vehicle emissions. Although traffic volumes would be higher in the future both with and without the implementation of the proposed alternatives, CO emissions from vehicles are expected to be much lower as a result of technological advances in vehicle emissions systems, as well as from normal turnover in the vehicle fleet. In other words, increases in traffic volumes are expected to be offset by increases in cleaner-running cars as a percentage of the entire vehicle fleet on the road.

Air Quality Implications

As a result of the high volume of pollutant emissions within the SCAB, all proposed alternatives should be carefully analyzed because the region's air quality may be affected both on the project-specific and cumulative basis, when considered together with other known projects. Within the study area, the major sources of pollution are mobile sources that include major freeways such as the I-10 Freeway, I-405 Freeway, and I-105 Freeway.

There are no large contributors of stationary source emissions within the study area. The potential air quality effects will be addressed primarily at the proposed station areas where the majority of people, automobiles, buses, and commercial development would be concentrated. As a result, the air quality conditions adjacent to station areas will be most important since there are a large number of residential land uses located adjacent to the proposed stations throughout the study area. Table 4-23 lists the sensitive receptors that are located adjacent to the alignments. In addition, residential land uses are located adjacent to the alignment.

Table 4-23. Distribution of Adjacent Sensitive Receptors within Study Area

Sensitive Receptor /a/	Project Corridor
Educational Facility/b/	8
Church	28
Hospital/Convalescent Facility	4
Total	**40**

/a/ Sensitive receptors within 200 feet of the proposed alignment right-of-way.
/b/ Includes day care/pre-school, public school, private schools, and college/trade school.
Source: TAHA, 2008.

4.5.4 Environmental Impacts/Environmental Consequences

Operational emissions were based on vehicle miles traveled. Automobile emissions factors were obtained from the CARB's EMFAC2007 model. EMFAC2007 is the latest emission inventory model that calculates emission inventories and emission rates for motor vehicles operating on roads in California. This model reflects the CARB's current understanding of how vehicles travel and how much they pollute. The EMFAC2007 model can be used to show how California motor vehicle emissions have changed over time and are projected to change in the future. Compressed natural gas (CNG) bus emission factors were obtained from a list of the CARB's approved CNG engines. Emissions associated with light rail electricity use were based on an electricity usage rate provided by Metro. Localized CO emissions were calculated utilizing the USEPA's CAL3QHC dispersion model and the CARB's EMFAC2007 model. CAL3QHC is a model developed by the USEPA to predict CO and other pollutant concentrations from motor vehicles at roadway intersections. The model uses a traffic algorithm for estimating vehicular queue lengths at signalized intersections. GHG emissions were also calculated using emission rates from EMFAC2007 and the CARB.

An adverse impact would occur if criteria pollutant emissions exceed the thresholds listed in Table 4-24 when compared to the No Build Alternative. An adverse impact would also occur if pollutant concentrations exceed the NAAQS or release substantial amounts of toxic air contaminants, odors, or GHGs.

According to 40 CFR Part 93.102, conformity determinations are required for projects that require the approval, funding, or implementation of federally funded projects. The proposed project would be required to comply with USEPA Transportation Conformity Rule (40 CFR Part 93). The conformity decision is based upon guidance contained in the

Table 4-24. CFR 40 PART 51 – Federal Thresholds

Pollutant	Tons per Year
Carbon Monoxide	100
Nitrogen Oxides	10
Reactive Organic Gas	10
Particulate Matter	70

Source: USEPA, CFR 40 Part 51.

USEPA's *Transportation Conformity Guidance for Qualitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (March 2006).

4.5.4.1 Regional Operational Emissions

No Build Alternative

The No Build Alternative would not result in new operational activity and would not have an adverse regional operational air quality impact.

TSM Alternative

As shown in Table 4-25, the TSM Alternative would increase mobile source emissions when compared to baseline conditions by less than 1 Dayton per year (tpy) for ROG and 5 tpy for NO_X. The TSM Alternative would decrease mobile source emissions when compared to baseline conditions by 1 tpy for CO and less than 1 tpy for PM_{10}. Emissions associated with the TSM Alternative would not exceed the federal thresholds. The TSM Alternative would not result in an adverse regional operational air quality impact.

Table 4-25. Regional Operational Emissions - NEPA

Alternative	Scenario	Tons Per Year			
		ROG	NO_X	CO	PM_{10}
TSM	TSM Alternative vs. No Build Alternative	<1	5	(1)	(<1)
	Significance Thresholds	10	10	100	70
	Exceed Threshold?	No	No	No	No
BRT	BRT Alternative vs. No Build Alternative	(<1)	3	(36)	(<1)
	Significance Thresholds	10	10	100	70
	Exceed Threshold?	No	No	No	No
LRT	LRT Alternative vs. No Build Alternative	(<1)	12	(8)	<1
	Significance Thresholds	10	10	100	70
	Exceed Threshold?	No	Yes	No	No

Source: TAHA, 2008.

BRT Alternative

The BRT Alternative would reduce automobile VMT and increase bus VMT in the transportation system. As shown in Table 4-25, the BRT Alternative would increase mobile source emissions when compared to baseline conditions by 3 tpy for NO_X. This

increase is because buses emit more NO_X than passenger automobiles and the BRT Alternative increase in bus VMT is off-setting the reduction in passenger automobile VMT. The BRT Alternative would decrease mobile source emissions when compared to baseline conditions by less than 1 tpy for ROG, 36 tpy for CO, and less than 1 tpy for PM_{10}. Emissions associated with the BRT Alternative would not exceed the federal thresholds. The BRT Alternative would not result in an adverse regional operational air quality impact.

Base LRT Alternative

As shown in Table 4-25, the Base LRT Alternative would increase mobile source emissions when compared to baseline conditions by 12 tpy for NO_X and less than 1 tpy for PM_{10}. The Base LRT Alternative would decrease mobile source emissions when compared to baseline conditions by less than 1 tpy for ROG and 8 tpy for CO. NO_X emissions associated with the Base LRT Alternative would exceed the federal threshold. The exceedance in NO_X emissions would occur because VMT by the LRT would produce approximately 13 tpy of NO_X and the auto-related emissions would only be reduced by approximately 1 tpy based on VMT data. The Base LRT Alternative would result in an adverse regional operational air quality impact.

LRT Alternative Design Options

The LRT design options would improve or reduce the VMT and the regional operational emissions shown in Table 4-25, which were calculated based on VMT. Although the design options would improve regional emissions compared to the Base LRT Alternative, an adverse regional operational impact would remain.

4.5.4.2 Localized Carbon Monoxide Hotspots

CO concentrations in 2030 are expected to be lower than existing conditions due to stringent State and federal mandates for lowering vehicle emissions. Although traffic volumes would be higher in the future both without and with the implementation of the proposed project, CO emissions from mobile sources are expected to be much lower due to technological advances in vehicle emissions systems, as well as from normal turnover in the vehicle fleet. Accordingly, increases in traffic volumes would be offset by increases in cleaner-running cars as a percentage of the entire vehicle fleet on the road.

The federal one- and eight-hour CO standards may be exceeded at congested intersections with high traffic volumes. A representative sample of intersections was selected based on congested conditions with high traffic volumes. The selected intersections are as follows:

- Aviation Boulevard/Century Boulevard - AM Peak Hour
- Crenshaw Boulevard/Adams Boulevard - AM Peak Hour
- Crenshaw Boulevard/Jefferson Boulevard - PM Peak Hour
- Crenshaw Boulevard/Slauson Avenue - AM Peak Hour
- Crenshaw Boulevard/Stocker Street - PM Peak Hour
- Crenshaw Boulevard/Washington Boulevard - AM Peak Hour

- La Brea Avenue/Jefferson Boulevard - PM Peak Hour
- La Brea Avenue/Rodeo Road - PM Peak Hour
- La Brea Avenue/Slauson Avenue - PM Peak Hour
- Wilton Place/Wilshire Boulevard - AM Peak Hour

The USEPA CAL3QHC micro-scale dispersion model was used to calculate CO concentrations for 2030 conditions. Table 4-26 displays the CO concentrations associated with each alternative.

No Build Alternative
This alternative would not result in new operational activity and would not have an adverse localized operational air quality impact.

TSM Alternative
Under the TSM Alternative, one-hour CO concentrations would be approximately 2 ppm at worst-case sidewalk receptors. Eight-hour CO concentrations would range from approximately 1.2 to 1.4 ppm. The federal one- and eight-hour standards of 35 and 9 ppm, respectively, would not be exceeded at the study intersections. The TSM Alternative would not result in an adverse localized carbon monoxide impact.

BRT Alternative
Under the BRT Alternative, one-hour CO concentrations would be approximately 2 ppm at worst-case sidewalk receptors. Eight-hour CO concentrations would range from approximately 1.2 to 1.4 ppm. The federal one- and eight-hour standards of 35 and 9 ppm, respectively, would not be exceeded at the study intersections. The BRT Alternative would not result in an adverse localized carbon monoxide impact.

Base LRT Alternative
Under the Base LRT Alternative, one-hour CO concentrations would be approximately 2 ppm at worst-case sidewalk receptors. Eight-hour CO concentrations would range from approximately 1.2 to 1.4 ppm. The federal one- and eight-hour standards of 35 and 9 ppm, respectively, would not be exceeded at the study intersections. The Base LRT Alternative would not result in an adverse localized carbon monoxide impact.

LRT Alternative Design Options
As previously described, the LRT Alternative may include six design options. These design options would not substantially alter the peak hour turn volumes that were used to estimate the localized CO concentrations for the Base LRT Alternative. Similar to the Base LRT Alternative, one- and eight-hour CO concentrations would be approximately 2 and 1.4 ppm, respectively. The federal one- and eight-hour standards of 35 and 9 ppm, respectively, would not be exceeded at the study intersections. The design options would not result in an adverse localized carbon monoxide impact.

Table 4-26. 2030 Carbon Monoxide Concentrations /a/

Alternative and Intersection	1-Hour (Parts per Million)		8-Hour (Parts per Million)	
	Existing (2008)	Project Year (2030)	Existing (2008)	Project Year (2030)
No Build Alternative				
Aviation Blvd/Century Blvd - AM Peak Hour	5	2	3.8	1.4
Crenshaw Blvd/Adams Blvd - AM Peak Hour	5	2	3.9	1.4
Crenshaw Blvd/Jefferson Blvd - PM Peak Hour	5	2	3.9	1.3
Crenshaw Blvd/Slauson Ave - AM Peak Hour	5	2	3.8	1.3
Crenshaw Blvd/Stocker St - PM Peak Hour	5	2	3.9	1.4
Crenshaw Blvd/Washington Blvd - AM Peak Hour	5	2	3.8	1.4
La Brea Ave/Jefferson Blvd - PM Peak Hour	5	2	3.6	1.2
La Brea Ave/Rodeo Rd - PM Peak Hour	5	2	3.9	1.4
La Brea Ave/Slauson Ave - PM Peak Hour	5	2	3.9	1.4
Wilton Pl/Wilshire Blvd - AM Peak Hour	5	2	3.9	1.4
TSM Alternative				
Aviation Blvd/Century Blvd - AM Peak Hour	5	2	3.8	1.4
Crenshaw Blvd/Adams Blvd - AM Peak Hour	5	2	3.9	1.4
Crenshaw Blvd/Jefferson Blvd - PM Peak Hour	5	2	3.9	1.3
Crenshaw Blvd/Slauson Avenue - AM Peak Hour	5	2	3.8	1.3
Crenshaw Blvd/Stocker Street - PM Peak Hour	5	2	3.9	1.4
Crenshaw Blvd/Washington Blvd - AM Peak Hour	5	2	3.8	1.4
La Brea Ave/Jefferson Blvd - PM Peak Hour	5	2	3.6	1.2
La Brea Ave/Rodeo Rd - PM Peak Hour	5	2	3.9	1.4
La Brea Ave/Slauson Ave - PM Peak Hour	5	2	3.9	1.4
Wilton Pl/Wilshire Blvd - AM Peak Hour	5	2	3.9	1.4
BRT Alternative				
Aviation Blvd/Century Blvd - AM Peak Hour	5	2	3.8	1.4
Crenshaw Blvd/Adams Blvd - AM Peak Hour	5	2	3.9	1.4
Crenshaw Blvd/Jefferson Blvd - PM Peak Hour	5	2	3.9	1.3
Crenshaw Blvd/Slauson Ave - AM Peak Hour	5	2	3.8	1.3
Crenshaw Blvd/Stocker St - PM Peak Hour	5	2	3.9	1.4
Crenshaw Blvd/Washington Blvd - AM Peak Hour	5	2	3.8	1.4
La Brea Ave/Jefferson Blvd - PM Peak Hour	5	2	3.6	1.2
La Brea Ave/Rodeo Road - PM Peak Hour	5	2	3.9	1.4
La Brea Ave/Slauson Ave - PM Peak Hour	5	2	3.9	1.4
Wilton Pl/Wilshire Blvd - AM Peak Hour	5	2	3.9	1.4

/a/ Existing concentrations include year 2008 one- and eight-hour ambient concentrations of 4 and 3.1 ppm, respectively. Future concentrations include year 2030 one- and eight-hour ambient concentrations of 1.36 and 1.1 ppm, respectively.

Source: TAHA, 2008.

4.5.4.3 Toxic Air Contaminants

No Build Alternative

This alternative would not result in new operational activity and would not have an adverse TAC impact.

TSM Alternative

The FHWA has published guidance for analyzing mobile source air toxic (MSAT) emissions. This guidance is designed for analyzing highway projects and is not compatible with the TSM Alternative. MSAT (e.g., diesel particulate matter, benzene, formaldehyde, acetaldehyde, acrolein, and 1,3-butadiene) emissions are directly related to VMT. The TSM Alterative would reduce regional VMT and associated MSATs. Diesel particulate matter emissions would not increase because new buses would be powered by CNG engines and not diesel engines. The TSM Alternative would not result in an adverse TAC impact.

BRT Alternative

The BRT Alternative would also include the construction of maintenance and operations facility Sites. The BRT Alterative would reduce regional VMT and associated MSATs. Diesel particulate matter emissions would not increase because new buses would be powered by CNG engines and not diesel engines. The BRT Alternative would not result in an adverse TAC impact.

Base LRT Alternative

The Base LRT Alterative would reduce regional VMT and associated MSATs. The light rail would be electrically powered and would not emit diesel particulate matter. The Base LRT Alternative would not result in an adverse TAC impact.

LRT Alternative Design Options

Several of the design options are included to improve the traffic flow impacts that result from several of the at-grade crossings or alignments that were proposed under the Base LRT Alternative. Similar to the Base Alternative, these design options would not increase regional VMT and associated MSATs, and would not result in an adverse TAC impacts.

4.5.4.4 Odors

No Build Alternative

This alternative would not result in new operational activity and would not have an adverse odor impact.

TSM Alternative

Land uses and industrial operations that are associated with odor complaints include agricultural uses, wastewater treatment plants, food processing plants, chemical plants, composting, refineries, landfills, dairies and fiberglass molding. The TSM Alternative would not include any land use or activity that typically generates adverse odors and would not result in an adverse odor impact.

BRT Alternative

Land uses and industrial operations that are associated with odor complaints include agricultural uses, wastewater treatment plants, food processing plants, chemical plants,

composting, refineries, landfills, dairies and fiberglass molding. The BRT Alternative would not include any land use or activity that typically generates adverse odors and would not result in an adverse odor impact.

Base LRT Alternative

Land uses and industrial operations that are associated with odor complaints include agricultural uses, wastewater treatment plants, food processing plants, chemical plants, composting, refineries, landfills, dairies and fiberglass molding. The Base LRT Alternative would not include any land use or activity that typically generates adverse odors and would not result in an adverse odor impact.

LRT Alternative Design Options

As previously mentioned, the LRT Alternative may include six design options. Land uses and industrial operations that are associated with odor complaints include agricultural uses, wastewater treatment plants, food processing plants, chemical plants, composting, refineries, landfills, dairies and fiberglass molding. Similar to the Base Alternative, these design options would not include land uses typically associated with odor complaints, and would not result in adverse odor impacts.

4.5.4.5 Global Warming and Greenhouse Gases

No Build Alternative

This alternative would not increase GHG emissions. This alternative would not result in new operational activity and would not have an adverse global warming impact.

TSM Alternative

As shown in Table 4-27, the TSM Alternative would decrease GHG emissions compared to baseline conditions by 2,275 tons per year. The TSM Alternative would result in less GHG emissions than baseline conditions and, as such, would result in a beneficial effect on global warming impacts.

Table 4-27. Estimated GHG Emissions

Scenario	Carbon Dioxide Equivalent (Tons per Year) /a/
TSM Alternative vs. No Build Alternative	(2,275)
BRT Alternative vs. No Build Alternative	(23,053)
LRT Alternative vs. No Build Alternative	3,249

/a/ Bus emissions were included from CNG-fueled vehicles.
Source: TAHA, 2008.

BRT Alternative

The BRT Alternative would be consistent with SB 375. As discussed in Section 4.1, Land Use and Development, new stations would potentially lead to transit oriented development along the alignment. Transit oriented development would encourage the use of the light rail system. As shown in Table 4-27, the BRT Alternative would decrease GHG emissions compared to baseline conditions by 23,053 tons per year. The BRT Alternative would result in less GHG emissions than baseline conditions and, as such, would result in a beneficial effect on global warming impacts.

Base LRT Alternative

The Base LRT Alternative would be consistent with SB 375. As discussed in Section 4.1, Land Use and Development, new stations would potentially lead to transit oriented development along the alignment. Transit oriented development would encourage the use of the light rail system. As shown in Table 4-27, the Base LRT Alternative would increase GHG emissions compared to baseline conditions by 3,249 tons per year. This increase is because buses emit more NO_X than passenger automobiles and the Base LRT Alternative increase in VMT is off-setting the reduction in passenger automobile VMT.

LRT Alternative Design Options

Several of the design options are included to improve the traffic flow impacts that result from several of the at-grade crossings or alignments that were proposed under the Base LRT Alternative. Therefore, these design options would not increase the VMT and GHG emissions shown in Table 4-27, which were calculated based on VMT. Although the design options would improve regional emissions compared to the Base LRT Alternative, the design options would increase GHG emissions compared to baseline conditions because the reduction in passenger automobile VMT would not offset the increase in bus VMT from feeder buses serving the LRT stations that would occur under the design options.

4.5.4.6 Transportation Conformity

The CAAA requires that all transportation plans and programs pass the air quality conformity test. This process involves forecasting future emissions of air pollution to determine whether the amount of future pollution resulting from the plan or program would be within the allowable limit for motor vehicle emissions. Projects must demonstrate conformity on a regional and project level.

Regional conformity is demonstrated by showing that the project is included in the relevant Regional Transportation Plan with substantially the same design concept and scope that was used for the regional conformity analysis. The project is included in Metro's current LRTP and in the SCAG's 2008 RTP. The same design concept and scope that was used for the regional conformity analysis is not substantially changed. The project would be consistent with regional conformity guidance.

Project level conformity is demonstrated by showing that it will not cause localized exceedances of CO, $PM_{2.5}$, and/or PM_{10} standards. Based on guidance contained in a report prepared for the FHWA, a project may be screened out of the project-level analysis if the "build" VMT is less than or equal to the "no build" VMT.

TSM Alternative

The TSM Alternative would result in 24,847 less VMT than the No Build Alternative. Based on the FHWA guidance, the TSM Alternative would not result in any localized exceedances of CO, $PM_{2.5}$, and/or PM_{10} standards and would be consistent with project-level conformity guidance.

BRT Alternative

The BRT Alternative would result in 121,829 less VMT than the No Build Alternative. Based on the FHWA guidance, the BRT Alternative would not result in any localized

exceedances of CO, $PM_{2.5}$, and/or PM_{10} standards and would be consistent with project-level conformity guidance.

Base LRT Alternative

The Base LRT Alternative would result in 23,078 less VMT than the No Build Alternative. The proposed project would not result in any localized exceedances of CO, $PM_{2.5}$, and/or PM_{10} standards and would be consistent with project-level conformity guidance.

LRT Alternative Design Options

As previously mentioned, the LRT Alternative may include six design options. These design options would not increase the VMT that was calculated for the Base LRT Alternative because the design options are intended to improve traffic flow. Therefore, similar to the Base LRT Alternative, the design options would be consistent with project-level conformity guidance.

4.5.5 Mitigation Measures

The Base LRT Alternative would result in NO_X emissions that exceed the federal threshold and would increase GHG emissions. There are no feasible mitigation measures that would reduce the significant emissions to insignificant levels.

4.5.6 CEQA Determination

The above analysis demonstrated compliance with the National Environmental Quality Act. The following analysis demonstrates compliance with the California Environmental Quality Act. The analysis is based on guidance provided by the SCAQMD.

No Build Alternative

This alternative would not result in new operational activity. Regional emissions, localized CO concentrations, TACs, odors, and GHG emissions would result in less-than-significant impacts.

TSM Alternative

As shown in Table 4-28, emissions associated with the TSM Alternative would not exceed the SCAQMD thresholds. The TSM Alternative would result in a less-than-significant regional operational air quality impact.

Localized CO concentrations for the TSM Alternative are shown in Table 4-28. The maximum one- and eight-hour CO concentrations would be 2 ppm and 1.4 ppm, respectively. These concentrations would be below the one- and eight-hour state standards of 20 and 9.0 ppm, respectively. The TSM Alternative would result in a less-than-significant localized operational air quality impact. Similar to the NEPA analysis presented above, TACs, odors, and GHG emissions would result in less-than-significant impacts.

Table 4-28. Regional Operational Emissions - CEQA

Alternative	Scenario	Pounds per Day				
		ROG	NO_x	CO	$PM_{2.5}$	PM_{10}
TSM Alternative	TSM Alternative vs. No Build Alternative	3	27	(5)	(<1)	(<1)
	Significance Thresholds	55	55	550	55	150
	Exceed Threshold?	No	No	No	No	No
BRT Alternative	BRT Alternative vs. No Build Alternative	(2)	18	(199)	(3)	(4)
	Significance Thresholds	55	55	550	55	150
	Exceed Threshold?	No	No	No	No	No
Base LRT Alternative	LRT Alternative vs. No Build Alternative	(1)	67	(43)	(2)	(2)
	Significance Thresholds	55	55	550	55	150
	Exceed Threshold?	No	Yes	No	No	No

Source: TAHA, 2008

BRT Alternative

As shown in Table 4-28, emissions associated with the Base LRT Alternative would exceed the SCAQMD threshold for NO_x. The exceedance in NOx emissions would occur because VMT by the LRT would produce approximately 67 ppd of NOx and the auto-related emissions would only be reduced by approximately 4 ppd based on VMT data. The Base LRT Alternative would result in a significant regional operational air quality impact.

Localized CO concentrations for the BRT Alternative are shown in Table 4-28. The maximum one- and eight-hour CO concentrations would be 2 ppm and 1.4 ppm, respectively. These concentrations would be below the one- and eight-hour State standards of 20 and 9.0 ppm, respectively. The BRT Alternative would result in a less-than-significant localized operational air quality impact. Similar to the NEPA analysis presented above, TACs, odors, and GHG emissions would result in less-than-significant impacts.

Base LRT Alternative

As shown in Table 4-28, emissions associated with the Base LRT Alternative would exceed the SCAQMD threshold for NO_x. This increase is because buses emit more NO_x than passenger automobiles and the Base LRT Alternative increase in bus VMT is off-setting the reduction in passenger automobile VMT. The Base LRT Alternative would result in a significant regional operational air quality impact.

Localized CO concentrations for the LRT Alternative are shown in Table 4-28. The maximum one- and eight-hour CO concentrations would be 2 ppm and 1.4 ppm, respectively. These concentrations would be below the one- and eight-hour State standards of 20 and 9.0 ppm, respectively. The LRT Alternative would result in a less-than-significant localized operational air quality impact. Similar to the NEPA analysis presented above, TACs, odors, and GHG emissions would result in less-than-significant impacts.

LRT Alternative Design Options

As previously mentioned, the LRT Alternative may include six design options. These design options would not increase the VMT that was calculated for the Base LRT Alternative. Each of the design options are intended to improve traffic conditions. Although traffic conditions may improve with the design options, regional air quality impacts would remain. Therefore, similar to the Base LRT Alternative, the design options would result in a significant regional air quality impact but would result in a less-than-significant impact regarding TACs, odors, and GHG emissions.

4.5.7 Impacts Remaining After Mitigation

The Base LRT Alternative would result in significant impacts related to NO_x emissions. There are no feasible mitigation measures that would reduce these emissions. Therefore, an unavoidable significant operational air quality impact is anticipated.

4.6 Noise and Vibration

This section addresses the regulatory requirements for noise analysis and impacts evaluation, discusses vibration-sensitive land uses and the existing noise environment, and evaluates existing noise levels at noise sensitive receptors and land uses located in the study area. Ambient vibration levels were not measured as part of this study. FTA Vibration Impact Criteria were used to identify locations where potential impacts to existing land use activities may occur based on potential noise levels from operation. If necessary, these locations will be surveyed for ambient vibration levels at a later time as part of the final engineering and design phase of the project. Noise and vibration impacts resulting from construction are discussed in Section 4.15 Construction Impacts.

Information in this section is based primarily on the following sources:

- Transit Noise and Vibration Impact Assessment (FTA, 2006)
- Field data collected in January and February 2008

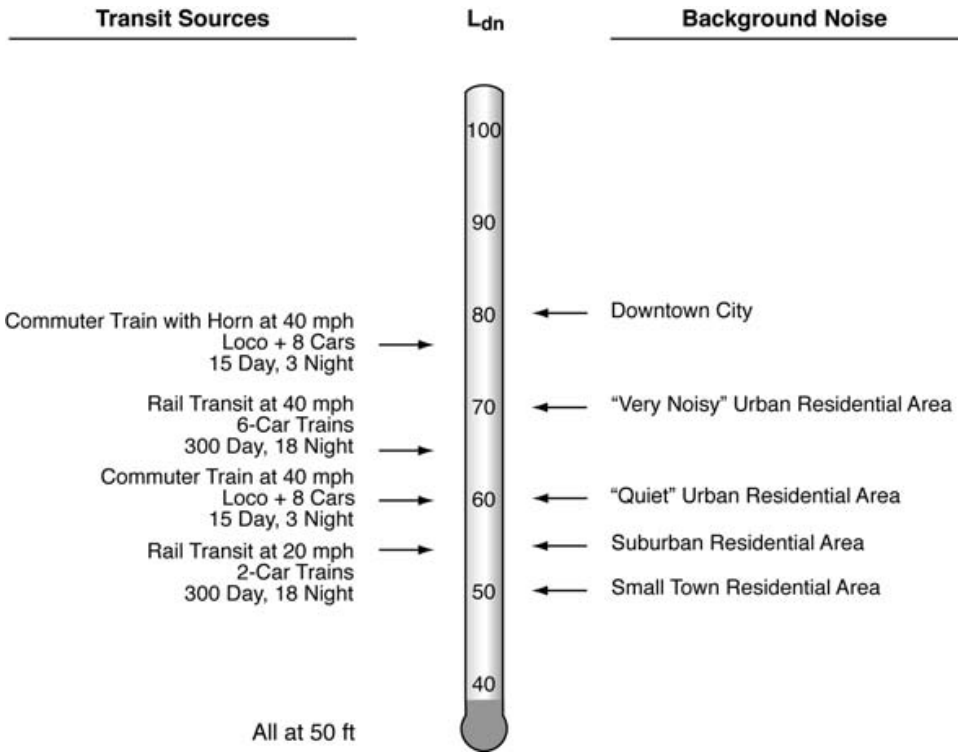
4.6.1 Definitions

4.6.1.1 Measuring Noise Levels

Sound levels are expressed on a logarithmic scale of decibels (abbreviated as dB), in which a change of 10 units on the decibel scale reflects a 10-fold increase in sound energy. A 10-fold increase in sound energy roughly translates to a doubling of perceived loudness. In evaluating human response to noise, acousticians compensate for people's response to varying frequency or pitch components of sound. The human ear is most sensitive to sounds in the middle frequency range used for human speech, and is less sensitive to lower and higher-pitched sounds. The "A" weighted scale is used to account for this sensitivity. Thus, most community noise standards are expressed in dB on the "A"-weighted scale, abbreviated dBA. Zero on the decibel scale is set roughly at the threshold of human hearing. The most commonly used noise metric is equivalent noise level (L_{eq}.) which represents the energy sum of all the sound that occurs during a measurement time period.

The community noise environment consists of wide varieties of sounds, some near and some far away, which vary over the 24-hour day. People respond to the 24-hour variation in noise but are most sensitive to noise at night. Thus, this section focuses on the metric known as day/night noise level (L_{dn}), which represents the average noise level over a 24-hour period. L_{dn} is a 24-hour L_{eq}, but with a 10-dB penalty assessed to noise events occurring at night between 10:00 p.m. and 7:00 a.m. The effect of this penalty is that, in the calculation of L_{dn}, any noise event during nighttime hours is equivalent to ten noise events during the daytime hours. This strongly weights L_{dn} toward nighttime noise to reflect most people being more easily annoyed by noise during the nighttime hours when background noise is lower and most people are sleeping. A rural area with no major roads nearby would have an average L_{dn} around 50 dBA; a noisy residential area close to major arterial streets would average 70 dBA. Figure 4-22 illustrates typical L_{dn} values for rural and urban areas.

Figure 4-22. Typical L_{dn} Values



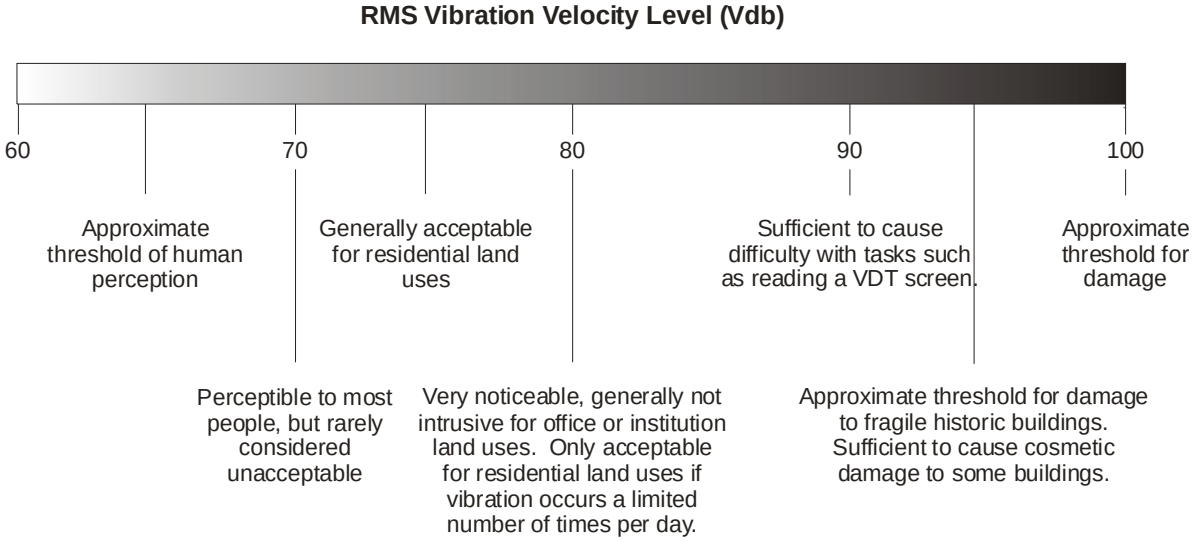
Source: Guidance Manual for Transit Noise and Vibration Impact Assessment, FTA, May 2006.

4.6.1.2 Ground-Borne Vibration

Ground-borne vibration is different from air-borne noise, as it is not a widespread environmental problem and it is generally limited to localized areas near roadways, rail systems, construction sites, and some industrial operations. Automobile and truck traffic rarely create perceptible ground-borne vibration, except when there are bumps, potholes, or other discontinuities in the roadway surface. When traffic causes phenomena, such as the rattling of windows, the cause is more likely to be air-borne vibration rather than ground-borne vibration. The unusual situations where traffic or other existing sources cause intrusive vibration may be an indication of geologic or soil conditions that would result in higher than normal levels of train vibration.

Existing background building vibration usually ranges from between 40 and 50 Vibration Velocity Levels (VdB), which is well below the range of human perception (Figure 4-23). Although the perceptibility threshold is approximately 65 VdB, human response to vibration is not usually significant unless the Root Mean Square (RMS) vibration velocity level exceeds 70 VdB (Guidance Manual for Transit Noise and Vibration Impact Assessment, FTA, May 2006). This is a typical level of vibration noticed 50 feet from a rapid or light-rail transit system. Buses and trucks rarely create vibration that exceeds 70 VdB, unless there are large bumps or potholes in the road.

Figure 4-23. Typical Levels of Ground-Borne Vibration



Source: Guidance Manual for Transit Noise and Vibration Impact Assessment, FTA, May 2006.

4.6.2 Regulatory Framework

The transit operations would be subject to FTA noise and vibration criteria. Project construction would be subject to the noise ordinances of the local jurisdictions of the Cities of Los Angeles, Inglewood, Hawthorne, El Segundo, and the County of Los Angeles.

Federal

FTA Noise Impact Criteria

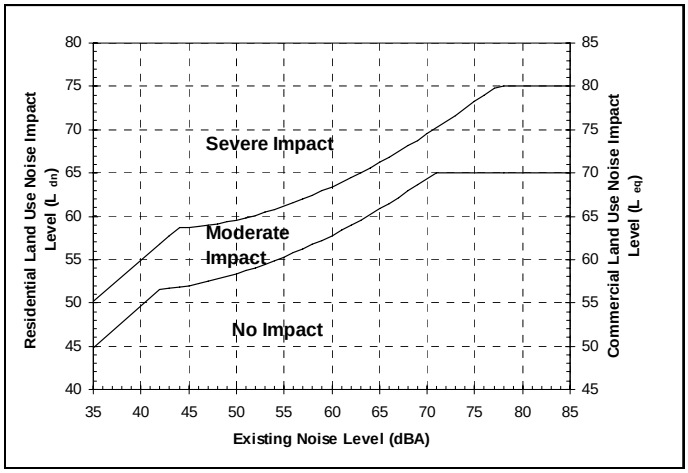
FTA has developed standards and criteria for assessing noise impacts related to transit projects. These standards, outlined in Transit Noise and Vibration Impact Assessment (FTA, 2006), are based on community reactions to noise. The criteria reflect changes in noise exposure using a sliding scale where the higher the level of existing noise, the smaller increase in total noise exposure is allowed. Some land use activities are more sensitive to noise than others, such as parks, churches, and residences, as compared to industrial and commercial uses. Non-sensitive uses do not require noise impact assessment. The FTA Noise Impact Criteria groups sensitive land uses into the following three categories:

- **Category 1** – *Buildings or parks where quiet is an essential element of their purpose*
- **Category 2** – *Residences and buildings where people normally sleep. This includes residences, hospitals, and hotels, where nighttime sensitivity is assumed to be of utmost importance*
- **Category 3** – *Institutional land uses with primarily daytime use that depends on quiet as an important part of operations, including schools, libraries, and churches*

L_{dn} is used to characterize noise exposure for residential areas (Category 2), and a maximum 1-hour L_{eq} (during the period that the facility is in use) is utilized for other noise-sensitive land uses such as school buildings (Categories 1 and 3).

The following two impact levels are included in the FTA criteria, as shown in Figure 4-24: It is Metro's policy to mitigate only severe impacts.

Figure 4-24. Noise Impact Criteria for Transit Projects



Source: Transit Noise and Vibration Impact Assessment, FTA, May 2006

- Moderate Impact – In this range, other project-specific factors must be considered to determine the magnitude of the impact and the need for mitigation. These other factors may include the predicted increase over existing noise levels, the type and number of noise-sensitive land uses affected, existing outdoor-indoor sound insulation, and the cost effectiveness of mitigating noise to more acceptable levels.
- Severe Impact – Noise mitigation will be specified for severe impact areas unless there is no practical method of mitigating the noise.

The noise impact criteria for transit operations are summarized in Table 4-29.

The first column shows the existing noise exposure and the remaining columns show the additional noise exposure caused by a rail project that would result in the two impact levels. As the existing noise exposure increases, the amount of allowable increase in noise exposure from the project alternatives decreases. The future noise exposure would be the combination of the existing noise exposure and the additional noise exposure caused by a rail project.

FTA Vibration Impact Criteria

FTA has developed impact criteria for acceptable levels of ground-borne noise and vibration (May 2006). Table 4-30 summarizes the FTA impact criteria for ground-borne vibration. These criteria are based on previous standards, criteria, and design goals, including noise and vibration guidelines from American National Standards Institute (ANSI) S3.29 (Acoustical Society of America, 1983) and the American Public Transit Association (American Public Transportation Association [APTA], 1981). Some buildings (e.g., concert halls, television and recording studios, and theaters) can be very sensitive to vibration, but do not fit into any of the three FTA sensitive land use categories previously described. Because of these buildings' sensitivity to vibration, they usually warrant special attention during the environmental review of a rail project. Table 4-31 lists criteria for acceptable levels of ground-borne vibration for various types of special buildings.

Table 4-29. FTA Noise Impact Criteria

Existing Noise Exposure L_{eq} or L_{dn} [1]	Noise Exposure Impact Thresholds for Transit Projects – L_{dn} or L_{eq} [1] (all noise levels in dBA)			
	Category 1 or 2 Sites		Category 3 Sites	
	Moderate Impact	Severe Impact	Moderate Impact	Severe Impact
<43	Ambient+10	Ambient+15	Ambient+15	Ambient+20
43-44	52	58	57	63
45	52	58	57	63
46-47	53	59	58	64
48	53	59	58	64
49-50	54	59	59	64
51	54	60	59	65
52-53	55	60	60	65
54	55	61	60	66
55	56	61	61	66
56	56	62	61	67
57-58	57	62	62	67
59-60	58	63	63	68
61-62	59	64	64	69
63	60	65	65	70
64	61	65	66	70
65	61	66	66	71
66	62	67	67	72
67	63	67	68	72
68	63	68	68	73
69	64	69	69	74
70	65	69	70	74
71	66	70	71	75
72-73	66	71	71	76
74	66	72	71	77
75	66	73	71	78
76-77	66	74	71	79
>77	66	75	71	80

Source: Transit Noise and Vibration Impact Assessment, FTA, May 2006.
Note: [1] L_{dn} is used for land uses where nighttime sensitivity is a factor. Daytime L_{eq} is used for land use involving only daytime activities.

Table 4-30. FTA Ground-Borne Vibration Impact Criteria

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 Micro-inch/sec)		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1: Buildings where vibration would interfere with interior operations	65 VdB[4]	65 VdB[4]	65 VdB[4]
Category 2: Residences and buildings where people normally sleep	72 VdB	75 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use	75 VdB	78 VdB	83 VdB

Source: Transit Noise and Vibration Impact Assessment (FTA, May 2006)
Notes: [1] "Frequent Events" are defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.
[2] "Occasional Events" are defined as between 30 and 70 vibration events of the same source per day. Most commuter rail lines have this many events.
[3] "Infrequent Events" are defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.
[4] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment, such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

Table 4-31. FTA Ground-Borne Vibration Impact Criteria for Special Buildings

Type of Building or Room	Ground-Borne Vibration Impact Levels (VdB re 11 micro-inch/sec)	
	Frequent Events[1]	Occasional or Infrequent Events[2]
Concert Halls	65 VdB	65 VdB
Television Studios	65 VdB	65 VdB
Recording Studios	65 VdB	65 VdB
Auditorium	72 VdB	80 VdB
Theaters	72 VdB	80 VdB

Source: Transit Noise and Vibration Impact Assessment (FTA, May 2006)
Notes: [1] "Frequent Events" are defined as more than 70 vibration events per day.
[2] "Infrequent Events" are defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.

State Noise and Vibration Impact Criteria

The State of California uses the impact criteria developed by the FTA and Federal Railway Administration (FRA) to determine acceptable levels of noise and ground-borne vibration.

The California Public Utilities Commission regulates train operational warning devices. California Public Utilities Code Section 7604 states that a bell, siren, horn, whistle, or similar audible warning device should be sounded at any public crossing. Section 7604

generally references Section 222 of Title 49 of the Code of Federal Regulations and states that warning devices should comply with the federal regulations. Title 49 states that the locomotive horn on the lead cab car shall be sounded when the lead cab car is approaching a public highway-rail grade crossing. The sounding should include two long blasts, one short blast, and one long blast.

The California Public Utilities Commission (CPUC) has jurisdiction over the operation of light rail transit systems. CPUC regulations require the use of audible warning devices, including on-vehicle audible warnings and crossing bells, at all grade crossings that are protected by crossing gates. Regarding crossing bells, Section 9.5 of CPUC General Order 75-D specifies that: "Bells or other audible warning devices shall be included in all automatic warning device assemblies (except as provided in Section 10) and shall be operated in conjunction with the flashing light signals. See American Railway Engineering and Maintenance of Way Association's *Communications and Signals Manual of Recommended Practices* (AREMA) for reference."[9] The General Order does not specify a sound level for the bell. Sections 3-2.60 and 3-2.61 of the AREMA manual state that omni-directional crossing bells should generate a sound level between 75 dBA and 105 dBA at a distance of 10 feet from the bell.

The FRA regulates train horn noise. The FRA requires that train horns provide a minimum of 96 and maximum of 110 dBA when measured 100 feet in front of the train in its direction of travel. The typical train horn produces a noise level of 105 dBA at 100 feet.

Wayside horns are a viable alternative to locomotive horns for audible warning at grade crossings. Wayside horns are mounted on poles at the crossing, have a more focused radiation pattern, and produce less community noise exposure. The FRA requires that wayside horns provide a minimum of 92 and maximum of 110 dBA when measured 100 feet from the centerline of the nearest track. The typical wayside horn produces a noise level of 97 dBA at 100 feet. The single greatest difference between wayside and train horns is that wayside horn noise is constant while train horn noise increases as the train approaches.

The CPUC has the final decision in designing grade crossing and implementing warning systems. Intersections with grade crossings must be designed to meet the CPUC regulations and the FRA warning standards. The CPUC considers each intersection during the final design process and works with the lead agency to install warning devices where necessary and wayside horns where appropriate

Local Noise and Vibration Impact Criteria

City of Los Angeles

The noise ordinance for the City of Los Angeles does not apply to "any vehicle which is operated upon any public highway, street or right-of-way" Section 114.02(a). Section 41.40 of the Los Angeles Municipal Code states that engaging in construction, repair, or

[9]Section 10 states that, "Warning devices may be installed on raised island medians. At at-grade crossings where warning devices are installed on the right-hand side of traffic flow, backlights or audible warning devices are not required on median-mounted warning devices."

excavation work with any construction type device or job-site delivering of construction materials without a Police Commission approved variance would constitute a violation:

- Between the hours of 9:00 p.m. and 7:00 a.m.
- In any residential zone, or within 500 feet of land so occupied, before 8:00 a.m. or after 6:00 p.m. on any Saturday, or at any time on any Sunday
- In a manner as to disturb the peace and quiet of neighboring residents or any reasonable person of normal sensitiveness residing in the area

However, Subsection (j) of Section 41.40 states that the noise standards do not apply to major public works construction by the City of Los Angeles and its proprietary Departments, including all structures and operations necessary to regulate or direct traffic due to construction activities. It also states that the Board of Police Commissioners will grant a variance for this work and construction activities will be subject to all conditions of the variance as granted. Concurrent with the request for a variance, the City Department that will conduct the construction work will notify each affected Council district office and established Neighborhood Council of projects where proposed Sunday and/or Holiday work will occur.

City of Inglewood

The City of Inglewood Municipal Code has no regulations that apply to the operation of transit vehicles. However, Section 5-43 makes it "unlawful for any person to operate any motor driven vehicle within the City that, due to the nature of the operation of the vehicle or due to the operation condition of the vehicle, or due to modifications made to the vehicle, generates noise so that a reasonable person is caused discomfort or annoyance" (Ordinance 88-29 9-13-88).

Construction noise is regulated by Section 5-41 of the Municipal Code, which states: "It shall be unlawful for any person within a residential zone, or within a radius of 500 feet there from, to operate equipment or perform any outside construction or repair work on buildings, structures, or projects or to operate any pile driver, pneumatic hammer, derrick, excavation or earth moving equipment, or other construction equipment between the hours of 8:00 p.m. and 7:00 a.m. of the next day in such a manner that a reasonable person residing in the area is caused discomfort or annoyance, unless beforehand a permit therefore has been obtained by the Permits and Licenses Committee of the City" (Ordinance 88-29 9-13-88).

City of El Segundo

The Municipal Code for the City of El Segundo, in Section 7-2-10: Exemptions, states: "The following activities shall be exempted from provisions of this Chapter:"

- "D. Construction Noise: Noise sources associated with or vibration created by construction, repair, or remodeling of any real property, provided said activities do not take place between the hours of 6:00 p.m. and 7:00 a.m. Monday through Saturday, or any time Sunday or a Federal holiday, and provided the noise level created by such activities does not exceed the noise standard of 65 dBA plus the limits specified in subsection 7-2-4C of this Chapter as measured on the receptor residential

property line and provided any vibration created does not endanger the public health, welfare and safety"

- "F. Activities Preempted By State or Federal law: Any activity to the extent regulation thereof has been preempted by State or Federal law, including, but not limited to, aircraft, motor vehicles, railroads and other interstate carriers" (Ordinance 1242, 1-16-1996)."

County of Los Angeles

The Noise Control Ordinance of the County of Los Angeles, Section 12.08.440, Construction Noise, prohibits the operation of any tools or equipment used in construction, drilling, repair, alteration, or demolition work between weekday hours of 7:00 p.m. and 7:00 a.m. or at any time on Sundays or holidays, such that the sound there from creates a noise disturbance across a residential or commercial real-property line, except for emergency work of public service utilities or by variance issued by the health officer. The ordinance also provides noise restrictions for mobile and stationary (periods of 10 days or more) construction activities during the daytime hours of 7:00 a.m. to 8:00 p.m. (Table 4-32). At business structures, mobile equipment is restricted to a maximum noise level of 85 dBA for nonscheduled, intermittent, short-term operation of mobile equipment for all hours during daily operation, including Sunday and legal holidays.

Table 4-32. County of Los Angeles Mobile and Stationary Noise Restrictions

Mobile Equipment	Single-Family Residential	Multi-Family Residential	Semi-Residential/ Commercial
Daily, except Sundays and legal holidays, 7:00 a.m. to 8:00 p.m.	75 dBA	80 dBA	85 dBA
Daily, 8:00 p.m. to 7:00 a.m. and all day Sunday and legal holidays	60 dBA	64 dBA	70 dBA
Stationary Equipment			
Daily, except Sundays and legal holidays, 7:00 a.m. to 8:00 p.m.	60 dBA	65 dBA	70 dBA
Daily, 8:00 p.m. to 7:00 a.m. and all day Sunday and legal holidays	50 dBA	55 dBA	60 dBA

Source: County of Los Angeles Noise Control Ordinance.

4.6.3 Existing Conditions/Affected Environment

4.6.3.1 General Setting

Prior to performing an analysis of the future noise and vibration levels, it is necessary to establish the existing baseline noise levels within the study area. This is accomplished by performing a series of measurements at representative noise-sensitive locations along the proposed alignments. The following section provides details about the existing noise levels used to establish the baseline conditions. Ambient vibration levels were not measured as part of this study. FTA Vibration Impact Criteria were used to identify locations where potential impacts may occur based on existing land use activities. If

necessary, these locations will be surveyed for ambient vibration levels at a later time as part of the final engineering and design phase of the project.

The overall study area is an urban environment with existing noise levels generated primarily by freeway traffic, local street traffic, and aircraft overflights. Ten 24-hour noise measurements and five short-term (15-minute) noise measurements were taken at 15 noise-sensitive locations within the study area. These locations were deemed to be representative of all noise-sensitive land uses within the study area. The noise-sensitive land uses and noise measurement locations are shown in Figure 4-25 through Figure 4-27, and measured noise levels are presented in Table 4-33.

Wilshire Avenue to Exposition Boulevard

The project area between Wilshire Avenue and Exposition Boulevard includes a mix of residential neighborhoods (Category 2) along small local streets and large commercial areas along the major streets, with the exception of Crenshaw Boulevard, which includes a mix of commercial and residential (Category 2) land uses.

Noise measurements taken along Crenshaw Boulevard (Figure 4-25, show that the existing peak hour L_{eq} noise levels range from 72 dBA to 77 dBA and the L_{dn} noise levels range from 73 to 78 dBA (Table 4-33). Traffic on Crenshaw Boulevard is the primary source of noise in this segment of the alignment.

Exposition Boulevard to the Harbor Subdivision Railroad

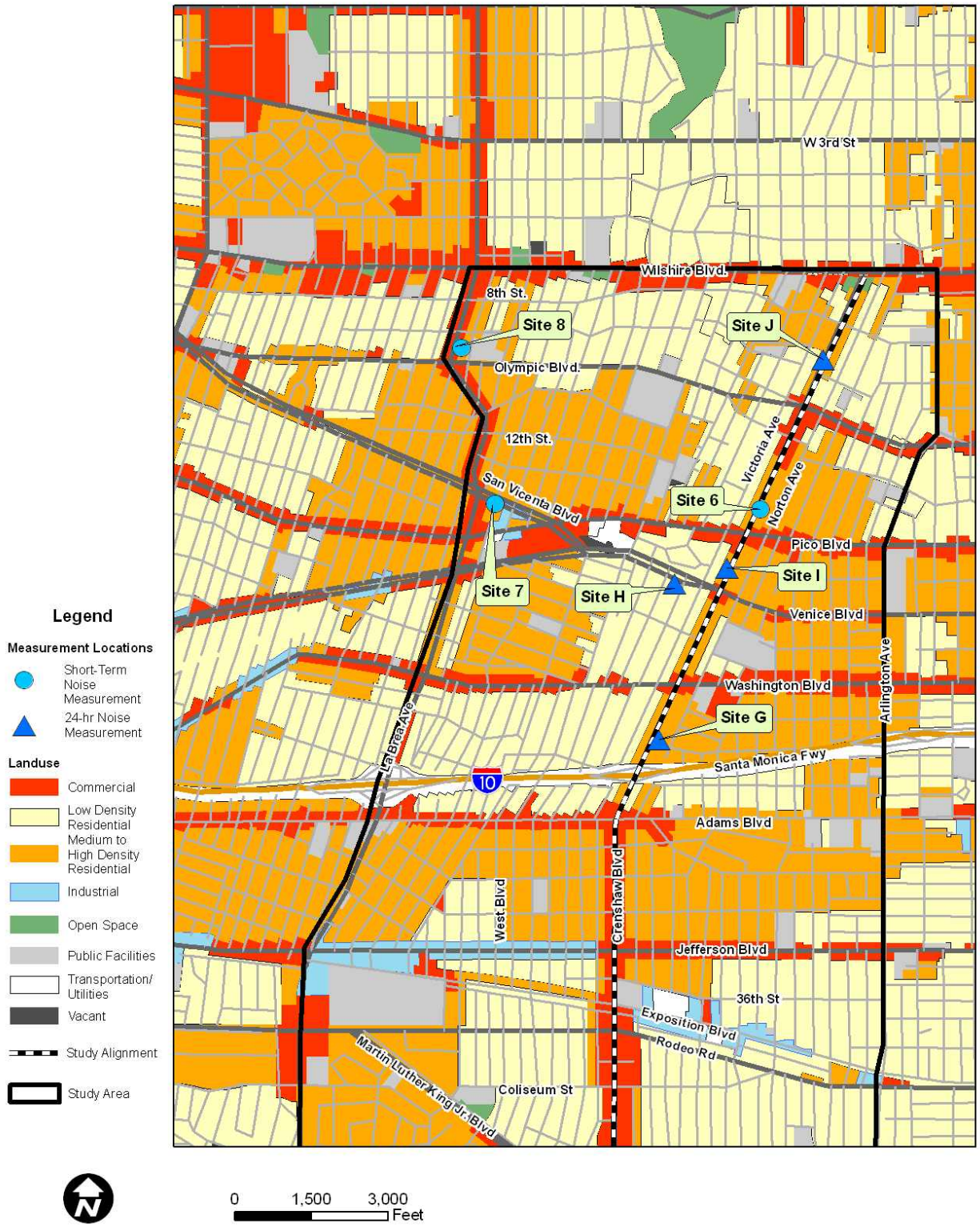
The project area between Exposition Boulevard and the Harbor Subdivision Railroad includes commercial uses along Crenshaw Boulevard. These commercial uses shield the residential uses (Category 2) behind them from the noise along Crenshaw Boulevard. Along Crenshaw Boulevard, the commercial uses extend from Exposition Boulevard to West 39th Street (Figure 4-26). From West 39th to Brynhurst Avenue, the land uses along Crenshaw Boulevard are primarily commercial, with the exception of Leimert Park (Category 3) and apartment buildings (Category 2), located at the intersection of West 39th Street and Crenshaw Boulevard (Figure 4-26). Crenshaw Boulevard from Brynhurst Avenue south to the Harbor Subdivision is a mix of residential (Category 2), schools (Category 3), churches (Category 3), motels (Category 2), and commercial uses.

Noise measurements taken along Crenshaw Boulevard (Figure 4-26), show that the existing peak hour L_{eq} noise levels range from 70 dBA to 75 dBA and the L_{dn} noise levels range from 72 to 77 dBA (Table 4-33). Traffic on Crenshaw Boulevard is the primary source of noise.

The Harbor Subdivision Railroad to Interstate 105 Freeway

The project area between the Harbor Subdivision Railroad and the I-105 Freeway consists primarily of commercial uses, with some pockets of noise sensitive uses located along the proposed alignments (Figure 4-27). Noise sensitive uses, including a cemetery (Category 3), a church (Category 3), a park (Category 3) and residential buildings (Category 2), are located along the Harbor Subdivision and Florence Avenue, between Crenshaw Boulevard and La Brea Avenue. Noise measurements taken in this area show that the peak hour L_{eq} noise levels range from 60 to 68 dBA and the L_{dn} noise level is 69 dBA. The major sources of noise in this

Figure 4-25. Wilshire Avenue to Exposition Boulevard - Noise Sensitive Land Uses and Measurement Locations

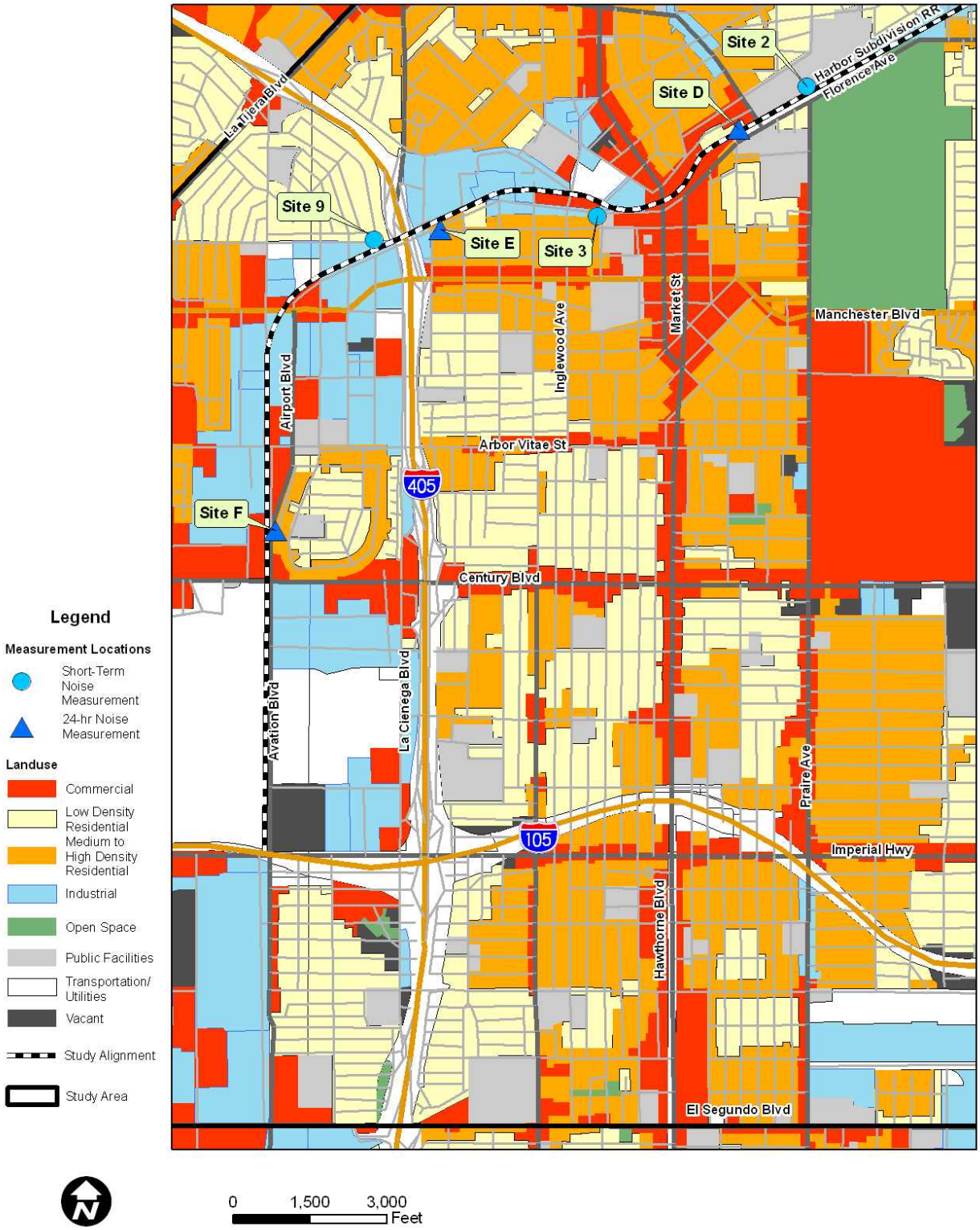


Source: Parsons Brinckerhoff, 2008

Figure 4-26. Exposition Boulevard to the Harbor Subdivision Railroad - Noise Sensitive Land Uses and Measurement Locations

Source: Parsons Brinckerhoff, 2008

Figure 4-27. The Harbor Subdivision Railroad to Interstate 105 - Noise Sensitive Land Uses and Measurement Locations



Source: Parsons Brinckerhoff, 2008.

Table 4-33. Existing Noise Measurements

Monitoring Site I.D.	Site Description	FTA Land Use Category[1]	Measured L_{dn}[2] (dBA)	Measured Peak-Hour L_{eq} (dBA)	Figure
Long-term (24-Hour) Noise Measurement Locations					
J	877 Crenshaw Blvd	2	74	72	Figure 4-25
I	1419 Crenshaw Blvd	2	74	74	Figure 4-25
H	1601 Wellington	2	78	77	Figure 4-25
G	2234 Crenshaw Blvd	2	77	74	Figure 4-25
A	3954 ¼ Crenshaw Blvd	2	72	70	Figure 4-26
B	4808 Crenshaw Blvd	2	72	71	Figure 4-26
C	6203 Crenshaw Blvd	2	77	75	Figure 4-26
D	411 La Colina Dr	2	69	68	Figure 4-27
E	622 La Casa Villa West	2	68	71	Figure 4-27
F	Aviation Blvd and 98th St	2	74	75	Figure 4-27
Short-term (15-Minute) Noise Measurement Locations[3]					
6	1216 Crenshaw Blvd	2	73	73	Figure 4-25
1	6611 Crenshaw Blvd	2	73	72	Figure 4-26
2	Edward Vincent Jr. Park – Tennis Courts	2	NA	60	Figure 4-27
3	201 W Regent St	3	68	70	Figure 4-27
9	5300 82nd St	2	68	70	Figure 4-27

Source: Parsons Brinckerhoff, 2008

Notes: NA – These sites do not have sleep activity. L_{dn} existing noise levels are not applicable at these sites. Each 15-minute noise measurement is compared to the closest 24-hour measurement site at the same hour of the day. The 15-minute noise levels are then adjusted relative to the 24-hour levels in order to develop a peak L_{eq} and L_{dn} for each of the 15-minute measurement locations.

[1] Land use category descriptors: FTA Category 1 = Buildings or parks where quiet is an essential element of their purpose; FTA Category 2 = Residences and other buildings where people sleep, such as hotels, apartments and hospitals; FTA Category 3 = Institutional land uses with primarily daytime and evening use, including schools, libraries and churches.

[2] L_{dn} is used for land uses with nighttime sensitivity to noise and for residential areas where FTA rather than FHWA noise procedures are applicable. Peak-hour L_{eq} is used for commercial, industrial, and other land uses that do not have nighttime noise sensitivity.

area are traffic on Florence Avenue, aircraft overflights into the Los Angeles International Airport (LAX), and current periodic freight-rail operations along the Harbor Subdivision.

Along the Harbor Subdivision from La Brea Avenue to the I-405 Freeway, noise sensitive uses include two churches (Category 3), residential buildings (Category 2), and the Inglewood courthouse (Category 3). Noise measurements taken in this area show that the peak hour L_{eq} noise levels range from 70 to 71 dBA and the L_{dn} noise level is 68 dBA (Table 4-33). The major sources of noise in the area are local street traffic, aircraft overflights into LAX, current freight-rail operations, and traffic on the I-405 Freeway.

Along the Harbor Subdivision from the I-405 Freeway to the I-105 Freeway, the land uses are predominantly commercial/office and industrial, with the exception of areas along 83rd Street and parts of Aviation Boulevard, between Arbor Vitae Street and Century Boulevard, which supports homes and motels (Category 2). Noise measurements taken in this area show that the peak hour L_{eq} noise level is 74 dBA and the L_{dn} noise level is 75 dBA (Table 4-33). The major sources of noise in the area are traffic on Century and Aviation Boulevards, aircraft overflights into LAX and current freight-rail operations along the Harbor Subdivision.

4.6.4 Environmental Impacts/Environmental Consequences

4.6.4.1 No Build Alternative

The only substantial source of future noise levels under the No Build Alternative would be increased automobile traffic on local arterials. Changes in the automobile traffic are not expected to change the existing 24-hour (L_{dn}) noise levels along any of the segments. Peak-hour noise levels are not expected to increase because traffic in the area is already at or above road capacity. Under these conditions, traffic speeds would be significantly reduced and noise levels would be correspondingly low. Ground vibration levels from the increased number of rubber-tired vehicles would still be below the threshold of human perception because tires and shocks isolate vehicle vibrations from the roadway surface. Therefore, no noise and vibration impacts are anticipated for the No Build Alternative.

4.6.4.2 TSM Alternative

No noise and vibration impacts are anticipated for the TSM Alternative. This alternative would add Rapid Bus Routes along Crenshaw, Hawthorne, Aviation and Martin Luther King Jr. Boulevards and would improve intersection improvement to reduce delay. Bus service would improve from 10- to 5-minute frequency during peak periods and from 20- to 10-minute frequency during off-peak periods. Existing noise levels along the proposed bus routes are between 70 to 77 dBA. The noise levels from the proposed increase in bus traffic are anticipated to be below a 65 dBA L_{dn}. Existing ambient noise levels under these conditions would mask the effect of additional buses. Ground vibration levels from rubber-tire vehicles are below the threshold of human perception, because tires and shocks isolate vehicle vibrations from the roadway surface. As such, under the FTA criteria, no noise or vibration impacts are anticipated under the TSM Alternative.

4.6.4.3 BRT Alternative

Passby Impacts from BRT Vehicles

The noise and vibration modeling for the BRT Alternative assumed 5-minute headways during peak hours (6:00 a.m. to 9:00 a.m. and 3:00 p.m. to 7:00 p.m.) and ten-minute headways during off peak hours (5:00 a.m. to 6:00 a.m., 9:00 a.m. to 3:00 p.m., and 7:00 p.m. to 1:00 a.m.). There is no service between 1:00 a.m. and 4:30 a.m. Modeling analysis speeds used the highest theoretical speeds for BRT travel between stations (30 to 40 mph). These higher speeds would result in the worst case noise levels when compared to noise from buses accelerating from bus stops or from station platforms.[10]

[10] According to the Federal Highway Administration Traffic Noise Model Technical Manual, the noise level of an accelerating bus is similar to the noise level generated by a bus cruising at 30 or 40 miles per hour.

Although a worst-case approach was used, based on FTA criteria, no noise and vibration impacts are anticipated for the BRT Alternative (refer to Table 4-34).

Maintenance and Operations Facility Sites – BRT Bus Facility Scenario

Using the general assessment of FTA's *Noise and Vibration Impacts Assessment*, only the salient features of each fixed facility are considered in the noise analysis. Table 4-35 shows the source reference levels at 50 feet based on measurements for the peak hour of operation of a typical stationary source of the type and size noted. The items shown in Table 4-35 are the highest single event noise levels (SEL) of the activities in a typical bus maintenance and operations facility. A bus maintenance and operations facility is a large facility, spread out over considerable area with various noise levels depending on the layout of the facility. Specifying the reference SEL at a distance of 50 feet from the property line would be misleading in this case. Consequently, the reference distance is described as the "the equivalent distance of 50 feet," which was determined by estimating the noise levels at a greater distance and projecting back to 50 feet, assuming the noise sources are concentrated at the center of the site.

A new maintenance and operations facility would be required to accommodate the expanded vehicle fleet under the BRT Alternative. The facility would be a stand-alone facility capable of performing all levels of service and maintenance of the BRT vehicles and would also serve as a storage area for vehicles that are not in service. Two sites, Site B and Site D, are currently proposed for use as a maintenance and operations facility, as described in Chapter 2, Section 2.2.3 and shown in Figure 2-14. In the assessment of noise from a bus facility there are a number of factors that were considered in the assessment of noise impacts, including: bus warm-up and idling, early morning departure, maintenance operations and washing.

Site B is located north of Harbor Subdivision and South of 83rd Street. The residential area (Type 2) on 82nd Street (monitoring Site 9) is adjacent to the proposed maintenance and operations facility. The nearest residential uses are 250 feet from the center of the facility. Use of this site as a maintenance and operations facility would increase the BRT Alternative noise levels from 60 dBA to 62 dBA at monitoring Site 9; however, the level of noise impact would remain at no impact. No vibration impacts are anticipated from the proposed maintenance and operations facility because rubber tire vehicles vibration levels are below the thresholds of human perception.

Site D is located north of Rosecrans Avenue. There are no noise- or vibration-sensitive land uses in the area; therefore, no noise or vibration impacts are anticipated.

4.6.4.4 Base LRT Alternative

The Base LRT Alternative has four potential sources of noise and vibration impacts during operations. These sources are: passby noise from LRT vehicles, warning signals at grade crossings, areas of special trackwork, and maintenance yards.

Passby Impacts from LRT Vehicles

The noise and vibration modeling for the Base LRT Alternative assumes a two-car train with 5-minute headways during peak hours (6:00 a.m. to 9:00 a.m. and 3:00 p.m. to 7:00 p.m.) and ten-minute headways during off peak hours (5:00 a.m. to 6:00 a.m., 9:00 a.m. to

Table 4-34. BRT Alternative Predicted Noise Levels and Impacts

BRT Segment	FTA Land Use[1]	Existing L_{dn}[2] (dBA)/Peak Hour Leq (dBA)	Predicted Project L_{dn}[2] (dBA)/Peak Hour L_{eq} (dBA)	Predicted Existing + Project L_{dn}[2] (dBA)/Peak Hour L_{eq} (dBA)	Number of Noise Impact						Predicted Vibration Levels[3]
					Moderate			Severe			
					SF	MF	Non-Residential	SF	MF	Non-Residential	
Wilshire Blvd to Olympic Blvd	2	74	62	74	0	0	0	0	0	0	NA
Olympic Blvd to Pico Blvd	2	73	61	73	0	0	0	0	0	0	NA
Pico Blvd to Venice Blvd	2	74	62	74	0	0	0	0	0	0	NA
Venice Blvd to Exposition Blvd	2	77	62	77	0	0	0	0	0	0	NA
Exposition Blvd to 46th St	2	72	57	72	0	0	0	0	0	0	NA
46th St to 54th St	2	72	58	72	0	0	0	0	0	0	NA
54th St to 63rd St	2	77	62	77	0	0	0	0	0	0	NA
63rd St to Victoria Ave	2	73	62	73	0	0	0	0	0	0	NA
Victoria Ave to Centinela Ave	3	60	56	61	0	0	0	0	0	0	NA
Centinela Ave to La Brea Ave	2	69	61	70	0	0	0	0	0	0	NA
La Brea Ave to North Oak St	2	68	53	68	0	0	0	0	0	0	NA
North Oak St to I-405[4]	2	68	56	68	0	0	0	0	0	0	NA
I-405 to Manchester Blvd[4]	2	68	59	68	0	0	0	0	0	0	NA
Manchester Blvd to Century Blvd[4]	2	74	55	74	0	0	0	0	0	0	NA

Source: Parsons Brinckerhoff, 2008

Notes: [1] Land use category descriptors: FTA Category 1 = Buildings or parks where quiet is an essential element of their purpose; FTA Category 2 = Residences and other buildings where people sleep, such as hotels, apartments and hospitals; FTA Category 3 = Institutional land uses with primarily daytime and evening use, including schools, libraries and churches.

[2] L_{dn} is used for land uses with nighttime sensitivity to noise and for residential areas where FTA rather than FHWA noise procedures are applicable. Peak-hour L_{eq} is used for commercial, industrial, and other land uses that do not have nighttime noise sensitivity.

[3] Projects that involve rubber-tire vehicles are unlikely to create vibration; unless the design includes features that will result in uneven pavement (e.g. expansions joints, speed bumps, etc).

[4] Noise analysis evaluated buses on elevated structure in these segments.

Table 4-35. Source Reference Levels at 50 feet from Center of Site, Stationary Sources (Bus System)

Source	Reference SEL (dBA)	Reference Conditions
Storage yard	111	100 buses accessing facility in peak activity hour
Operating Facility	114	100 buses accessing facility, 30 buses serviced and cleaned in peak activity hour
Transit Center	101	20 buses in peak activity hour

Source: Parsons Brinckerhoff, 2008.

3:00 p.m., and 7:00 p.m. to 1:00 a.m.). There is no service between 1:00 a.m. and 4:00 a.m. Modeling speeds are shown in Table 4-36 by monitoring site and cross streets. Based on FTA criteria, moderate noise impacts are anticipated at two monitoring sites, Site 1 and Site C (refer to Table 4-36). The segment with monitoring Site C includes the West Angeles Villas, which would have a moderate impact based on L_{dn} levels. St. John the Evangelist Catholic School is also within this segment, but it would have no impact because the criteria are based on peak-hour noise levels for daytime sensitive land uses. Table 4-37 lists the residences at Sites 1 and C would have a moderate impact based on L_{dn} levels.

Table 4-36. LRT Speeds by Segment

From Cross Street	To Cross Street	Sites[1]	Speed
Exposition Blvd	46th St	A	35
46th St	54th St	B	35
54th St	63rd St	C	35
63rd St	Victoria Ave	1	35
Victoria Ave	Centinela Ave	2	50
Centinela Ave	La Brea Ave	D	42
La Brea Ave	North Oak St	3	54
North Oak St	I-405	E	54
I-405	Manchester Blvd	9	54
Manchester Blvd	Century Blvd	F	55

Source: Parsons Brinckerhoff, 2008.
Notes: [1] Monitoring sites are identified in Table 4-33, Existing Noise Measurements.

Table 4-37. Residences at Sites 1 and C with Moderate Impact

54th Street to 63rd Street	63rd Street to Victoria Avenue
5716 Crenshaw Boulevard	6303 Crenshaw Boulevard
5857 Crenshaw Boulevard	6307 Crenshaw Boulevard
5863 Crenshaw Boulevard	6315 Crenshaw Boulevard
5871 Crenshaw Boulevard	6320 Crenshaw Boulevard
5903 Crenshaw Boulevard	6321 Crenshaw Boulevard
5909 Crenshaw Boulevard	6326 Crenshaw Boulevard
5925 Crenshaw Boulevard	6332 Crenshaw Boulevard
3331 West 59th Place	6340 Crenshaw Boulevard
6030 Crenshaw Boulevard	6345 Crenshaw Boulevard
6113 Crenshaw Boulevard	6405 Crenshaw Boulevard
6121 Crenshaw Boulevard	6412 Crenshaw Boulevard
6131 Crenshaw Boulevard	6417 Crenshaw Boulevard
6203 Crenshaw Boulevard	6418 Crenshaw Boulevard
6207 Crenshaw Boulevard	6519 Crenshaw Boulevard
6215 Crenshaw Boulevard	6531 Crenshaw Boulevard
	6601 Crenshaw Boulevard
	6607 Crenshaw Boulevard
	6613 Crenshaw Boulevard
	6621 Crenshaw Boulevard
	6627 Crenshaw Boulevard

No impacts are anticipated for other notable sensitive receptors, including West Angeles Church of God in Christ, Leimert Park, View Park Prep, motels and apartment buildings in Hyde Park, and residences and churches along the Harbor Subdivision. Due to their existing ambient noise levels in the area compared to the project noise levels, an impact is not anticipated for these sensitive receptors using FTA noise and vibration criteria. No vibration impacts are anticipated for the Base LRT Alternative (refer to Table 4-38 and Table 4-39).

As part of studying noise and vibration impacts resulting from the aerial structure, analysis was conducted using the general assessment of FTA's *Noise and Vibration Impacts Assessment* to determine if noise and vibration impacts would occur to land uses not directly along Crenshaw Boulevard and the rest of the project alignment, due to the height of the structure. Since the project noise level would decrease as the distance between the project and receiver increases, it was determined that no noise impacts to the sensitive receivers along the streets parallel to Crenshaw Boulevard would be anticipated.

Table 4-38. LRT Noise Levels and Impacts

LRT Segment	Sites	FTA Land Use[1]	Existing L_{dn}[2] (dBA)/Peak Hour L_{eq} (dBA)	Project L_{dn}[2](dBA)/Peak Hour L_{eq} (dBA)	Existing + Project L_{dn}[2] (dBA)/Peak Hour L_{eq} (dBA)	Number of Noise Impact					
						Moderate			Severe		
						SF	MF	Non-Residential	SF	MF	Non-Residential
Exposition Blvd to 46th St	A	2	72	61	72	0	0	0	0	0	0
46th Street to 54th St	B	2	72	63	72	0	0	0	0	0	0
54th Street to 63rd St	C	2	77	67	77	0	15	0	0	0	0
63rd St to Victoria Ave	1	2	73	67	74	10	12	0	0	0	0
Victoria Ave to Centinela Ave	2	3	60	60	63	0	0	0	0	0	0
Centinela Ave to La Brea Ave	D	2	69	62	70	0	0	0	0	0	0
La Brea Ave to North Oak St	3	2	68	55	68	0	0	0	0	0	0
North Oak St to I-405	E	2	68	57	68	0	0	0	0	0	0
I-405 to Manchester Blvd	9	2	68	52	68	0	0	0	0	0	0
Manchester Blvd to Century Blvd	F	2	74	52	74	0	0	0	0	0	0

Notes: [1] Land use category descriptors: FTA Category 1 = Buildings or parks where quiet is an essential element of their purpose; FTA Category 2 = Residences and other buildings where people sleep, such as hotels, apartments and hospitals; FTA Category 3 = Institutional land uses with primarily daytime and evening use, including schools, libraries and churches.

[2] L_{dn} is used for land uses with nighttime sensitivity to noise and for residential areas where FTA rather than FHWA noise procedures are applicable. Peak-hour L_{eq} is used for commercial, industrial, and other land uses that do not have nighttime noise sensitivity.

Table 4-39. LRT Vibration Levels and Impacts

LRT Segment	Sites	FTA Land Use[1]	Predicted Vibration Levels	Impact Threshold (1 Micro-inch/sec)	Impact
Exposition Blvd to 46th St	A	2	54	72	No
46th Street to 54th St	B	2	55	72	No
54th Street to 63rd St	C	2	60	72	No
63rd St to Victoria Ave	1	2	60	72	No
Victoria Ave to Centinela Ave	2	3	57	72	No
Centinela Ave to La Brea Ave	D	2	60	72	No
La Brea Ave to North Oak St	3	2	50	72	No
North Oak St to I-405	E	2	52	72	No
I-405 to Manchester Blvd	9	2	57	72	No
Manchester Blvd to Century Blvd	F	2	51	72	No

Source: Parsons Brinckerhoff, Inc., 2008

As identified in traffic analysis prepared for this Draft EIS/EIR, placement of the LRT along Crenshaw Boulevard will not reduce the number of traffic through lanes. The traffic analysis prepared for the related environmental studies does not show an increase in traffic on the roadways parallel to Crenshaw Boulevard. No increase in traffic noise levels due to the Base LRT Alternative are anticipated on the parallel streets.

The elevated section of the Base LRT Alternative from 59th Street to Victoria Avenue could potentially increase traffic noise level by up to 3 dBA along Crenshaw Boulevard due to reflected noise from the traffic under the elevated structure. The two segments along Crenshaw Boulevard that could be affected by reflected noise are 54th Street to 63rd Street and 63rd Street to Victoria Avenue. Sensitive noise receptors including the West Angeles Villas and St. John the Evangelist Catholic School are within this segment of the corridor. Moderate noise impacts are anticipated for this area (Table 4-38 and Table 4-39) without the reflected traffic noise. The additional 3 dBA of noise caused by reflection would not change the previously identified moderate noise impacts or add any new impacts to the Base LRT Alternative (Table 4-38 and Table 4-39).

As part of studying noise and vibration impacts resulting from the aerial structure, analysis was conducted using the general assessment of FTA's *Noise and Vibration Impacts Assessment* to determine if noise and vibration impacts would occur to land uses not directly along Crenshaw Boulevard and the rest of the project alignment, due to the height of the

structure. Since the project noise level would decrease as the distance between the project and receiver increases, it was determined that no noise impacts to the sensitive receivers along the streets parallel to Crenshaw Boulevard would be anticipated.

Impacts from Warning Signals for the At-grade Crossings

Warning signals for the at-grade crossings, bells or horns, can generate additional impacts or increase impacts generated by LRT passbys.

There are eight existing at-grade railroad crossings at which warning signals would be used for the LRT operations (Table 4-40). The warning signals have the potential to increase the L_{dn} levels by four to eight dBA at locations within 50 feet of the crossing and one to 3 dBA at sensitive receptors between 50 and 100 feet from the crossing. Table 4-40 gives the location of the at-grade crossing and any additional impacts due to the warning signals. Only two of the monitoring sites are within 200 feet of an at-grade crossing (E and D). Noise impacts at monitoring Site D will increase from no impact to moderate noise impacts with crossing bells at Centinela Avenue. The nearby single- and multi-family homes in the areas of the grade crossing with North Oak Avenue, Centinela Avenue and West Boulevard would experience a moderate noise impact. The other noise sensitive land uses in these areas, the park, St. John Chrysostom Church and Inglewood cemetery, would not have a noise impact with the warning signals in place.

Existing freight service on the Harbor Subdivision would remain with the project, and there is a potential for a cumulative impact related to Base LRT Alternative warning signals in conjunction with existing freight service warning signals. However, existing freight service is infrequent (less than one train a month over a six month period) and warning signal noise from freight service would have a negligible effect on noise levels when added together with the frequent 5 and 10 minute headways occurring with LRT service. Although warning signals would sound more frequently due to multiple use for both LRT and freight services, the additional sounding of the signals would occur during limited times of operation and would not result in an adverse cumulative impact.

Impacts from Special Trackwork

The Base LRT Alternative would require special trackwork for turnouts and crossovers. Turnouts, also known as switches, allow trains to move from one track to another. Movement from the mainline to maintenance and operations yards would also utilize turnouts. Crossovers allow trains to move between parallel tracks, allowing one train to run both directions.

The noise from the turnouts and crossovers comes from the small gap in the central part of the switch, known as the frog. In the process of crossing this gap, the Base LRT Alternative noise level can increase up to six dBA. Crossovers and turnouts can also increase vibration levels by up to ten VdB.

Table 4-40. LRT Noise Levels with At-Grade Crossings

Crossing Street	FTA Land Use Category within 50 ft[1]	FTA Land Use Category within 100 ft[1]	Representative Site I.D.	Project L_{dn}[2] (dBA) /Peak Hour L_{eq} (dBA)	Project + Crossing Bells L_{dn}[2] (dBA) /Peak Hour L_{eq} (dBA)	Noise Impact With Crossing Bells					
						Moderate			Severe		
						SF	MF	Non-Residential	SF	MF	Non-Residential
Arbor Vitae St	None	None	None	Nearest sensitive land use -Animo High School at 500 ft		0	0	0	0	0	0
Manchester Blvd	None	None	None	Nearest sensitive land use -residential on Bellanca Ave at 800 ft		0	0	0	0	0	0
Hindy Ave	None	None	None	Nearest sensitive land use -residential on 82nd St at 440 ft		0	0	0	0	0	0
North Oak Ave	None	2	E	57	58	0	0	0	0	0	0
Centinela Ave	None	2,3	D	62	64	**1**	0	0	0	0	0
Redondo Blvd	None	None	None	Nearest sensitive land use - residential on 68th St and Inglewood Park Cemetery at 250 ft		0	0	0	0	0	0
West Blvd	None	2	D	62	64	**3**	**1**	0	0	0	0
Brynhurst Ave	None	None	None	Nearest sensitive land use - residential on 71st St and Inglewood Park Cemetery at 240 ft		0	0	0	0	0	0

Source: Parsons Brinckerhoff, Inc., 2008

Note: [1] Land use category descriptors: FTA Category 1 = Buildings or parks where quiet is an essential element of their purpose; FTA Category 2 = Residences and other buildings where people sleep, such as hotels, apartments and hospitals; FTA Category 3 = Institutional land uses with primarily daytime and evening use, including schools, libraries and churches.

Currently only two areas are designed to have special track work, east of Crenshaw Station on the Expo Line and north of the Century Station on the Base LRT Alternative. Additional crossovers may be added at strategic locations to provide flexibility during emergencies. The additional crossover locations would be developed as part of the final design. Table 4-41 shows the noise impact for special trackwork placed near the sensitive receivers at these sites. There would be an increase from no impact to moderate noise impacts at monitoring Site A. No impact would occur at monitoring Site F. No vibration impacts are anticipated from special trackwork at these locations.

Table 4-41. LRT Noise Levels with Special Trackwork

Site I.D.	FTA Land Use Category[1]	Existing L_{dn}[2] (dBA) /Peak Hour L_{eq} (dBA)	Project L_{dn}[2] (dBA) /Peak Hour L_{eq} (dBA)	Noise Impact	Project+ 6 dBA for Special Track Work L_{dn}[2] (dBA) /Peak Hour L_{eq} (dBA)	Existing + Project and Special Track Work L_{dn}[2] (dBA) /Peak Hour L_{eq} (dBA)	Noise Impact
A	2	72	61	No Impact	67	73	Moderate Impact
F	2	74	52	No Impact	58	74	No Impact

Source: Parsons Brinckerhoff, Inc., 2008

Notes: [1] Land use category descriptors: FTA Category 1 = Buildings or parks where quiet is an essential element of their purpose; FTA Category 2 = Residences and other buildings where people sleep, such as hotels, apartments and hospitals; FTA Category 3 = Institutional land uses with primarily daytime and evening use, including schools, libraries and churches.

[2] L_{dn} is used for land uses with nighttime sensitivity to noise and for residential areas where FTA rather than FHWA noise procedures are applicable. Peak-hour L_{eq} is used for commercial, industrial, and other land uses that do not have nighttime noise sensitivity.

4.6.4.5 LRT Alternative Design Options

The aerial station and aerial crossing Design Options 1 and 2 would reduce LRT vehicle noise at nearby sensitive land uses by moving the noise source further from these land uses. Additional noise may be generated as reflection from the elevated structure. As discussed above, reflected noise would result in a moderate impact.

Design Option 3 would reduce LRT vehicle noise at nearby sensitive land uses by moving the noise source into a trench. Removing the at-grade crossing would also reduce engine noise generated by vehicles accelerating after train crossings. Additional noise may be generated as reflection from the trench but this noise would likely be overshadowed by traffic noise. The cut and cover crossing would eliminate the warning signal impact identified at Centinela Avenue.

Design Options 4 and 6 would eliminate LRT vehicle noise at nearby sensitive land uses by moving the noise source into a below-grade alignment.

The below-grade station in Design Option 5 would not generate LRT vehicle noise because the noise source would be below grade. Additional noise may be generated by automobiles and pedestrians accessing the below-grade station. This noise would be consistent with the

existing urban ambient noise environment and would not result in an adverse impact. The addition of the below-grade station would not generate a noise impact.

Similar to the Base LRT Alternative, the design options would not result in a vibration impact, but would result in moderate noise impacts regarding passby LRT vehicle trips and special trackwork activity.

Maintenance and Operations Facility Sites – Rail Facility Scenario

Using the general assessment of FTA's *Noise and Vibration Impacts Assessment*, only the salient features of each fixed facility are considered in the noise analysis. Table 4-42 shows the source reference levels at 50 feet based on measurements for the peak hour of operation of a typical stationary source of the type and size noted.

Table 4-42. Source Reference Levels at 50 feet from Center of Site, Stationary Sources (Rail System)

Source	Reference SEL (dBA)	Reference Conditions
Yards and Shops	118	20 train movements in peak activity hour
Layover Tracks (commuter rail)	109	One train with diesel locomotive idling for one hour
Crossovers	100	One Train
Crossing signals	109	3600 second duration

The items shown in Table 4-42 are the highest SEL of the activities in a typical maintenance and operations facility. A rail maintenance and operations facility is a large facility, spread out over considerable area with various noise levels depending on the layout of the facility. Specifying the reference SEL at a distance of 50 feet from the property line would be misleading in this case. Consequently, the reference distance is described as the "the equivalent distance of 50 feet," which is determined by estimating the noise levels at a greater distance and projecting back to 50 feet, assuming the noise sources are concentrated at the center of the site.

Two sites are currently proposed for use as a maintenance and operations facility, as described in Chapter 2, Section 2.2.3 and shown in Figure 2-14.

Site B is located north of Harbor Subdivision and South of 83rd Street. The residential area (Type 2) on 82nd Street (Monitoring Site 9) is adjacent to the proposed maintenance yard. The nearest homes are 250 feet from the center of the yard. Use of this site as a maintenance facility would increase the Base LRT Alternative noise level from 60 dBA to 62 dBA at monitoring Site 9; however, the level of noise impact would remain at no impact. There would be no vibration impacts from the proposed yard because the trains would be moving at low speeds.

Site D is located north of Rosecrans Avenue. There are no noise- or vibration-sensitive land uses in the area; therefore, no noise or vibration impacts are anticipated.

4.6.5 Mitigation Measures

4.6.5.1 No Build Alternative

No noise and vibration impacts are predicted for the No Build Alternative. No mitigation is proposed.

4.6.5.2 TSM Alternative

No noise and vibration impacts are predicted for the TSM Alternative. No mitigation is proposed.

4.6.5.3 BRT Alternative

No noise and vibration impacts are predicted for the BRT Alternative. No mitigation is proposed.

Impacts from Maintenance and Operations Facility

No noise and vibration impacts are anticipated from the implementation of Site B or Site D for the proposed maintenance and operations facility. No mitigation is proposed.

4.6.5.4 Base LRT Alternative

Passby Impacts from LRT Vehicles

Moderate noise impacts from LRT Vehicles passbys are predicted along segments 54th to 63rd Street and 63rd Street to Victoria Avenue (refer to Table 4-38). This section of the alignment is on an aerial structure. Based on FTA criteria, mitigation is not required for moderate impacts. In addition, there are no vibration impacts anticipated. Therefore, no noise or vibration mitigation is proposed.

Impacts from Warning Signals for the At-Grade Crossings

Warning signals for the at-grade crossing on Centinela Avenue are anticipated to increase the impact level at monitoring Site D from no impact to moderate impact (refer to Table 4-40**).** This section of the alignment is a dedicated right-of-way. Based on FTA criteria, mitigation is not required for moderate impacts. In addition, there are no vibration impacts anticipated. Therefore, no noise or vibration mitigation is proposed.

Impacts from Special Trackwork

Currently only two areas are designed to have special track work, east of Crenshaw Station on the Expo Line and north of Century Station. Monitoring Site A would experience moderate noise impact with the addition of the special trackwork. Based on FTA criteria, mitigation is not required for moderate impacts. In addition, there are no vibration impacts anticipated. Therefore, no noise or vibration mitigation is proposed.

As mentioned previously, additional crossover locations may be developed at strategic locations during final design. If special trackwork must be placed near sensitive land uses, a spring-rail or moveable frog shall be used at those locations. These types of tracks reduce noise by covering the gap in the central part of the switch.

Impacts from Maintenance and Operations Facility

No noise and vibration impacts are anticipated for Sites B or D. Therefore, no mitigation is proposed.

Other Impacts from LRT Alternative

If the LRT Alternative is selected, design features, such as shape of the structure and use of noise absorptive materials on the structure would be studied during final design.

4.6.6 CEQA Determination

Under the CEQA, a substantial noise increase may result in a significant adverse environmental effect. This CEQA analysis uses a 3- and 5-dBA increase as a threshold for a significant impact. Category one or two sensitive land uses would use a 3-dBA increase as a significance threshold, while category three sensitive receptors would use a 5-dBA significance threshold. Applying CEQA guidelines, severe noise impacts must be mitigated or identified as noise impact for which no abatement measures are available, due to economic, social, environmental, legal, or technological conditions.

Under CEQA, a substantial vibration increase may result in a significant adverse environmental effect. CEQA does not provide specific thresholds for significant adverse vibration impact. For this study, a vibration impact as defined by FTA is applied as the CEQA threshold for significance. Applying CEQA guidelines, any vibration impacts must be mitigated or identified as noise impact for which no abatement measures are available, due to economic, social, environmental, legal or technological conditions.

4.6.6.1 No Build Alternative

Changes in the automobile traffic are not expected to change the existing 24-hour (L_{dn}) noise levels along any of the segments. Peak-hour noise levels are not expected to increase because traffic in the area is already at or above road capacity. Under these conditions, traffic speeds would be significantly reduced and noise levels would be correspondingly low. Ground vibration levels from rubber-tire vehicles are below the threshold of human perception, because tires and shocks isolate vehicle vibrations from the roadway surface. Therefore, no significant environmental impacts are anticipated for the No Build Alternative.

4.6.6.2 TSM Alternative

This alternative would add Rapid Bus Routes along Crenshaw, Hawthorne, Aviation and Martin Luther King Jr. Boulevards, and would improve intersections to reduce delay. Bus service would improve from 10- to 5-minute frequency during peak periods and from 20- to 10-minute frequency during off-peak periods. Existing noise levels along the proposed bus routes are between 70 to 77 dBA. The noise levels from the proposed increase in bus traffic are anticipated to be below a 65 dBA L_{dn}. Existing ambient noise levels under these conditions would mask the affect of additional buses. Ground vibration levels from rubber-tire vehicles are below the threshold of human perception, because tires and shocks isolate vehicle vibrations from the roadway surface. Therefore, no significant environmental impacts are anticipated for the TSM Alternative.

4.6.6.3 BRT Alternative

The noise and vibration modeling for the BRT Alternative assumed 5-minute headways during peak-hours (6:00 a.m. to 9:00 a.m. and 3:00 p.m. to 7:00 p.m.) and ten-minute headways during off peak-hours (5:00 a.m. to 6:00 a.m., 9:00 a.m. to 3:00 p.m., and 7:00 p.m. to 1:00 a.m.). There is no service between 1:00 a.m. and 5:00 a.m. Modeling analysis speeds used the highest theoretical speeds for BRT travel between stations. These higher speeds would result in the highest noise levels. As shown in Table 4-34, the highest increase in noise level would be one dBA and would occur between Victoria Avenue and La Brea Avenue. This would not exceed the 3- and 5-dBA significance thresholds. Although a worst-case approach was used, based on FTA criteria, no noise and vibration impacts are anticipated for the BRT Alternative. Therefore, no significant environmental impacts are anticipated for the BRT Alternative.

4.6.6.4 Base LRT Alternative

The highest noise increase from train passbys would be 3 dBA and would occur from Victoria Avenue to Centinela Street. The nearest sensitive use to this segment is a category three use, which has a significance threshold of 5 dBA. Therefore, the noise increase would not exceed the significance threshold. As shown in Table 4-38, no category one, two or three sensitive uses would exceed their significance thresholds. Therefore, a less-than-significant impact from normal train passbys is anticipated.

Directional signals would direct the noise from the signal to the crossing roadways or shield on the side of the signals that face sensitive receivers. The highest noise increase from warning signals at grade crossings would be 2 dBA and would not exceed the 3- and 5-dbA significance thresholds. Therefore, a less-than-significant noise impact is anticipated for warning signals for the at-grade crossings.

Special trackwork would potentially increase noise levels at sensitive receptors by 1 dBA and would not exceed the significance thresholds. Therefore, a less-than-significant impact is anticipated for special trackwork. In addition, there are no adverse vibration impacts anticipated and a less-than-significant vibration impact is anticipated for the Base LRT Alternative.

The elevated section of the Base LRT Alternative from 59th Street to Victoria Avenue would potentially increase traffic noise level by up to 3 dBA along Crenshaw Boulevard, due to reflected noise from the traffic under the elevated structure. The two segments along Crenshaw Boulevard that could be affected by reflected noise are 54th Street to 63rd Street and 63rd Street to Victoria Avenue. The addition of reflected traffic noise from the aerial structure combined with the anticipated project noise would not exceed 3 dBA. Therefore, a less-than-significant reflective noise impact from the aerial structure is anticipated for the Base LRT Alternative.

LRT Alternative Design Options

As discussed previously, the LRT Alternative may include six design options. The Aerial Station and Aerial Crossing Design Options 1 and 2 would reduce LRT vehicle noise at nearby sensitive land uses by moving the noise source further from these land uses. Additional noise may be generated as reflection from the elevated structure. As discussed above, reflected noise would not substantially increase noise levels.

Design Option 3 would reduce LRT vehicle noise at nearby sensitive land uses by moving the noise source into a trench. Removing the at-grade crossing would also reduce engine noise generated by vehicles accelerating after train crossings. Additional noise may be generated as reflection from the trench but this noise would likely be overshadowed by traffic noise. The cut and cover crossing would eliminate the warning signal impact identified at Centinela Avenue and may eliminate the moderate LRT vehicle passby noise impact that was identified in the Base LRT Alternative.

Design Options 4 and 6 would eliminate LRT vehicle noise at nearby sensitive land uses by moving the noise source into a below-grade alignment.

The below-grade station in Design Option 5 would not generate LRT vehicle noise because the noise source would be below grade. Additional noise may be generated by automobiles and pedestrians accessing the below-grade station. This noise would be consistent with the existing urban ambient noise environment and would not result in a significant impact. The addition of the below-grade station would not generate a noise impact.

Similar to the Base LRT Alternative, these design options would result in less-than-significant noise impacts.

4.6.6.5 Maintenance and Operations Facility Sites

The anticipated noise increase from operation of a maintenance and operations facility site would not exceed the 3- and 5-dBA significance threshold. In addition, no significant vibration impacts are anticipated for nearby sensitive receptors at either potential maintenance and operations facility site location. Therefore, a less-than-significant noise and vibration impact is anticipated for the maintenance and operations facility sites.

4.6.7 Impacts Remaining After Mitigation

Considering that no mitigation measures are required, as noted above, operational noise impacts would be less than significant.

4.7 Ecosystems/Biological Resources

This section addresses the potential impacts of the project on ecosystems and biological resources. After a discussion of the regulatory framework governing the protection of biological resources, existing ecosystems and biological resources are described, followed by an analysis of potential impacts of the project on these resources. Due to the urbanized nature of the project area, ecosystems and biological resources are not expected to be adversely affected by the project.

Information in this section is based primarily on the following sources:

- A search of the California Natural Diversity Database (CNDDB) was conducted to identify sensitive plants and animals with the potential to occur in the study area. The proposed alignments are located within the Hollywood, Inglewood, and Venice 7.5-minute quadrangles, and all three quadrangles were included in the search.
- A visual review of parks and other public open spaces within 0.25 mile of either side of the proposed alignments, stations, and maintenance and operations facility sites was conducted.

4.7.1 Regulatory Framework

Biological resources within 0.25 mile of either side of the proposed alignments, stations, and maintenance and operations facility sites are protected by several federal, State, and local laws and policies, as described in this section.

4.7.1.1 Federal

Endangered Species Act

The Endangered Species Act and subsequent amendments provide for the conservation of endangered and threatened species and the ecosystems upon which they depend. Section 7 of the Endangered Species Act requires federal agencies to aid in the conservation of listed species, and to ensure that the activities of federal agencies will not jeopardize the continued existence of listed species or adversely modify designated critical habitat. At the federal level, the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) are responsible for administration of the Endangered Species Act.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act decrees that all migratory birds and their parts (including eggs, nests and feathers) are fully protected. Under the act, taking, killing, or possessing migratory birds is unlawful. Projects that are likely to result in the taking of birds protected under the Migratory Bird Treaty Act will require the issuance of take permits from the USFWS. Activities that would require such a permit would include, but not be limited to, the destruction of migratory bird nesting habitat during the nesting season when eggs or young are likely to be present. Under the act, surveys are required to determine if nests will be disturbed and, if so, a buffer area with a specified radius around the nest would be established so that no disturbance or intrusion would be allowed until the young had fledged and left the nest. If not otherwise specified in the permit, the size of the buffer area would vary with species and local circumstances (e.g.

presence of busy roads), and would be based on the professional judgment of the monitoring biologist.

4.7.1.2 State

California Endangered Species Act

The California Department of Fish and Game is responsible for the administration of the California Endangered Species Act. Unlike the federal Endangered Species Act, there are no State agency consultation procedures under the California Endangered Species Act. For projects that affect both a State and federal listed species, compliance with the federal Endangered Species Act will satisfy the California Endangered Species Act if the California Department of Fish and Game determines that the federal incidental take authorization is "consistent" with the California Endangered Species Act. Projects that result in a take of a State-only listed species require a take permit under the California Endangered Species Act. The federal and/or State acts also lend protection to species that are considered rare enough by the scientific community and trustee agencies to warrant special consideration, particularly with regard to protection of isolated populations, nesting or den locations, communal roosts, and other essential habitat.

California Fish and Game Code Sections 3500 - 3705, Migratory Bird Protection

Sections 3500 through 3705 of the California Fish and Game Code regulate the taking of migratory birds and their nests. These codes prohibit the taking of nesting birds, their nests, eggs, or any portion thereof during the nesting season. Typically, the breeding/nesting season is from March 1st through August 30th. Depending on each year's seasonal factors, the breeding season can start earlier and/or end later.

4.7.1.3 Local

Los Angeles County General Plan

The *Los Angeles County General Plan* identifies Significant Ecological Areas (SEAs) containing biological resources and sets forth the goal of conserving these areas. While development within an SEA is not prohibited, the Plan does require development to be limited and controlled in order to avoid impacting valuable biological resources.

City of Los Angeles Native Tree Protection Ordinance

In an effort to slow the decline of native tree habitat, the City of Los Angeles passed a Native Tree Protection Ordinance (Ordinance No. 177,404), which became law on April 23, 2006. The Native Tree Protection Ordinance:

- Protects all native oak tree species (Quercus Spp) including California Sycamore (Platanus Racemosa), California Bay (Umbellularia Californica), and California Black Walnut (Juglans Californica);
- Applies to protected trees four inches or greater in diameter, at 4.5 feet above ground (multiple trunk trees are calculated by cumulative diameter);
- Applies to protected trees on private lots; and
- Requires that a protected tree report be submitted by a registered consulting arborist, landscape architect, or pest control advisor who is also a certified arborist.

Protected tree removal requires a removal permit by the Board of Public Works. Any act that may cause the failure or death of a protected tree requires inspection by the City's Urban Forestry Division. Although the law does not require a permit for the pruning of protected trees, the City recommends consultation with a certified arborist to ensure that the pruning of protected trees is performed carefully.

City of Inglewood General Plan

The *City of Inglewood General Plan* includes a chapter identifying the existing environmental resources in the City of Inglewood based on a search of the California Natural Diversity Database and reconnaissance level surveys. The Plan states that no protected species occur within the City of Inglewood, but redevelopment efforts would be impacted if any species are identified in the future through focused field surveys.

City of El Segundo General Plan

The *City of El Segundo General Plan* identifies sensitive plant and animal species that exist within the City and sets forth a policy for conservation. While most native vegetation has been replaced with landscaped exotic vegetation, some important plant communities do exist within the City of El Segundo, including the southern dune scrub plant community within the El Segundo Dunes. Several sensitive and endangered species, including the El Segundo Blue Butterfly and the Pacific Pocket Mouse, are known to exist in the El Segundo Dunes. In addition, the City's coastal area provides foraging habitat for shorebirds.

4.7.2 Affected Environment/Existing Conditions

This section identifies areas within 0.25 mile of either side of the proposed alignments, stations, and maintenance and operations facility sites that may be considered to have biological resources. In general, the proposed alignments and stations are located within a highly developed and urbanized area and potential biological resources are limited to a few small parks. These parks are primarily landscaped areas and wildlife species utilizing the parks are mostly those adapted to living in an urban environment. Native plant species are mainly limited to those few, such as California Sycamore, preserved within public parks. Table 4-43 presents rare wildlife and plant species and ecosystems (plant communities) listed on the CNDDB as having the potential to occur within the three 7.5-minute quadrants associated with the project alternatives.

Sensitive animal and plant species and vegetation communities identified by the CNDDB as having the potential to occur within 0.25 mile of either side of the proposed alignments, stations, and maintenance and operations facility sites are largely absent. Due to their mobility, some sensitive bird species may utilize existing mature trees during migration, but would not be supported as residents within this urbanized setting. With the exception of the small pond located within the Inglewood Park Cemetery, there are no wetland areas within 0.25 mile of either side of the proposed alignments, stations, and maintenance and operations facility sites. Vegetation around this pond is non-native, landscaped vegetation, but waterfowl were observed utilizing the small amount of open water there. No wildlife corridors exist within this area to support movement of wildlife species other than birds. There are no Habitat Conservation Plans (HCPs) for this area.

Table 4-43. Ecosystems and Special Status Wildlife and Plant Species within the Biological Study Area

Common Name	Scientific Name	Status
Ecosystems (Vegetation Communities)		
Southern Dune Scrub	Southern Dune Scrub	None
Southern Coastal Salt Marsh	Southern Coastal Salt Marsh	None
Southern Sycamore Alder Riparian Woodland	Southern Sycamore Alder Riparian Woodland	None
California Walnut Woodland	California Walnut Woodland	None
Birds		
California Brown Pelican	Pelecanus Occidentalis Californicus	FE[1]/CE[2]
Western Snowy Plover	Charadrius AlexanDrinus Nivosus	FT[3]/SC[4]
California Least Tern	Sternula Antillarum Browni	FE[1]/CE[2]
Burrowing Owl	Athene Cunicularia	SC[4]
Southwestern Willow Flycatcher	Empidonax Traillii Extimus	CE
Coastal California Gnatcatcher	Polioptila Californica Californica	FT[3]/SC[4]
Belding's Savannah Sparrow	Passerculus Sandwichensis Beldingi	CE[2]
Mammals		
Hoary Bat	Lasiurus Cinereus	SC[4]
Pallid Bat	Antrozous Pallidus	SC[4]
Big Free-tailed Bat	Nyctinomops Macrotis	SC[4]
Western Mastiff Bat	Eumops Perotis Californicus	SC[4]
Pocketed Free-tailed Bat	Nyctinomops Femorosaccus	SC[4]
Southern California Saltmarsh Shrew	Sorex Ornatus Salicornicus	SC[4]
Pacific Pocket Mouse	Perognathus Longimembris Pacificus	FE[1]/SC[4]
South Coast Marsh Vole	Microtus Californicus Stephensi	SC[4]
American Badger	Taxidea Taxus	SC[4]
Reptiles		
Southwestern Pond Turtle	Actinemys Marmorata Pallida	SC[4]
Coast (San Diego) Horned Lizard	Phrynosoma Coronatum (Blainvillii Population)	SC[4]
Invertebrates		
Sandy Beach Tiger Beetle	Cicindela Hirticollis Gravida	None
Senile Tiger Beetle	Cicindela Senilis Frosti	None
Globose Dune Beetle	Coelus Globosus	None
Lange's El Segundo Dune Weevil	Onychobaris Langei	None
Dorothy's El Segundo Dune Weevil	Trigonoscuta Dorothea Dorothea	None
Belkin's Dune Tabanid Fly	Brennania Belkini	None
Henne's Eucosman Moth	Eucosma Hennei	None
Busck's Gallmoth	Carolella Busckana	None
Wandering Skipper	Panoquina Errans	None
El Segundo Blue Butterfly	Euphilotes Battoides Allyni	FE[1]
Monarch Butterfly	Danaus Plexippus	None
Mimic Tryonia	Tryonia Imitator	None

Table 4-43. Ecosystems and Special Status Wildlife and Plant Species within the Biological Study Area (continued)

Common Name	Scientific Name	Status
Monarch Butterfly	Danaus Plexippus	None
Mimic Tryonia	Tryonia Imitator	None
Plants		
Orcutt's Pincushion	Chaenactis Glabriuscula Var. Orcuttiana	SEC[6]
Southern Tarplant	Centromadia Parryi Ssp. Australis	SEC[6]
Coulter's Goldfields	Lasthenia Glabrata Ssp. Coulteri	SEC[6]
Beach Spectaclepod	Dithyrea Maritima	CT[5]/SEC[6]
Ventura Marsh Milk-Vetch	Astragalus Pycnostachyus Var. Lanosissimus	FE[1]/CE[2]/SEC[6]
Coastal Dunes Milk-Vetch	Astragalus Tener Var. Titi	FE[1]/CE[2]/SEC[6]
Braunton's Milk-Vetch	Astragalus Brauntonii	FE[1]/SEC[6]
Brand's Star Phacelia	Phacelia Stellaris	FC[7]/SEC[6]
San Fernando Valley Spineflower	Chorizanthe Parryi Var. Fernandina	FC[7]/CE[2]/SEC[6]
Prostrate Navarretia	Navarretia Prostrata	SEC[6]
Spreading Navarretia	Navarretia Fossalis	FT[3]/SEC[6]
California Orcutt Grass	Orcuttia Californica	FE[1]/CE[2]/SEC[6]
San Bernardino Aster	Symphyotrichum Defoliatum	FEC[8]
Greata's Aster	Symphyotrichum Greatae	NVEC[9]
Ballona Cinquefoil	Potentilla Multijuga	PEC[10]
Los Angeles Sunflower	Helianthus Nuttallii Ssp. Parishii	PEC[10]
Santa Barbara Morning-Glory	Calystegia Sepium Ssp. Binghamiae	PEC[10]
White Rabbit-Tobacco	Pseudognaphalium Leucocephalum	RTECCE[11]
Marsh Sandwort	Arenaria Paludicola	FE[1]/CE[2]/SEC[6]
Davidson's Saltscale	Atriplex Serenana Var. Davidsonii	FEC[8]
Many-Stemmed Dudleya	Dudleya Multicaulis	FEC[8]
Round-leaved Filaree	California Macrophylla	SEC[6]
Mesa Horkelia	Horkelia Cuneata Ssp. Puberula	SEC[6]
Plummer's Mariposa-lily	Calochortus Plummerae	FEC[8]

Source: California Natural Diversity Database (CNDDB), January 7, 2008
[1]FE - Federally Endangered (U.S. Fish and Wildlife Service).
[2]CE - California Endangered (California Department of Fish and Game).
[3]FT - Federally Threatened (U.S. Fish and Wildlife Service).
[4]SC - Species of Concern in California (California Department of Fish and Game).
[5]CT - California Threatened (California Department of Fish and Game).
[6]SEC - Seriously Endangered in California (California Native Plant Society).
[7]FC - Candidate for Federal Listing (U.S. Fish and Wildlife Service).
[8]FEC - Fairly Endangered in California (California Native Plant Society).
[9]NVEC - Not Very Endangered in California (California Native Plant Society).
[10]PEC - Presumed Extinct in California (California Native Plant Society).
[11]RTECCE - Rare, Threatened or Endangered in California but Common Elsewhere (California Native Plant Society).

There are no SEAs located within 0.25 mile of either side of the proposed alignments, stations, and maintenance and operations facility sites.

Visual surveys were conducted on January 9, 2008 and May 14, 2008. The surveys consisted of visual observation and photographic documentation of all parks and open space areas within 0.25 mile of either side of the proposed alignments, stations and maintenance and operations facility sites. During the surveys, mature trees existing in roadway medians directly within the proposed alignments were also observed. During the visual observations, there were only a handful of native tree species along the alignment that have the potential to be affected. However, there was a rough approximation of 50 non-native tree species along the alignment that could support birds during nesting season.

Refer to Section 4.12 Parklands and Community Facilities for the location of the parks described in the following subsections.

4.7.2.1 Wilshire Boulevard

There are no designated or sensitive biological resources located along the Wilshire Boulevard portion of the project. The Wilshire Boulevard portion of the project is associated with the No Build, TSM and BRT Alternatives.

4.7.2.2 Crenshaw Boulevard

There are no designated or sensitive biological resources located along the Crenshaw Boulevard portion of the project. There are three parks located within 0.25 mile of the Crenshaw Boulevard portion of the project. The Harold A. Henry Park, located north of Olympic Boulevard and to the west of Crenshaw Boulevard, is a small neighborhood park that contains playground and picnic areas and a number of large mature trees including pine, eucalyptus, and palm trees. The Washington Irving Pocket Park is located adjacent to the Washington Irving Library, just east of Crenshaw Boulevard on Washington Boulevard. The vegetation at this park is primarily grass and the park facility consists of a bench. The Leimert Plaza Park is located at the intersection of Crenshaw Boulevard/Vernon Avenue/Leimert Boulevard. This park consists of landscaped vegetation that does not support sensitive biological resources. All three parks are within 0.25 mile of the TSM and BRT Alternatives. The only park along the Crenshaw Boulevard portion of the project that is within 0.25 mile of the Base LRT Alternative is the Leimert Plaza Park.

4.7.2.3 Harbor Subdivision

There are no designated or sensitive biological resources located along the Harbor Subdivision portion of the project. Within 0.25 mile of the Harbor Subdivision, immediately adjacent to the project, are the City of Inglewood's Edward Vincent Jr. Park and nearby Inglewood Park Cemetery. The Edward Vincent Jr. Park is a 55-acre park that consists of several playgrounds, soccer fields, tennis courts, a swimming pool, an amphitheater, and landscaped grounds. Mature trees, including sycamores, pines, palms, and carob trees exist in the park. Located across Florence Avenue from Edward Vincent Jr. Park, the Inglewood Park Cemetery comprises approximately 300 acres and contains the largest amount of open space within 0.25 mile of the Harbor Subdivision Alignment. Established in 1905, the Inglewood Park Cemetery supports biological resources including large open grassy areas, mature trees, and a small pond.

Mature palm trees line both sides of Florence Avenue in the area of the Edward Vincent Jr. Park and Inglewood Park Cemetery. These palms could provide potential roosting and nesting sites for birds, including raptors.

Also located within 0.25 mile south of Harbor Subdivision portion of the project, just west of La Brea Avenue, at the corner of Manchester Boulevard and Grevillea Avenue, is the Grevillea Park. Grevillea Park is a small narrow landscaped area with no equipment or buildings. The park consists of landscaping, including a couple of large mature California sycamore trees, along with a mural (the Helen Lundeberg History of Transportation mural). The large mature California sycamore trees could provide potential roosting and nesting sites for birds, including raptors.

In addition, Rogers Park is located within 0.25 mile of the Harbor Subdivision portion of the project, just north of Florence Avenue and west of La Brea Avenue. Rogers Park consists of a playground, various playing fields, a wading pool, a picnic area, and a multi-purpose recreation building. Vegetation within this park does not support biological resources.

In the southernmost segment of the Harbor Subdivision portion of the project, to the east of Aviation Boulevard between approximately Century Boulevard and Arbor Vitae Street, is an area known as Manchester Square. This area includes several parcels that the Los Angeles World Airports (LAWA) has purchased over the years as part of a voluntary residential relocation program (in lieu of sound-proofing) associated with the operation of LAX. Although no buildings remain on these vacant parcels, which vary in size from one lot to multiple lots, they are fenced areas that have grassy vegetation and trees. However, although these lots could provide food and cover for urban wildlife, no vegetation exists that would support sensitive biological resources.

All of the build alternatives (i.e., TSM, BRT and Base LRT Alternatives) are within 0.25 mile of the locations described above.

4.7.2.4 Other Areas

There are no designated or sensitive biological resources located within 0.25 mile of the proposed Site B or Site D maintenance and operations facility sites for the BRT and Base LRT Alternatives. However, the proposed use of Site D would involve construction at a location that is currently vacant. Based on a visual survey of the Site D on May 14, 2008, vegetation consists of native and non-native shrubs and grasses. No vegetation exists that would support sensitive biological resources. Mature trees line the border of the site with the adjacent office buildings. This vegetation may provide potential roosting and nesting sites for birds as well as food and cover for human-tolerant wildlife.

4.7.3 Environmental Impacts/Environmental Consequences

This section addresses the potential impacts of the project on ecosystems and biological resources. Potential impacts of the project on landscaping and landscaped areas, which are not special ecosystems nor contain significant biological resources, are further addressed above in Section 4.4, Visual Quality.

As described previously, the 0.25 mile area surrounding the proposed alignments, stations, and maintenance and operations facility sites is heavily urbanized. Due to lack of suitable habitat, none of the sensitive species listed by the CNDDB are anticipated to occur. Further, since there are no sensitive ecological areas, wetlands, wildlife migratory corridors, and/or habitat conservation areas within the area, none of the proposed alternatives would result in impacts to such biological resources.

The primary areas where biological resources do occur, and which could be potentially impacted by the operation of the project, are located immediately adjacent to the project. Parks, such as Leimert Park and Edward Vincent Jr. Park, are located directly within and adjacent to the project alignment.

4.7.3.1 Methodology

The methodology used to evaluate impacts to biological resources entails a review of the CNDDB to determine which threatened or endangered plant or animal species have the potential to occur within the 7.5-minute quadrangles in which the proposed alignments, stations, and maintenance and operations facility sites are located. The visual surveys were conducted to determine whether biological resources, including sensitive ecological areas, wetlands, wildlife migratory corridors, and/or habitat conservation areas, occur within 0.25 mile of the proposed alignments, stations, and maintenance facility sites to support these sensitive species. If the project could potentially impact biological resources that exist within this area, there would be a potential for adverse impacts.

4.7.3.2 No-Build Alternative

The No-Build Alternative would not result in any substantial physical impacts to ecological or biological resources. Therefore, there would be no adverse impacts to sensitive species or habitat.

4.7.3.3 TSM Alternative

The TSM Alternative would not result in any substantial physical impacts to ecological or biological resources. Therefore, there would be no adverse impacts to sensitive species or habitat.

4.7.3.4 BRT Alternative

As described above, there are currently no sensitive species or habitat located directly within the project area. The BRT Alternative would require removal or disturbance (including trimming) of mature trees along the proposed alignment. The BRT Alternative, adjacent to the Edward Vincent Jr. Park (within the Harbor Subdivision portion of the project), would require the removal of two rows of existing palm trees located north and south of the Harbor Subdivision. These mature trees provide potential nesting and roosting habitat for select bird species, including raptors. Removal or disturbance of this vegetation during the nesting season could affect the habitat and any bird species that are present. Mitigation measure **EB1**, described below, would be implemented to ensure no adverse impact would occur.

In addition, the BRT Alternative could result in removal of native tree species (as defined in the Native Tree Protection Ordinance) located along Crenshaw Boulevard within the

City of Los Angeles. However, compliance with the Native Tree Ordinance would ensure no adverse impact would occur. If the project requires pruning or removal of native tree species, mitigation measure **EB2**, as described below, would be implemented to ensure that the pruning or removal would not damage or adversely impact the trees.

In conclusion, through compliance with existing ordinances and implementation of mitigation measures, the BRT Alternative would not be anticipated to have an adverse impact on biological resources. In addition, operation of the BRT Alternative would be along a defined corridor within a highly urbanized area. Therefore, no adverse impacts on biological resources are anticipated.

4.7.3.5 Base LRT Alternative

As described above, there are currently no sensitive species or habitat located directly within the project area. The Base LRT Alternative could require removal or disturbance of mature trees along Crenshaw Boulevard. Removal or disturbance of vegetation during the nesting season could affect the habitat and any bird species that are present. Mitigation measure **EB1**, described below, would be implemented to ensure no adverse impact would occur. In addition, compliance with the City of Los Angeles Native Tree Ordinance would ensure that no adverse impact would occur. If the project requires pruning or removal of native tree species, mitigation measure **EB2**, as described below, would be implemented to ensure that the pruning or removal would not damage or adversely impact the trees.

Through compliance with existing applicable ordinances and implementation of mitigation measures, the Base LRT Alternative is not anticipated to have an adverse impact on biological resources. In addition, operation of the Base LRT Alternative would be along a defined corridor within a highly urbanized area. Therefore, no adverse impacts on biological resources are anticipated.

4.7.3.6 LRT Alternative Design Options

Similar to the Base LRT Alternative, the design options are unlikely to result in substantial impacts to biological resources. As with the Base LRT Alternative, removal or disturbance of vegetation during the nesting season could affect the habitat and any bird species that are present. Mitigation measure **EB1**, described below, would be implemented to ensure no adverse impact to biological resources would occur. If any trees to be pruned or removed include native trees, compliance with the City of Los Angeles Native Tree Ordinance would be required to ensure no adverse impact would occur. Mitigation Measure **EB2**, as described below, would be implemented to ensure that the pruning or removal would not damage or adversely impact the trees.

4.7.3.7 Maintenance and Operations Facility Sites

Of the two proposed maintenance and operations facility locations, only Site D is currently a vacant lot and contains various native and non-native shrubs, grasses and mature trees. The mature trees provide potential nesting sites for raptors and other birds. Should Site D be chosen as a maintenance and operations facility, the removal or disturbance of the mature trees may be required. Since removal or disturbance of trees during the nesting season could result in the loss of this habitat and individuals of select

bird species, mitigation measure **EB-1**, as described below, would be implemented to ensure no adverse impact to biological resources would occur.

With implementation of mitigation measures, the location of the proposed maintenance and operations facility at Site D is not anticipated to have an adverse impact on biological resources. In addition, operation of the facility at Site D would be within a developed site within an urbanized area. Therefore, no adverse impacts on biological resources are anticipated.

4.7.4 Mitigation Measures

To avoid violations of federal and State migratory bird protections and prevent impacts to bird species that may utilize trees located within the proposed alignments, stations, or maintenance facility sites, project construction will be timed to occur outside the breeding bird season, which occurs generally from March 1st through August 31st and as early as February 1st for raptors. However, if construction must occur during the nesting season, the following mitigation measure would be implemented:

EB1 Two biological surveys shall be conducted, one 15 days prior and a second 72 hours prior to construction that would remove or disturb suitable nesting habitat. The surveys shall be performed by a biologist with experience conducting breeding bird surveys. The biologist shall prepare survey reports documenting the presence or absence of any protected native bird in the habitat to be removed and any other such habitat within 300 feet of the construction work area (within 500 feet for raptors). If a protected native bird is found, surveys will be continued in order to locate any nests. If an active nest is located, construction within 300 feet of the nest (500 feet for raptor nests) will be postponed until the nest is vacated and juveniles have fledged and when there is no evidence of a second attempt at nesting.

EB2 If construction of the project requires pruning of native tree species, the pruning shall be performed in a manner that does not cause permanent damage or adversely affect the health of the trees. If construction of the project requires the removal of a native tree species, the affected tree species shall be relocated or replaced at a minimum ratio of 2:1 and subject to the conditions of the Native Tree Protection Ordinance under Article 6 Chapter IV of the Los Angeles City Municipal Code.

4.7.5 CEQA Determination

The *L.A. California Environmental Quality Act Thresholds Guide* addresses impacts to biological resources under Section C. The *L.A. CEQA Thresholds Guide* (page C-6) states that a project would normally have a significant impact on biological resources if it could:

- Result in the loss of individuals, or the reduction of existing habitat, of a state or federal listed endangered, threatened, rare, protected, or candidate species, or a Species of Special Concern or federally listed critical habitat;
- Result in the loss of individuals or the reduction of existing habitat of a locally designated species or a reduction in a locally designated natural habitat or plant community;

- Interfere with wildlife movement/migration corridors that may diminish the chances for long-term survival of a sensitive species;
- Result in the alteration of an existing wetland habitat; or
- Interfere with habitat such that normal species behaviors are disturbed (e.g., from the introduction of noise, light) to a degree that may diminish the chances for long-term survival of a sensitive species.

Because no wildlife corridors or wetlands exist within the proposed alignments, the thresholds described in the third and fourth bullets above are not applicable. However, because species of concern have the potential to occur within 0.25 mile of the proposed alignment, and because locally protected trees are known to exist, potential impacts to these biological resources were evaluated for each of the project alternatives, as well as the proposed maintenance and operations facility sites.

4.7.5.1 No-Build Alternative

The No-Build Alternative would not result in physical impacts to ecological and biological resources. Therefore, no impacts to sensitive species, habitat, or locally protected trees are anticipated.

4.7.5.2 TSM Alternative

The TSM Alternative would not result in physical impacts. Therefore, there are no impacts to sensitive species, habitat, or locally protected trees.

4.7.5.3 BRT Alternative

As previously discussed, the BRT Alternative would require removal or disturbance (including trimming) of mature trees located along the proposed alignment and/or stations. As these trees may provide nesting and roosting habitat for sensitive bird species, including raptors, mitigation measure **EB1** would be implemented to ensure impacts are less than significant. Specifically, the BRT Alternative adjacent to the Edward Vincent Jr. Park would require the removal of two rows of existing palm trees located north and south of the Harbor Subdivision. These mature trees provide potential nesting and roosting habitat for select bird species, including raptors. Removal or disturbance of this vegetation during the nesting season could affect this habitat and any present bird species. Mitigation measure **EB1** would be implemented to ensure impacts are less than significant.

In addition, since the BRT Alternative could result in removal of native trees adjacent to Crenshaw Boulevard, compliance with the City of Los Angeles Native Tree Protection Ordinance would be required to ensure impacts would be less than significant. If construction activities require the pruning or trimming of native tree species, than mitigation measure **EB2** would be implemented to ensure impacts are less than significant.

Operation of the BRT Alternative would be along a defined corridor within an urbanized area. Through compliance with existing ordinances and implementation of mitigation, the BRT Alternative is anticipated to have a less-than-significant impact on sensitive species, habitat, or locally protected trees biological resources.

4.7.5.4 Base LRT Alternative

As previously discussed, the Base LRT Alternative would require removal or disturbance of mature trees located along the proposed alignment and/or stations. Removal or disturbance of mature tress during the nesting season could affect this habitat and the present bird species. Mitigation measure **EB1** would be implemented to ensure impacts are less than significant. Compliance with the City of Los Angeles Native Tree Ordinance would ensure that impacts are less than significant. Although the ordinance does not require a permit for the pruning of protected trees, if the project requires pruning of native tree species, mitigation measure **EB2** would be implemented to ensure that the pruning would not damage or significantly impact the trees.

Operation of the Base LRT Alternative would be along a defined corridor within an urbanized area. Compliance with existing ordinances and implementation of mitigation measures would result in a less-than-significant impact on sensitive species, habitat, or locally protected trees biological resources for the Base LRT Alternative.

Design Options

Similar to the Base LRT Alternative, these design options are unlikely to result in significant impacts to biological resources. However, if vegetation were to be removed or disturbed during the nesting season, impacts to birds and habitat could occur. Mitigation measure **EB1** would be implemented to ensure that impacts to these biological resources are less than significant. In addition, if any trees to be removed include native trees, compliance with the City of Los Angeles Native Tree Ordinance would be required. Although the ordinance does not require a permit for the pruning of protected trees, if the project requires pruning of native tree species, mitigation measure **EB2** would be implemented to ensure that impacts from pruning would be less than significant.

4.7.5.5 Maintenance and Operations Facility Sites

The BRT and Base LRT Alternatives would require construction and operation of a maintenance and operations facility at Sites B or D. Construction of the proposed facility at Site D could require the removal or disturbance (including trimming) of mature trees located at the site. These trees may provide nesting and roosting habitat for sensitive bird species, including raptors, and mitigation measure **EB1** would be implemented to ensure impacts are less than significant.

Operation of the maintenance and operations facility sites would be within a developed site within an urbanized area. With implementation of mitigation measures, the proposed maintenance and operations facility sites are anticipated to have a less-than-significant impact on sensitive species, habitat, or locally protected trees.

4.7.6 Impacts Remaining After Mitigation

Implementation of mitigation measures **EB1** and **EB2** would reduce potential impacts to biological resources to less-than-significant levels.

4.8 Geotechnical/Subsurface/Seismic/Hazardous Materials

This section describes the existing geologic conditions of the Crenshaw Transit Corridor study area. The geologic conditions that are addressed include general topography, geologic materials, faults and seismicity, and potential hazardous materials. An analysis is presented evaluating the project alternatives, design options, and maintenance and operations facility sites.

4.8.1 Regulatory Framework

Information on geology, soils, seismicity, and hazardous materials has been identified as a result of a review of available published and unpublished literature from applicable federal, State, and local agencies. Presented below are brief discussions of the regulatory framework applicable to the jurisdictions located within the study area.

4.8.1.1 Federal

Hazardous Materials Resources

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 defines the term hazardous substance as any substance, material, or waste, the exposure to which results in, or may result in, adverse effects on health or safety.

4.8.1.2 State

Geology, Soils, and Seismicity Resources

Principal state guidance relating to geologic hazards is contained in the Alquist-Priolo Act (Public Resource Code [PRC]. 2621 et seq.) and the Seismic Hazards Mapping Act of 1990 (PRC 2690-2699.6). The Alquist-Priolo Act prohibits the location of most types of structures for human occupancy across active traces of faults in earthquake fault zones, shown on maps prepared by the state geologist, and regulates construction in the corridors along active faults (earthquake fault zones). The Seismic Hazards Mapping Act of 1990 focuses on hazards related to strong ground shaking, liquefaction, and seismically-induced landslides. Under its provisions, the State is charged with identifying and mapping areas at risk of strong ground shaking, liquefaction, landslides, and other corollary hazards. The maps are to be used by cities and counties in preparing their general plans and adopting land use policies to reduce and mitigate potential hazards to public health and safety.

Pursuant to the Surface Mining and Reclamation Act (PRC 2710 et seq.), the State Mining and Geology Board identifies, in adopted regulations, areas of regional significance that are known to contain mineral deposits judged to be important in meeting the future needs of the area (PRC 2426 and 2790; Title 14 PRC 3350, et seq.). The State Mining and Geology Board also adopts State policy for the reclamation of mined lands and certifies local ordinances for the approval of reclamation plans as being consistent with State policies (PRC 2755-2764, 2774 et seq.).

Hazardous Materials Resources

The California Health and Safety Code (Sections 25316 and 25317) identifies the substances, materials, and wastes that require hazardous substance removal, including petroleum and petroleum by-products, waste oil, crude oil, and natural gas. Other

pertinent regulations include the Resource Conservation and Recovery Act (RCRA), the Clean Water Act, and any Department of Transportation standards.

4.8.1.3 Local

The local jurisdictions, departments, and documents that regulate and oversee issues related to geology, soils, seismicity, and hazardous materials within the study area are listed below.

The City of Los Angeles

Geology, Soils, and Seismicity Resources

- The 1996 City of Los Angeles General Plan, Safety Element
- The City of Los Angeles Department of Public Works
- The City of Los Angeles Department of Building and Safety

Hazardous Materials Resources

- The City of Los Angeles Department of Building and Safety
- The City of Los Angeles Bureau of Sanitation, Industrial Waste Management Division
- The City of Los Angeles Fire Department, Hazardous Materials Division
- The City of Los Angeles Fire Department, Underground Storage Tank Division

The City of Inglewood

Geology, Soils, and Seismicity Resources

- The City of Inglewood General Plan (1980s and 1990s)
- The 2006 City of Inglewood General Plan Update, Technical Background Report
- The City of Inglewood Public Works Department
- The City of Inglewood Planning and Building Services Department

The City of Hawthorne

Geology, Soils, and Seismicity Resources

- The City of Hawthorne General Plan
- The City of Hawthorne Department of Building of Safety
- The City of Hawthorne Public Works Department

The City of El Segundo

Geology, Soils, and Seismicity Resources

- The 1992 City of El Segundo General Plan, Public Safety Element
- The City of El Segundo Public Works Department
- The City of El Segundo Planning and Building Safety Department

The County of Los Angeles

Geology, Soils, and Seismicity Resources

- The 1990 Los Angeles County General Plan, Seismic Safety Element
- The County of Los Angeles Department of Public Works

Hazardous Materials Resources

- The County of Los Angeles Regional Water Quality Control Board

The State of California

Hazardous Materials Resources

- The Department of Toxic Substances Control

4.8.2 Existing Conditions/Affected Environment

4.8.2.1 Regional Setting

The study area ranges in elevation across its length from approximately 220 feet above mean sea level (amsl) at Wilshire Boulevard to approximately 120 feet amsl at Rodeo Road, to a topographic high of approximately 180 feet amsl near the junction with Slauson Avenue, and to an approximate elevation of 160 feet amsl near the junction with the Harbor Subdivision right-of-way. It has an approximately 170 feet amsl near the Inglewood Park Cemetery (where it crosses the southern portion of the Baldwin Hills), and an approximately 100 feet amsl at the southern end near its terminus east of Los Angeles International Airport.

A review of the Hollywood and Inglewood, California 7.5 Minute Quadrangle Topographic Maps indicates that local surface-water sheet flow is generally toward the south-southeast along the portion of the alignment north of Florence Avenue. South of Florence Avenue, sheet flow is generally toward the south, as indicated on the Venice, California 7.5 Minute Quadrangle Topographic Map (U.S. Geological Survey [USGS], 1964).

4.8.2.2 Regional Geology

The project alignment traverses the Los Angeles Basin. The Los Angeles Basin, a structural trough, is a northwest-trending, alluvium lowland plain that is approximately 50 miles long and 20 miles wide. Mountains and hills that generally expose Late Cretaceous to Late Pleistocene-age sedimentary and igneous rocks bound the basin along the north, northeast, east, and southeast. The Los Angeles Basin is part of the Peninsular Ranges geomorphic province of California, which is characterized primarily by four sub-parallel structural blocks: the Northeastern, Northwestern, Southwestern, and Central Blocks, and is sliced longitudinally by young, steeply dipping northwest-trending fault zones. The Los Angeles Basin, located at the northerly terminus of the Peninsular Ranges, is the site of active sedimentation and the strata is interpreted to be as much as 31,000 feet thick in the center of the synclinal trough of the Central Block of the Los Angeles Basin. The project alignment traverses the southern portion of the Central Block, the Newport-Inglewood Fault Zone (NIFZ), and the northern portion of the Southwestern Block of the Los Angeles Basin.

Present structural relief of the basin resulted chiefly from upper Miocene to Lower Pliocene differential sinking, local uplift, folding, and faulting. Deformation of the basin continues through present time, as evidenced by warped Quaternary strata, relative uplift and subsidence of highland and lowland areas, and historical earthquakes along the NIFZ, as well as other regional faults within the basin.

4.8.2.3 Regional Hazardous Materials

The study area traverses urbanized areas containing small commercial buildings, parking lots, gasoline stations, and interspersed residential developments. The potential for encountering pre-existing hazardous waste material is present during any construction project, particularly within an urban area.

Since the proposed alignment traverses current or historic oil production areas, including two oil fields, it is likely that some hazardous substances, such as hazardous natural soil gases and petroleum-contaminated soil and groundwater, could be encountered.

These hazardous substances could be encountered during construction of underground segments and foundation excavations. The numerous potential sources of petroleum-based contamination and the migration of the contaminant, via groundwater flow, could make it difficult to precisely determine the impacted areas.

4.8.2.4 Specific Geologic Setting

Wilshire Boulevard/Crenshaw Boulevard to Rodeo Road

The project alignment would begin at the Wilshire Boulevard/Western Avenue intersection and extend west on Wilshire Boulevard to Crenshaw Boulevard, then continue south on Crenshaw Boulevard to Rodeo Road. This alignment is within the Central Block of the Los Angeles Basin and travels through the Las Cienegas oil field (north of the Interstate 10 Freeway). The geologic materials within this area generally consist of artificial fill, overlying slightly elevated and dissected Quaternary-age alluvial fan sediments. These deposits include sediments in modern stream channels and on their alluvial fans and floodplains formed by coalesced fans of the Los Angeles River, the Rio Hondo, the San Gabriel River, and the ancestral Santa Ana River. These deposits are predominately unconsolidated to weakly consolidated detritus sediments, generally dissected and eroded, consisting of silt, clay, sand, and gravel.

Crenshaw Boulevard

This portion of the project alignment begins at Rodeo Road in the north, trends southward along Crenshaw Boulevard, travels through the northeastern alluvial slopes of the Baldwin Hills area, and to 67th Street (immediately south of the Harbor Subdivision right-of-way). This portion of the alignment is within the Central Block of the Los Angeles Basin. The geologic materials generally consist of artificial fill placed during the development of roads and pads for the Inglewood oil field in the early 1920s, residential development in the 1940's and 1950s, and the Baldwin Hills reservoir, which was constructed in the 1950s and failed on December 14th, 1963. These fill deposits are overlying slightly elevated and dissected Quaternary-age alluvial fan deposits. These alluvial deposits washed out onto the floodplains as coalescing alluvial fans, which is especially common on the steep

northeastern flanks. Alluvium in this area generally consists of sand intermixed with clay, silt, and gravel, varying in composition depending on the composition of the source rock.

Harbor Subdivision Right-of-Way to Imperial Highway

This portion of the project alignment begins at 67th Street, trends southwest along the Harbor Subdivision Right-of-Way, turning south at Manchester Boulevard, and continuing to proceed south along Aviation Boulevard to its terminus at the Imperial Highway (east of the LAX). This alignment is within the western portion of the Central Block, the NIFZ in the Baldwin Hills area, and the Southwestern Block of the Los Angeles Basin. The Southwestern Block bounds the steep southwest flank of the central synclinal trough, from which the Southwestern Block is separated by the northwest-trending NIFZ of deformation.

The Baldwin Hills are the most prominent and youngest topographic feature along the northwest-trending NIFZ of faulting and folding within the Los Angeles Basin. The hills consist of a dome-like prominence rising in elevation to 150 to 200 feet amsl, with steeper northern slopes and gentler southern slopes. The surfaces of these hills are deeply dissected. The Baldwin Hills lie across and are an expression of the NIFZ which comprises a complex system of faults and folds that extends from West Los Angeles, southeast through the Inglewood-Long Beach areas of Los Angeles County, into Orange County, and offshore toward San Diego. The rocks and sediments that make up the terrain of the Baldwin Hills were formed within the last 2 million years; have been uplifted at an average rate of 0.5 to 0.8 centimeters/year; are weakly indurated and cemented; and, due to the steep terrain, are extremely vulnerable to landslides and erosion; triggered principally by sustained, heavy rains.

The geologic materials within this portion of the alignment generally consist of artificial fill derived from local geologic units, pre-development landslides, and colluvium and alluvium overlying mainly unconsolidated bedded sand, gravel, clay, and silt. Floodplain deposits bordering the west sides of the Baldwin Hills were mostly deposited by the ancestral Los Angeles river system and its recent descendant, Ballona Creek, and generally consist of alluvium comprised of varying proportions of gravel, sand, silt, and clay. The area immediately west of the Baldwin Hills, overlain by floodplain deposits, was named the Ballona Plain by Tieje (1926), who described deposits of peat, clayey sand, and boulder gravel overlying tilted Pleistocene beds. The peat is a component of marshy areas observed in older aerial photographs and maps, including early soil maps of the area.

4.8.2.5 Subsurface Gases

The proposed alignment traverses two oil fields: La Cienegas and Inglewood. Common problems associated with oil field properties include the release of methane and hydrogen sulfide soil gas, oil seepage, contaminated soils, leaking wells, and wells not plugged and abandoned to current standards.

Based on the Geologic Map of the Hollywood and Burbank (South 1/2) Quadrangles, Los Angeles County, California, the proposed alignment will traverse the Las Cienegas oil field south of Olympic Boulevard and east of La Brea Avenue. The oil field was discovered in 1961 and is currently an actively producing oil field. Wells drilled near the

Las Cienegas oil field bottom at relatively shallow depths encountered gneissic metadiorite.[11]

The proposed alignment will traverse a portion of the Inglewood oil field when crossing the southern Baldwin Hills. The oil field was discovered in 1924 by the Standard Oil Company and is currently an actively producing oil field. Wells drilled in the Inglewood oil field bottom encountered both massive and foliated, intensely altered rhyolite porphyry.

Portions of the proposed alignment are within the City of Los Angeles Methane and Methane Buffer Zones. The location of the study area in relation to oil fields and the City of Los Angeles Methane and Methane Buffer Zones is presented in Figure 4-28, Oil Field Hazard Map.

4.8.2.6 Faults and Seismicity

General Setting

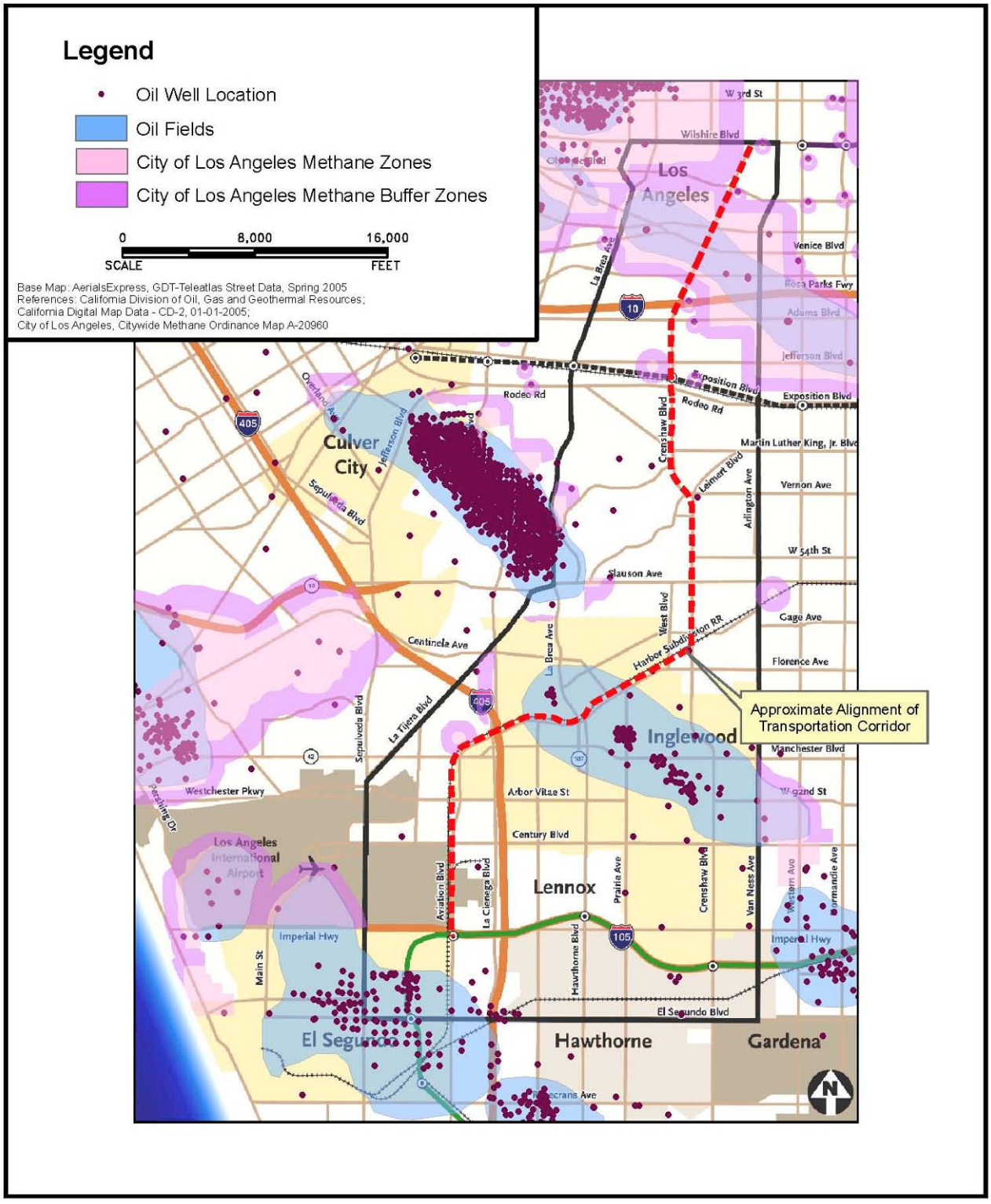
Two principal seismic considerations are surface rupturing of earth materials along fault traces and damage to structures due to seismically-induced ground shaking. The fault classification system adopted by the California Geological Survey (formerly California Division of Mines and Geology [CDMG]), relative to the state legislation delineating the earthquake fault zones along active or potentially active faults (Alquist-Priolo Act), is used for structures. An active fault is one that is known to have moved in Holocene time (the last 11,000 years). A fault that is known to have moved during the last 1.8 million years (Pleistocene time), but has not been proven by direct evidence to have either moved or not moved within the last 11,000 years, is considered to be potentially active. Any fault that has not moved during both Holocene and Pleistocene times (that is no movement within the last 1.8 million years), is considered to be inactive.

The NIFZ is a northwest-trending, approximately 2- to 4-mile wide belt of anticline folds[12] and faults disrupting early Holocene to Late Pleistocene-age and older deposits. The NIFZ is characterized by trends related to right-lateral shearing at depth (Moody and Hill, 1956). The zone defines the boundary between the western basement complex of Catalina-type schist and related rocks to the southwest, and the eastern basement complex of metasedimentary, metavolcanic, and plutonic rocks to the northeast. Right-lateral, strike-slip displacement of 3,000 to 5,000 feet has been measured in Lower Pliocene strata along the NIFZ (Dudley, 1954; Hill, 1954; Poland, et al., 1959). Apparent vertical offset across faults of the NIFZ ranges from 4,000 feet at the basement interface, to 1,000 feet in the Pliocene strata, and 200 feet at the Plio-Pleistocene boundary (Yerkes, et al., 1965). It has been inferred that movement along this structural zone was initiated during Middle Miocene period (circa 15 million years ago), with seismic activity continuing to the present time. There is abundant seismic evidence that the zone is tectonically active; thus, the surrounding metropolitan area is subject to certain seismic risks. At least five earthquakes of magnitude 4.8 or larger have been associated with the NIFZ since 1920.

[11] Gneissic, a coarse textural lineation noticed in the rock, is the result of the banding of light and dark colored minerals. Metadiorite is a name given to the metamorphosed granite (i.e., metadiorite) based on the percentage of quartz, alkaline, and plagioclase feldspars.

[12] Anticlinal folds are folds in a rock body from which the strata dip away in opposite directions. The core of the folds contains the oldest rocks, which convex upwards.

Figure 4-28. Oil Fields Map



Source: Parsons Brinckerhoff.

Based on the current understanding of the geologic framework of the area, the seismic hazard expected to have the highest probability of impacting the project alignment is ground shaking resulting from an earthquake occurring along any of several major active and potentially active faults in Southern California. Known regional active faults that could produce significant ground shaking along the project alignments include the Newport-Inglewood fault, the Santa Monica fault, the Puente Hills Blind Thrust, the Upper Elysian Park Blind Thrust, the Hollywood fault, and the Raymond fault, among others. The closest of these is the Newport-Inglewood fault, with a surface projection of potential rupture area located in the southern central section of the study area. The location of the study area in relation to known faults is shown in Figure 4-29.

Wilshire Boulevard/Crenshaw Boulevard
Table 4-44 is a summary of active faults, the approximate distance to the project alignments, the maximum earthquake magnitude, peak site acceleration, and estimated site intensity near the intersection of Wilshire Boulevard and Crenshaw Boulevard. All sources were reviewed for the seismic hazards study and were incorporated for the ground motion study.

Crenshaw Boulevard/Martin Luther King Jr. Boulevard
Table 4-45 is a summary of active faults, the approximate distance from the project alignments, the maximum earthquake magnitude, peak site acceleration, and estimated site intensity near the intersection of Crenshaw Boulevard and Martin Luther King Jr. Boulevard. All sources were reviewed for the seismic hazards study and were incorporated for the ground motion study.

Harbor Subdivision Right-of-Way
The project alignment crosses the NIFZ near two intersections: Florence Avenue and La Brea Avenue, and Florence Avenue and Prairie Avenue. The NIFZ has the potential to induce ground deformation by rupturing the ground surface.

The Overland fault trends northwest parallel to and between the Charnock fault to the west and the NIFZ to the east. The fault extends from the northwest flank of the Baldwin Hills to Santa Monica Boulevard in the vicinity of Overland Avenue. Based on groundwater level measurement, displacement along the fault is believed to be near vertical, with the western side being down-dropped approximately 30 feet (Poland et al , 1959) forming an apparent graben between the Charnock and Overland faults. There is no evidence that the Overland fault has offset the "50-foot gravel" which is apparently earliest Holocene or pre-Holocene in age. The Fault Activity Map of California considers this fault late Quaternary (700,000 to 1.6 million years ago) in age, thereby definition the Overland Fault is considered by the State as potentially active.

The project alignment crosses a mapped trace of the Charnock fault at the southernmost extension near the intersection of Aviation Boulevard and Imperial Highway (Jennings, 1977). The Charnock fault is an inferred fault paralleling the trend of the NIFZ. The attitude of the Charnock fault is not known. The Charnock fault fails to displace the "50-foot gravel" of the Ballona Gap (Poland et al., 1959), but is depicted as cutting the upper Pleistocene deposits. The fault has not been observed at the surface. The Charnock fault is likely Pre-Holocene and, thus, does not meet the state's definition of an active fault based on currently available information.

Figure 4-29. Geologic and Seismic Hazards Map

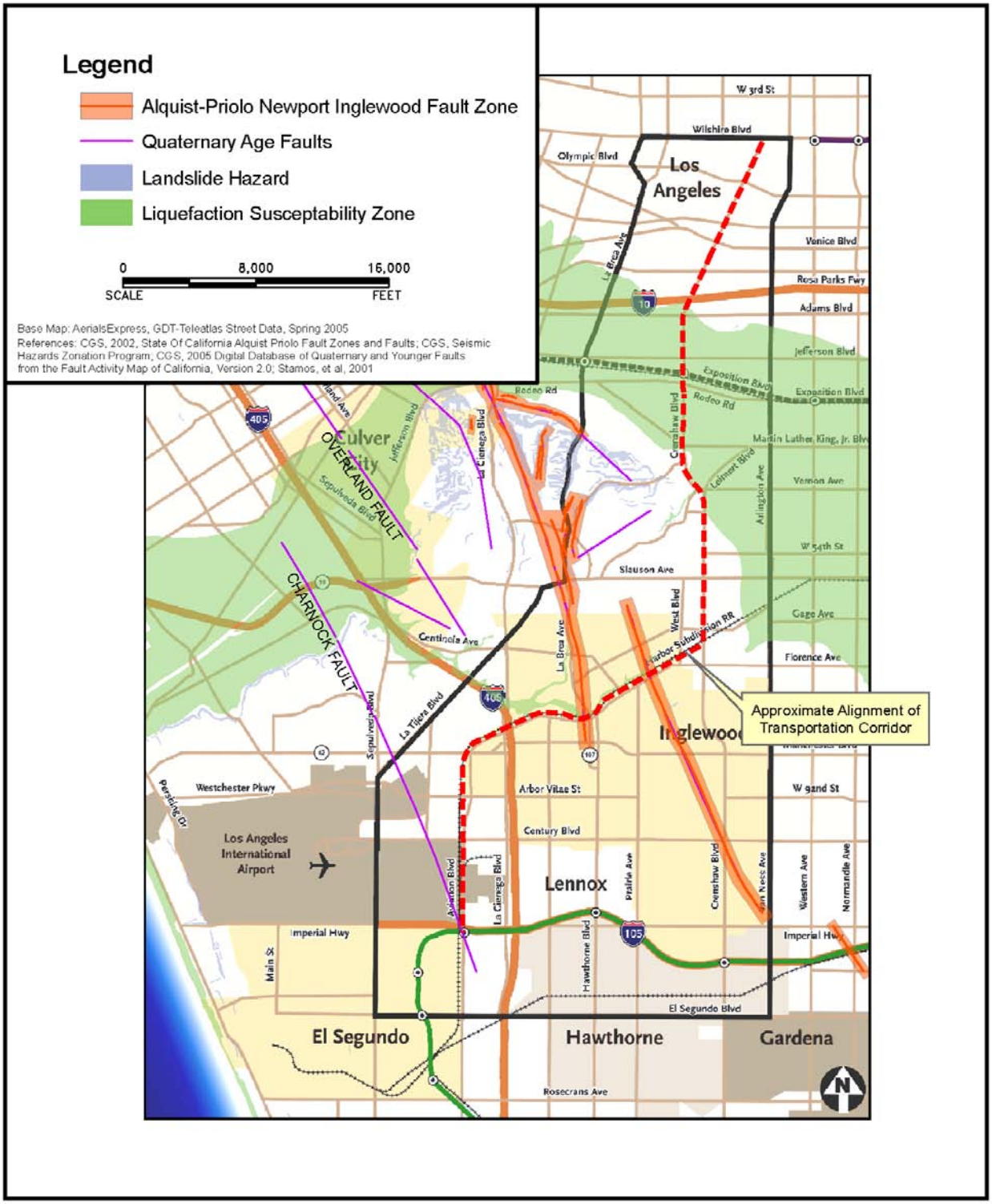


Table 4-44. Active Faults – Wilshire Boulevard/Crenshaw Boulevard

Abbreviated Fault Name	Approximate Distance from Alignments miles	Estimated Maximum Earthquake Event		
		Maximum Earthquake Magnitude (Mw)	Peak Site Acceleration (g)	Estimated Site Intensity (Modified Mercalli)
Hollywood	3.0	6.4	0.466	X
Newport-Inglewood (L.A. Basin)	3.5	7.1	0.412	X
Puente Hills Blind Thrust	3.7	7.1	0.524	X
Upper Elysian Park Blind Thrust	4.3	6.4	0.399	X
Santa Monica	4.8	6.6	0.414	X
Raymond	7.5	6.5	0.309	IX
Verdugo	8.7	6.9	0.327	IX
Malibu Coast	11.7	6.7	0.240	IX
Sierra Madre	13.1	7.2	0.277	IX
Northridge (E. Oak Ridge)	14.6	7.0	0.231	IX
Sierra Madre (San Fernando)	14.7	6.7	0.196	VIII
Palos Verdes	14.9	7.3	0.205	VIII
San Gabriel	17.9	7.2	0.167	VIII
Whittier	18.7	6.8	0.128	VIII
Santa Susana	20.3	6.7	0.143	VIII
Clamshell-Sawpit	20.4	6.5	0.124	VII
Anacapa-Dume	21.4	7.5	0.214	VIII
San Jose	25.7	6.4	0.088	VII
Simi-Santa Rosa	26.3	7.0	0.130	VIII
Holser	26.4	6.5	0.093	VII
Oak Ridge (Onshore)	31.1	7.0	0.108	VII
Chino-Central Ave. (Elsinore)	31.8	6.7	0.085	VII
San Joaquin Hills	34.1	6.6	0.072	VII
Cucamonga	34.2	6.9	0.090	VII
San Cayetano	35.7	7.0	0.092	VII
San Andreas - Whole M-1a	35.9	8.0	0.136	VIII
San Andreas - Mojave M-1c-3	35.9	7.4	0.093	VII
San Andreas - 1857 Rupture M-2a	35.9	7.8	0.120	VII
San Andreas - Cho-Moj M-1b-1	35.9	7.8	0.120	VII
Newport-Inglewood (Offshore)	40.4	7.1	0.066	VI
Elsinore (GLEN IVY)	42.3	6.8	0.050	VI
San Andreas - Carrizo M-1c-2	45.1	7.4	0.072	VI
Santa Ynez (East)	48.3	7.1	0.053	VI
San Jacinto-San Bernardino	48.8	6.7	0.038	V
San Andreas - SB-Coach. M-2b	50.2	7.7	0.078	VII

Table 4-44. Active Faults – Wilshire Boulevard/Crenshaw Boulevard (continued)

Abbreviated Fault Name	Approximate Distance from Alignments miles	Estimated Maximum Earthquake Event		
		Maximum Earthquake Magnitude (Mw)	Peak Site Acceleration (g)	Estimated Site Intensity (Modified Mercalli)
San Andreas - SB-Coach. M-1b-2	50.2	7.7	0.078	VII
San Andreas - San Bernardino M-1	50.2	7.5	0.067	VI
Ventura - Pitas Point	50.3	6.9	0.055	VI
Oak Ridge(Blind Thrust Offshore)	51.9	7.1	0.062	VI
Cleghorn	52.6	6.5	0.029	V

Source: EQFAULT (Blake, 2000)
Note: Peak Site Acceleration based on Sadigh et al. (1997).

Table 4-45. Active Faults – Crenshaw Blvd/Martin Luther King Jr. Blvd

Abbreviated Fault Name	Approximate Distance from Alignments miles	Estimated Maximum Earthquake Event		
		Maximum Earthquake Magnitude (Mw)	Peak Site Acceleration (g)	Estimated Site Intensity (Modified Mercalli)
Newport-Inglewood (L.A. Basin)	1.6	7.1	0.494	X
Puente Hills Blind Thrust	5.0	7.1	0.468	X
Santa Monica	6.0	6.6	0.370	IX
Hollywood	6.4	6.4	0.320	IX
Upper Elysian Park Blind Thrust	7.0	6.4	0.303	IX
Raymond	10.0	6.5	0.248	IX
Malibu Coast	11.4	6.7	0.245	IX
Verdugo	11.7	6.9	0.264	IX
Palos Verdes	11.9	7.3	0.241	IX
Sierra Madre	16.2	7.2	0.234	IX
Northridge (E. Oak Ridge)	17.1	7.0	0.201	VIII
Sierra Madre (San Fernando)	18.2	6.7	0.160	VIII
Whittier	18.3	6.8	0.131	VIII
Anacapa-Dume	20.7	7.5	0.221	IX
San Gabriel	21.4	7.2	0.141	VIII
Clamshell-Sawpit	22.4	6.5	0.112	VII
Santa Susana	23.2	6.7	0.123	VII
San Jose	26.0	6.4	0.087	VII
Simi-Santa Rosa	28.6	7.0	0.119	VII
Holser	29.3	6.5	0.082	VII

Table 4-45. Active Faults – Crenshaw Blvd/Martin Luther King Jr. Blvd (continued)

Abbreviated Fault Name	Approximate Distance from Alignments miles	Estimated Maximum Earthquake Event		
		Maximum Earthquake Magnitude (Mw)	Peak Site Acceleration (g)	Estimated Site Intensity (Modified Mercalli)
Chino-Central Ave. (Elsinore)	31.6	6.7	0.086	VII
San Joaquin Hills	31.8	6.6	0.079	VII
Oak Ridge (Onshore)	33.3	7.0	0.100	VII
Cucamonga	35.4	6.9	0.086	VII
Newport-Inglewood (Offshore)	37.7	7.1	0.072	VI
San Cayetano	38.2	7.0	0.084	VII
San Andreas - 1857 Rupture M-2a	39.1	7.8	0.110	VII
San Andreas - Mojave M-1c-3	39.1	7.4	0.085	VII
San Andreas - Whole M-1a	39.1	8.0	0.124	VII
San Andreas - Cho-Moj M-1b-1	39.1	7.8	0.110	VII
Elsinore (Glen Ivy)	41.4	6.8	0.051	VI
San Andreas - Carrizo M-1c-2	48.5	7.4	0.065	VI
San Jacinto-San Bernardino	50.1	6.7	0.037	V
Santa Ynez (East)	50.8	7.1	0.049	VI
Ventura - Pitas Point	51.6	6.9	0.053	VI
San Andreas - SB-Coach. M-2b	51.6	7.7	0.075	VII
San Andreas - SB-Coach. M-1b-2	51.6	7.7	0.075	VII
San Andreas - San Bernardino M-1	51.6	7.5	0.065	VI
Oak Ridge(Blind Thrust Offshore)	51.7	7.1	0.062	VI
Channel Is. Thrust (Eastern)	53.4	7.5	0.080	VII

Source: EQFAULT (Blake, 2000)
Notes: Peak Site Acceleration based on Sadigh and others. (1997).

Table 4-46. is a summary of active faults, the approximate distance from the project alignment at the intersection of Florence Avenue and Prairie Avenue, the maximum earthquake magnitude, peak site acceleration, and estimated site intensity where the NIFZ crosses the alignment. All sources were reviewed for the seismic hazards study and were incorporated for the ground motion study.

Table 4-47 is a summary of active faults, the approximate distance from the project alignments, the maximum earthquake magnitude, peak site acceleration, and estimated site intensity for near the intersection of Imperial Highway and Aviation Boulevard. All sources were reviewed for the seismic hazards study and were incorporated for the ground motion study.

Table 4-46. Active Faults – Harbor Subdivision Right-of-Way

Abbreviated Fault Name	Approximate Distance from Alignments miles	Estimated Maximum Earthquake Event		
		Maximum Earthquake Magnitude (Mw)	Peak Site Acceleration (g)	Estimated Site Intensity (Modified Mercalli)
Newport-Inglewood (L.A. Basin)	0.0	7.1	0.585	X
Puente Hills Blind Thrust	7.0	7.1	0.400	X
Santa Monica	7.5	6.6	0.320	IX
Hollywood	8.6	6.4	0.261	IX
Upper Elysian Park Blind Thrust	9.2	6.4	0.247	IX
Palos Verdes	9.6	7.3	0.278	IX
Malibu Coast	11.7	6.7	0.240	IX
Raymond	12.4	6.5	0.207	VIII
Verdugo	14.2	6.9	0.226	IX
Whittier	18.6	6.8	0.129	VIII
Sierra Madre	18.6	7.2	0.207	VIII
Northridge (E. Oak Ridge)	19.0	7	0.183	VIII
Anacapa-Dume	20.3	7.5	0.225	IX
Sierra Madre (San Fernando)	20.9	6.7	0.138	VIII
San Gabriel	24.1	7.2	0.126	VIII
Clamshell-Sawpit	24.2	6.5	0.102	VII
Santa Susana	25.4	6.7	0.111	VII
San Jose	26.8	6.4	0.084	VII
San Joaquin Hills	30.3	6.6	0.084	VII
Simi-Santa Rosa	30.4	7	0.111	VII
Holser	31.4	6.5	0.075	VII
Chino-Central Ave. (Elsinore)	32.1	6.7	0.084	VII
Oak Ridge (Onshore)	35.0	7	0.094	VII
Newport-Inglewood (Offshore)	36.0	7.1	0.076	VII
Cucamonga	36.5	6.9	0.083	VII
San Cayetano	40.1	7	0.080	VII
Elsinore (Glen Ivy)	41.2	6.8	0.052	VI
San Andreas - 1857 Rupture M-2a	41.7	7.8	0.103	VII
San Andreas - Whole M-1a	41.7	8	0.116	VII
San Andreas - Mojave M-1c-3	41.7	7.4	0.079	VII
San Andreas - Cho-Moj M-1b-1	41.7	7.8	0.103	VII
San Andreas - Carrizo M-1c-2	51.1	7.4	0.061	VI
San Jacinto-San Bernardino	51.3	6.7	0.036	V
Oak Ridge(Blind Thrust Offshore)	51.4	7.1	0.062	VI
Ventura - Pitas Point	52.6	6.9	0.052	VI
Santa Ynez (East)	52.6	7.1	0.047	VI
Channel Is. Thrust (Eastern)	53.1	7.5	0.081	VII

Table 4-46. Active Faults – Harbor Subdivision Right-of-Way (continued)

Abbreviated Fault Name	Approximate Distance from Alignments miles (km)	Estimated Maximum Earthquake Event		
		Maximum Earthquake Magnitude (Mw)	Peak Site Acceleration (g)	Estimated Site Intensity (Modified Mercalli)
San Andreas - San Bernardino M-1	53.1	7.5	0.063	VI
San Andreas - SB-Coach. M-1b-2	53.1	7.7	0.073	VII
San Andreas - SB-Coach. M-2b	53.1	7.7	0.073	VII
Coronado Bank	54.1	7.6	0.066	VI
Cleghorn	55.4	6.5	0.027	V
Oak Ridge Mid-Channel Structure	57.0	6.6	0.036	V
M. Ridge-Arroyo Parida-Santa Ana	58.4	7.2	0.057	VI
Elsinore (Temecula)	61.3	6.8	0.030	V
Red Mountain	61.4	7	0.045	VI

Source: EQFAULT (Blake, 2000)
Note: Peak Site Acceleration based on Sadigh et al. (1997).Imperial Highway/Aviation Boulevard

Table 4-47. Active Faults – Imperial Highway/Aviation Boulevard

Abbreviated Fault Name	Approximate Distance from Alignments miles	Estimated Maximum Earthquake Event		
		Maximum Earthquake Magnitude (Mw)	Peak Site Acceleration (g)	Estimated Site Intensity (Modified Mercalli)
Newport-Inglewood (L.A. Basin)	2.6	7.1	0.449	X
Palos Verdes	6.5	7.3	0.342	IX
Santa Monica	9.3	6.6	0.275	IX
Puente Hills Blind Thrust	9.8	7.1	0.326	IX
Hollywood	10.8	6.4	0.216	VIII
Malibu Coast	11.8	6.7	0.238	IX
Upper Elysian Park Blind Thrust	12.2	6.4	0.194	VIII
Raymond	15.5	6.5	0.167	VIII
Verdugo	17.3	6.9	0.188	VIII
Anacapa-Dume	19.3	7.5	0.235	IX
Whittier	20.3	6.8	0.118	VII
Northridge (E. Oak Ridge)	20.6	7.0	0.168	VIII
Sierra Madre	21.8	7.2	0.179	VIII
Sierra Madre (San Fernando)	23.9	6.7	0.119	VII
Clamshell-Sawpit	27.0	6.5	0.090	VII
San Gabriel	27.2	7.2	0.111	VII
Santa Susana	27.5	6.7	0.102	VII
San Jose	28.8	6.4	0.077	VII
San Joaquin Hills	29.7	6.6	0.086	VII

Table 4-47. Active Faults – Imperial Highway/Aviation Boulevard (continued)

Abbreviated Fault Name	Approximate Distance from Alignments miles	Estimated Maximum Earthquake Event		
		Maximum Earthquake Magnitude (Mw)	Peak Site Acceleration (g)	Estimated Site Intensity (Modified Mercalli)
Simi-Santa Rosa	31.9	7.0	0.105	VII
Holser	33.4	6.5	0.069	VI
Chino-Central Ave. (Elsinore)	33.6	6.7	0.079	VII
Newport-Inglewood (Offshore)	34.9	7.1	0.079	VII
Oak Ridge (Onshore)	36.4	7.0	0.090	VII
Cucamonga	38.8	6.9	0.077	VII
San Cayetano	41.6	7.0	0.076	VII
Elsinore (Glen Ivy)	42.1	6.8	0.050	VI
San Andreas - 1857 Rupture M-2a	44.9	7.8	0.095	VII
San Andreas - Whole M-1a	44.9	8.0	0.108	VII
San Andreas - Mojave M-1c-3	44.9	7.4	0.072	VI
San Andreas - Cho-Moj M-1b-1	44.9	7.8	0.095	VII
Oak Ridge(Blind Thrust Offshore)	50.4	7.1	0.064	VI
Channel Is. Thrust (Eastern)	51.8	7.5	0.083	VII
Coronado Bank	52.2	7.6	0.069	VI
Ventura - Pitas Point	52.9	6.9	0.051	VI
San Andreas - Carrizo M-1c-2	53.7	7.4	0.058	VI
San Jacinto-San Bernardino	53.7	6.7	0.033	V
Santa Ynez (East)	54.1	7.1	0.045	VI
San Andreas - SB-Coach. M-1b-2	55.6	7.7	0.069	VI
San Andreas - SB-Coach. M-2b	55.6	7.7	0.069	VI

Source: EQFAULT (Blake, 2000)
Notes: Peak Site Acceleration based on (Sadigh and others, 1997).

4.8.2.7 Ground Shaking

Seismic hazards that could affect the site include ground shaking resulting from an earthquake occurring along one of several major active faults in the region. The magnitude of ground shaking is generally characterized by using the Peak Horizontal Ground Acceleration (PHGA). To take into consideration the impact of regional faults, a site-specific ground motion study was performed using the computer program EZ-FRISK Version 7.24 to estimate ground motion parameters for the site and the results are shown in Table 4-48.

The average of four attenuation relationships was used in the analysis. The results of the analysis suggest that the PHGA, with a 10 percent probability of exceedance in 50 years (recurrence interval of 475 years), is approximately 0.49g. This level of ground motion is considered the Design Basis Earthquake (DBE). The PHGA, with a 10 percent

Table 4-48. Ground Motion Study Results

Event	Northern Subarea	Mid-Corridor Subarea	Southern Subarea
Most Probable Event (MPE)	0.23	0.21	0.20
Operating Design Earthquake (ODE)	0.36	0.32	0.31
Design Basis Earthquake (DBE)	0.49	0.44	0.42
Upper-Bound Earthquake (UBE)	0.60	0.54	0.52
Maximum Design Earthquake (MDE)	0.73	0.65	0.64
Maximum Considered Earthquake (MCE)	0.77	0.69	0.69

Source: EZ-Frisk results
Note: Using an average of three attenuation relationships.

probability of exceedance in 100 years (recurrence interval of 949 years), is approximately 0.60g. This level of ground motion is considered the Upper-Bound Earthquake (UBE).

The design criteria set by Metro requires that for important structures, such as those comprising the project, special earthquake protection criteria be followed: "The guiding philosophy of earthquake design for the Metro Rail projects is to provide a high level of assurance that the overall system will continue to operate during and after an Operating Design Earthquake (ODE)." Operating procedures assume safe shut down and inspection before returning to operation. "Further, the system design will provide a high level of assurance that public safety will be maintained during and after a Maximum Design Earthquake (MDE)." The ODE is defined as the earthquake event with a 40 percent probability of exceedance in 100 years, which corresponds to an average recurrence interval of 200 years. Such an event can reasonably be expected to occur during the 100-year facility design life. The MDE is defined as the earthquake event with a 5 percent probability of exceedance in 100 years, which corresponds to an average recurrence interval of 2,000 years.

Other design criteria for the seismic design of the project are the Most Probable Event (MPE) and the Maximum Considered Earthquake (MCE). The MPE is defined as the earthquake event with a 50 percent probability of exceedance in 50 years, which corresponds to an average recurrence interval of approximately 75 years. The MCE is defined as the earthquake event with a 2 percent probability of exceedance in 50 years, which corresponds to an average recurrence interval of approximately 2,500 years. The 2007 *California Building Code* (CBC) uses the MCE as the basis for seismic design requirements.

4.8.2.8 Liquefaction

Liquefaction is the loss of soil strength or stiffness due to a build up of pore-water pressure during severe ground shaking. Liquefaction is associated primarily with loose (low density), saturated, fine- to medium-grained, cohesion-less soils. Effects of severe liquefaction can include sand boils, excessive settlement, bearing capacity failures, and lateral spreading.

A review of the Seismic Hazard Zones Map for the Inglewood, Hollywood, and Venice 7.5 Minute Quadrangles (CDMG, 1999) indicates that the portion of the project alignment south of the Interstate 10 (I-10) Freeway and along the eastern slopes of the Baldwin Hills is in an area mapped as being susceptible to liquefaction (Figure 4-29).

The portion of the project alignment along the Harbor Subdivision right-of-way is also adjacent to an area identified as being susceptible to liquefaction, as depicted in Figure 4-29.

4.8.2.9 Seismically-Induced Settlement

Seismically-induced settlement consists of dry dynamic settlement (above groundwater) and liquefaction-induced settlement (below groundwater). These settlements occur primarily within loose to moderately dense sandy soil, due to a reduction in volume during and shortly after an earthquake event.

Much of the artificial fill along the proposed alignment is expected to be uncertified. Also, substantial portions of the sandy alluvium along the alignment are anticipated to be loose or medium dense. Accordingly, the proposed alignment is deemed susceptible to seismically-induced settlement.

4.8.2.10 Landslides

According to the Los Angeles County Seismic Safety Element (1990) and the City of Los Angeles Safety Element (1996), the study area is not within an area identified as having a potential for slope instability. Additionally, the study area is not located within an area identified as having a potential for seismic slope instability (CDMG, 1999). There are no known landslides near the project alignments, nor are they in the path of any known or potential landslides.

The topography of the alignment is relatively flat; therefore, the potential of landslides is considered low.

4.8.2.11 Flooding

Earthquake-induced flooding can be caused by the failure of dams or other water-retaining structures, as a result of an earthquake. Due to the absence of such structures near the project alignments, the potential for earthquake-induced flooding is considered low.

4.8.2.12 Seiches and Tsunamis

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Tsunamis are sea waves generated by a large-scale disturbance of the ocean floor, which induces a rapid displacement of the water column above. The most frequent causes of tsunamis are shallow underwater earthquakes and submarine landslides.

According to the City of Los Angeles Safety Element (1996) and the Los Angeles Seismic Safety Element (1990), the study area is not within a potential inundation area (potential flood area) for an earthquake-induced dam failure from nearby dams.

4.8.2.13 Mineral Resources

Regarding loss of mineral resources, the study area traverses areas underlain by geologic materials, such as sand and gravel, that may be considered mineral resources and which could be used as construction aggregate. However, these materials have not been previously mined in the area. Therefore, mining the material is considered uneconomical. There is a potential for re-use of the excavated materials for fills.

4.8.2.14 Hazardous Materials

This section identifies current locations along the proposed transportation alignments that have the potential for contamination from hazardous materials or from the migration of contaminants from adjacent sites with known or suspected subsurface impacts.

A Phase I Environmental Site Assessment (ESA) of the proposed alignment sections for the transit improvements within the Crenshaw Transit Corridor was conducted (with the exception of portions of Lines 710 and 740 of the TSM Alternative and the proposed Maintenance Facility locations). The purpose of the ESA was to identify, to the extent feasible pursuant to the processes prescribed in American Society for Testing and Materials International (ASTM), recognized environmental conditions (RECs) in connection with the subject property. The scope of work for the Phase I ESA included: records review; site reconnaissance; interviews; and report preparation. The Phase I ESA is available upon request.

An environmental database report prepared by FirstSearch™ was reviewed for local, state, and federal listings for properties within 1,000 feet of the rail alignment. Regulatory database lists were reviewed for cases pertaining to leaking underground storage tanks (USTs), hazardous waste sites, and other sites of environmental concern. Historical information was obtained from a review of aerial photographs, Sanborn Maps, and historical topographic maps of the subject property right-of-way and adjacent sites.

For this study, classification criteria was established to assist in identifying the potential impacts of each contaminated or potentially contaminated facility that was identified in the FirstSearch™ environmental database report system, the site reconnaissance, or reviews of other records. Each facility was classified as High, Moderate, or Low with respect to its type of operation, proximity to the subject property, the anticipated hydrogeologic gradient, field observations, and regulatory information. In general, the classification criteria are:

- High – facilities with known or probable soil/groundwater contamination (i.e., Leaking Underground Storage Tanks [LUSTs]), and facilities where remediation is incomplete or undocumented, and the contamination is known or suspected to exist on the subject property.
- Moderate – facilities with identified or potential soil contamination (i.e., LUSTs), remediation is in progress, or groundwater contamination that does not appear to be migrating and has not been reported on the subject property. Facilities with a heavy industrial/manufacturing background that typically use or have used significant quantities of hazardous materials may also be classified as Moderate.

- **Low** – facilities that have completed remediation or have historically utilized only small amounts of known contaminants (i.e., small quantity generators or underground storage tanks).

Areas of potential environmental concern were identified from Wilshire Boulevard to Jefferson Boulevard in the Phase I ESA; however, no alignments are proposed in this area that would affect the subsurface.

Table 4-49 summarizes the environmental concerns identified onsite, or associated with the affected parcels, that have a classification criterion of Moderate to High.

Table 4-49. On-site Identified Areas of Concern and Potential Hazardous Materials

Facility Name/Location	Concern Observed	Hazard
East and west of Crenshaw Blvd between Exposition Blvd and Vernon Ave	Former agricultural usage, possible pesticides	High
Former Gulf Oil, 3630 & 3644 Crenshaw Blvd	Former gas station, USTs formerly located fronting Crenshaw Boulevard	High
Cameo Cleaners, 3650 Crenshaw Blvd	Dry cleaners, release of perchloroethylene (PCE) and trichloroethylene (TCE) to subsurface	Moderate
Railroad tracks and East of Victoria Ave	Staining along railroad tracks	High
Harbor Subdivision railroad	Railroad usage, possible lead arsenates and/or pesticides for weed control. Likely creosote treated railroad ties	High
Directly north of railroad tracks, near La Colina Rd	Two buckets of oily water near railroad right-of-way	Moderate
Vacant lot, 5600 Arbor Vitae	Monitoring wells east and west of railroad tracks	High
West of railroad tracks and south of Manchester Blvd	55-gallon drum tipped over with 1 quart oil cans spilled on ground, some soil staining	High
West of railroad tracks between Manchester Blvd and Westchester Pkwy	Fenced storage area with various retail chemical containers such as strippers, paint thinner, and paint. No soil staining observed	Moderate
Adjacent to railroad tracks, west of Cedar Ave	Asphalt debris pile	Moderate
East and West of the Harbor Subdivision railroad from ~ Regent St to Imperial Hwy	Former agricultural usage, possible pesticides	High

Source: Leighton Consulting, Inc., 2008.

Table 4-50 shows the offsite facilities have a classification criterion of Moderate and High based on the current site usage, former site usage, observed hazards, and/or known releases to the subsurface.

Table 4-50. Off-site Identified Areas of Concern and Potential Hazardous Materials

Facility Name/Address	BRT Location/Hazard	LRT Location/Hazard
West Angeles Cathedral (formerly 20th Century Plastics), 3628 Crenshaw Blvd	At-Grade/Low	At-Grade/Moderate
Shell Gas Station, 3645 Crenshaw Blvd	At-Grade/Low	At-Grade/Moderate
Former Gulf Oil, 3630 & 3644 Crenshaw Blvd	At-Grade/Low	At-Grade/High
Cameo Cleaners, 3650 Crenshaw Blvd	At-Grade/Low	At-Grade/Moderate
Lula Washington Dance Theatre, 3773 Crenshaw Blvd	At-Grade/Low	At-Grade/Moderate to High
Shell Gas Station, 6805 Crenshaw Blvd	At-Grade/Low	At-Grade/Moderate
Former Crenshaw Collision Center, 6530 Crenshaw Blvd	At-Grade/Low	Aerial/Moderate
Salvage yard, 6745 Victoria Ave	At-Grade/Moderate	Aerial/Moderate
Enderlo Vault Co., 827 Redondo Blvd	At-Grade/Moderate	At-Grade/Moderate
So Cal Gas Company, Inglewood Manufactured Gas Plant, 700 Warren Ln	At-Grade/Moderate	At-Grade/Moderate
Manufacturing facilities, including plastic and metal manufacturing, machine shop, and plating works, 200-330 Beach Ave	Aerial/Moderate	Aerial/Moderate
Fujita Corporation, 230 La Brea Ave	Aerial/Moderate	Aerial/Moderate
So Cal Edison Electrical Substation, 201 Florence Ave	Near Aerial/Moderate	Aerial/Moderate
Former Smoot Holman, 311 Florence Ave	At-Grade/Moderate	Aerial/Moderate
Former Kroehler Manufacturing, 301 Florence Ave	At-Grade/Moderate	Aerial/Moderate
Blue Diamond Materials (441), Cemex (505), formerly - Foundry (401); Salvage Yard (431); Metal Salvage and Melting (441), 401-505 Railroad Pl	At-Grade/Moderate	At-Grade/Moderate
Former Standard Oil Co. of California and Inglewood Foundry, 401-417 Florence Ave	At-Grade/Moderate	At-Grade/Moderate
Mobil Gas Station, formerly Golden Star Laundry, 8307 La Cienega Blvd	At-Grade/Moderate to High	Aerial/High
LAX Equipment, 830 Florence Ave	At-Grade/Moderate	Aerial to At-Grade /Moderate
Charles Caine Co., 8325 Hindry Ave	At-Grade/Moderate	At-Grade/Moderate
Former Circuit Board Manufacturing and Machine Shop, 8331-8341 Hindry Ave	At-Grade/Moderate	At-Grade/Moderate
Zephyr Manufacturing, 201 Hindry Ave	At-Grade/Moderate	At-Grade/Moderate
Isis Electrical Substation, 8331 Isis Ave	At-Grade/Moderate	At-Grade/Moderate
Shell Gas Station, 1135 Manchester Blvd	At-Grade/Moderate	At-Grade/Moderate
Budget Truck Rental, 5560 Manchester Blvd	At-Grade/Moderate to High	At-Grade/High
Former metal spinning (1315), machine shop (1319), dry cleaning plant (1325), and the American Bitumuls & Asphalt Company (1401), 1315-1401 Aviation Blvd	At-Grade/Moderate	At-Grade/Moderate
Unocal/76 Gas Station, 8600 Aviation Blvd	At-Grade/Moderate	At-Grade/Moderate
Rho-Chem, 425 Isis Ave	At-Grade/Moderate	At-Grade/Moderate

Table 4-50. Off-site Identified Areas of Concern and Potential Hazardous Materials (continued)

Facility Name/Address	BRT Location/Hazard	LRT Location/Hazard
Industrial facilities: electronic manufacturing (8700); plastic manufacturing (8900), auto parts manufacturing (8924), and aircraft tool manufacturing and polishing and plating (9030), 8700-9030 Bellanca Ave; Manchester Blvd to Arbor Vitae, west of railroad tracks	At-Grade/Moderate	At-Grade/Moderate
Princeland Properties, 1237 Arbor Vitae	At-Grade/Moderate	At-Grade/Moderate
Formerly Freight Forwarders/Union Bank/Estate of Joseph Collin/Bodycote Hinderliter/Inglewood Suppliers/Sunsetting Auto Body, 9007 – 9121 Aviation Blvd	At-Grade/Moderate	At-Grade/Moderate
King Delivery (currently vacant lot), 5600 Arbor Vitae	Aerial/High	At-Grade/High
Numerous manufacturing facilities including aircraft parts (9632), 9630-9998 Bellanca Ave	At-Grade/Moderate	Aerial/Moderate
North American Aviation, Inc., Airplane factory, 5601 Imperial Hwy	At-Grade/Moderate	Aerial to Below-Grade/Moderate

Source: Leighton Consulting, Inc., 2008.

4.8.3 Environmental Impacts/Environmental Consequences

4.8.3.1 Methodology

The method for assessing impacts involves examining the Crenshaw Transit Corridor Project for known geologic hazards and hazardous materials. If stations or structures are located within or directly adjacent to geologic hazard areas or areas that are impacted by hazardous pollutants, there would be a potential for an impact that would require additional geotechnical studies and may require enhanced design to eliminate or mitigate the potential impact.

4.8.3.2 Subsurface Gases

The project alignment will traverse the Las Cienegas oil field south of Olympic Boulevard and east of La Brea Avenue and will traverse a portion of the Inglewood oil field when crossing the southern Baldwin Hills. Portions of the alignment are within the City of Los Angeles Methane and Methane Buffer Zones.

No Build Alternative

The No Build Alternative would not result in any subsurface excavation. Therefore, the No Build Alternative would not result in any adverse effects related to subsurface gases.

TSM Alternative

Like the No Build Alternative, the TSM Alternative would not result in any excavation of soil. Therefore, the TSM Build Alternative would not result in any adverse effects related to subsurface gases.

BRT Alternative

The BRT Alternative would result in some potential ground disturbances during excavation activities. The BRT Alternative may potentially encounter subsurface gases in

the areas where grading and/or excavation would occur which may include the release of methane and hydrogen sulfide soil gas, oil seepage, contaminated soils, leaking wells, and wells not plugged and abandoned to current standards. Discovery of these subsurface gases would potentially result in an adverse effect.

Base LRT Alternative
The Base LRT Alternative would result in some potential ground disturbances during excavation activities. The Base LRT Alternative may potentially encounter subsurface gases in the areas where grading and/or excavation would occur which may include the release of methane and hydrogen sulfide soil gas, oil seepage, contaminated soils, leaking wells, and wells not plugged and abandoned to current standards. The possibility of discovering subsurface gases would increase in the areas of the proposed below-grade segments. Discovery of these subsurface gases would potentially result in an adverse effect.

LRT Alternative Design Options
The LRT design options would result in some potential ground disturbances during excavation activities. The design options may potentially encounter subsurface gases in the areas where grading and/or excavation would occur which may include the release of methane and hydrogen sulfide soil gas, oil seepage, contaminated soils, leaking wells, and wells not plugged and abandoned to current standards. Discovery of these subsurface gases would potentially result in an adverse effect for all of the design options.

Maintenance and Operations Facility Sites
At least one of the proposed locations is within the El Segundo oil field. At these locations, adverse effects related to grading and excavation include the release of methane and hydrogen sulfide soil gas, oil seepage, contaminated soils, leaking wells, and wells not plugged and abandoned to current standards. Discovery of these subsurface gases would potentially result in an adverse effect.

4.8.3.3 Faults, Seismicity, and Ground Shaking

The proposed alignment traverses the Newport-Inglewood fault, near the intersection of Florence Avenue and La Brea Avenue, which has the potential to induce ground deformation by rupturing the ground surface.

No Build Alternative
Given the proximity of the Newport-Inglewood fault to the study area, the potential would remain for fault rupture. Therefore, the No Build Alternative would potentially result in an adverse effect related to active or potentially active faults.

TSM Alternative
The TSM Alternative is in close proximity to the Newport-Inglewood fault. Therefore, there is a potential for ground deformation to have an adverse effect on the TSM Alternative.

BRT Alternative
The BRT Alternative crosses the Newport-Inglewood fault. Therefore, there would be a potential for ground deformation to have an adverse effect on the BRT Alternative.

Base LRT Alternative
The Base LRT Alternative crosses the Newport-Inglewood fault. Therefore, there would be a potential for ground deformation to have an adverse effect on the Base LRT Alternative.

LRT Alternative Design Options
As discussed previously, the LRT Alternative may include six design options. These design options all cross the Newport-Inglewood fault. Therefore, there would be a potential for ground deformation to have an adverse impact.

Maintenance and Operations Facility Sites
The maintenance and operations facility sites are located in proximity to the Newport-Inglewood fault. Therefore, there would be a potential for ground deformation to have an adverse effect on the maintenance and operations facility sites.

4.8.3.4 Liquefaction

No Build Alternative
The No Build Alternative would not include activities that would result in any adverse effects related to liquefaction. Therefore, no adverse effects on liquefaction are anticipated.

TSM Alternative
The TSM Alternative would not include activities that would result in any impacts related to liquefaction. Therefore, no adverse effects on liquefaction are anticipated.

BRT Alternative
The BRT alternative is susceptible to liquefaction in two areas. The first area mapped as being susceptible to liquefaction is south of the I-10 Freeway, along the eastern slopes of the Baldwin Hills. The second area is the portion of the BRT alternative along the Harbor Subdivision right-of-way. Therefore, there would be a potential for liquefaction and for lateral spreading in these areas.

Base LRT Alternative
The Base LRT Alternative is susceptible to liquefaction in two areas. The first area mapped as being susceptible to liquefaction is south of the I-10 Freeway, along the eastern slopes of the Baldwin Hills. The second area is the portion of the Base LRT Alternative along the Harbor Subdivision right-of-way. Therefore, there would be a potential for liquefaction and for lateral spreading in these areas.

LRT Alternative Design Options
As discussed previously, the LRT Alternative may include six design options. Similar to the Base LRT Alternative, these design options would be susceptible to liquefaction in two areas and there would be a potential for liquefaction and for lateral spreading in these areas.

Maintenance and Operations Facility Sites
The two potential sites for a maintenance and operations facility are not located in areas susceptible to liquefaction. Therefore no adverse effects related to liquefaction are anticipated.

4.8.3.5 Seismically-Induced Settlement

No Build Alternative

The No Build Alternative would not include activities that would result in the potential for risk of seismically-induced settlement. Therefore, no adverse effects are anticipated for the No Build Alternative.

TSM Alternative

The TSM Alternative would not include activities that would result in any impacts related to seismically-induced settlement. Therefore, no adverse effects are anticipated for the TSM Alternative.

BRT Alternative

Structures and improvements planned along the proposed alignment may be susceptible to seismically-induced settlement. Therefore, a potential for adverse effects would be anticipated for the BRT Alternative.

Base LRT Alternative

Structures and improvements planned along the proposed alignment may be susceptible to seismically-induced settlement. Therefore, a potential for adverse effects would be anticipated for the Base LRT Alternative.

LRT Alternative Design Options

As discussed previously, the LRT Alternative may include six design options. These design options contain structures and improvements along the proposed alignment that may be susceptible to seismically-induced settlement. Therefore, a potential for adverse effects would be anticipated for these design options.

Maintenance and Operations Facility Sites

The maintenance and operations facility sites would not include activities that would result in seismically-induced settlement. Therefore, no adverse effects are anticipated for the maintenance and operations facility sites.

4.8.3.6 Landslides

No Build Alternative

The No Build Alternative would not include activities that would result in the potential for risk of landslides. Therefore, no adverse effects are anticipated for the No Build Alternative.

TSM Alternative

The TSM Alternative would not include activities that would result in the potential for risk of landslides. Therefore, no adverse effects are anticipated.

BRT Alternative

The BRT Alternative is not located in areas mapped as susceptible of landslides. The alignment is relatively flat and the potential for landslides along the alignment would be remote. Therefore, no adverse effects related to landslides are anticipated for the BRT Alternative.

Base LRT Alternative
The Base LRT Alternative is not located in areas mapped as susceptible of landslides. The alignment is relatively flat and the potential for landslides along the alignment would be remote. Therefore, no adverse effects related to landslides are anticipated for the Base LRT Alternative.

LRT Alternatives Design Options
As discussed previously, the LRT Alternative may include six design options. These design options are not located in areas mapped as susceptible of landslides. The alignment is relatively flat and the potential for landslides along the alignment would be remote. Therefore, no adverse effects related to landslides are anticipated for these design options.

Maintenance and Operations Facility Sites
The proposed maintenance and operations facility sites are not located in areas susceptible to landslides. Therefore, no adverse effects are anticipated for the maintenance and operations facility sites.

4.8.3.7 Flooding

No Build Alternative
The No Build Alternative would not include activities that would result in the potential for risk of flooding. Therefore, no adverse effects are anticipated for the No Build Alternative.

TSM Alternative
The TSM Alternative would not include activities that would result in the potential for risk of flooding. Therefore, no adverse effects are anticipated.

BRT Alternative
The BRT Alternative is not located in an area mapped as susceptible to flooding. The alignment is located in an area already developed with impervious surfaces as wells as well-developed drainage infrastructure and would not increase the risk of flooding. Therefore, no adverse effects related to flooding are anticipated for the BRT Alternative.

Base LRT Alternative
The Base LRT Alternative is not located in an area mapped as susceptible to flooding. The alignment is located in an area already developed with impervious surfaces as wells as well-developed drainage infrastructure and would not increase the risk of flooding. Therefore, no adverse effects related to flooding are anticipated for the Base LRT Alternative.

LRT Alternative Design Options
As discussed previously, the LRT Alternative may include six design options. The Base LRT Alternative may include an aerial station at Century Boulevard instead of an at-grade station at LAX. These design options are not located in areas mapped as susceptible to flooding. The alignment is located in an area already developed with impervious surfaces as wells as well-developed drainage infrastructure and would not increase the risk of flooding. Therefore, no adverse effects related to flooding are anticipated for these design options.

Maintenance and Operations Facility Sites

The proposed maintenance and operations facility sites are not located in areas susceptible to flooding. Therefore, no adverse effects are anticipated for the maintenance and operations facility sites.

4.8.3.8 Seiches and Tsunamis

No Build Alternative

The No Build Alternative would not include activities that would result in the potential for risk of seiches and tsunamis. Therefore, no adverse effects are anticipated for the No Build Alternative.

TSM Alternative

The TSM Alternative would not include activities that would result in the potential for risk of seiches and tsunamis. Therefore, no adverse effects are anticipated.

BRT Alternative

The BRT Alternative is not located in an area susceptible to inundation from seiches and tsunamis. The nearest section of the alignment is located approximately three and a half miles from the Santa Monica Bay. The potential for a risk of tsunami is remote and the BRT Alternative would not increase the risk of occurrence or the number of people that would potentially be exposed to a tsunami. In addition, there are no reservoirs nearby, which would result in risk from seiches. Therefore, no adverse effects related to seiches and tsunamis are anticipated for the BRT Alternative.

Base LRT Alternative

The Base LRT Alternative is not located in an area susceptible to inundation form seiches and tsunamis. The nearest section of the alignment is located approximately three and a half miles from the Santa Monica Bay. The potential for a risk of tsunami is remote and the Base LRT Alternative would not increase the risk of occurrence or the number of people that would potentially be exposed to a tsunami. In addition, there are no reservoirs nearby, which would result in risk from seiches. Therefore, no adverse effects related to seiches and tsunamis are anticipated for the Base LRT Alternative.

LRT Alternative Design Options

As discussed previously, the LRT Alternative may include six design options. With these design options, the potential for a risk of tsunami is remote and the design options would not increase the risk of occurrence or the number of people that would potentially be exposed to a tsunami. In addition, there are no reservoirs nearby, which would result in risk from seiches. Therefore, no adverse effects related to seiches and tsunamis are anticipated for these design options.

Maintenance and Operations Facility Sites

The proposed maintenance and operations facility sites are not located in areas susceptible to seiches and tsunamis. Therefore, no adverse effects are anticipated for the maintenance and operations facility sites.

4.8.3.9 Hazardous Materials

No Build Alternative

There are no elements of the No Build Alternative that are anticipated to have long-term hazardous materials impacts. Operations of facilities and services created under the alternative would be conducted in accordance with all federal and State regulatory requirements that are intended to prevent or manage hazards. Therefore, the No Build Alternative would not result in any adverse effects related to hazardous materials.

TSM Alternative

The TSM Alternative would not include activities that would result in the potential for risk of long-term hazardous material exposure. Therefore, no adverse effects are anticipated.

BRT Alternative

Operation of the BRT Alternative would not result in the risk of exposure to hazardous materials. Operations of facilities and services created under the BRT Alternative would be conducted in accordance with all federal and State regulatory requirements that are intended to prevent or manage hazards. Therefore, the BRT Alternative would not result in any adverse effects related to hazardous materials.

Base LRT Alternative

Operation of the Base LRT Alternative would not result in the risk of exposure to hazardous materials. Operations of facilities and services created under the Base LRT Alternative would be conducted in accordance with all federal and State regulatory requirements that are intended to prevent or manage hazards. Therefore, the Base LRT Alternative would not result in any adverse effects related to hazardous materials.

LRT Alternative Design Options

As discussed previously, the LRT Alternative may include six design options. These design options would not result in the risk of exposure to hazardous materials. Operations of facilities and services created under these design options would be conducted in accordance with all federal and State regulatory requirements that are intended to prevent or manage hazards. Therefore, these design options would not result in any adverse effects related to hazardous materials.

Maintenance and Operations Facility Sites

A search of environmental databases with the potential for hazardous materials indicated that there is a Cortese-listed address, 8325 Hindry Avenue Los Angeles, located on potential Maintenance Site B and a historical-listed EPA site, 1 Chapman Way El Segundo, located on potential Maintenance Site D. See Mitigation Measure Geo 6. Features included in the maintenance and operations facility sites will require storing hazardous materials/waste on-site and consist of a storage yard for approximately 40 LRT vehicles, a maintenance area, a paint shop and prep shop with associated sheet metal, welding, and paint storage areas, a car wash building, and a traction power substation for the yard and shop. There is the potential for hazardous materials/waste spills to occur; however, it is assumed that the storage and disposal of hazardous materials/waste will be conducted in accordance with all federal and State regulatory requirements that are intended to prevent or manage hazards, and that if a spill does occur, it will be remediated accordingly. No long-term hazardous material impacts are anticipated.

4.8.4 Mitigation Measures

GEO1 A geotechnical study for proposed at-grade, aerial, and below-grade structures and improvements shall be required. This technical study shall identify design specifications for maintaining structural integrity under static and seismic loading and operational demands. The geotechnical study shall include a soil-gas investigation at planned below-grade structures and where deep excavations are anticipated to develop mitigation measures to be implemented during construction and incorporated in the design. Mitigation measures typically include installation of soil gas barriers, monitoring, venting, and purging. The study shall be performed before the commencement of Final Design.

GEO2 Conduct a limited Phase II ESA prior to construction in areas where construction workers may be exposed to impacted soil. A base line soil sampling protocol shall be established with special attention to those areas of potential environmental concern identified in the Phase I report. The soil shall be assessed for constituents likely to be present in the subsurface including, but not limited to, total petroleum hydrocarbons (TPH), VOCs, semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), pesticides, lead arsenates, and Title 22 metals. The depth of the sampling shall be based on the depth of grading or cut and fill activities. In addition, in areas where groundwater will be encountered, samples shall also be analyzed for suspected contaminants prior to dewatering. This will ensure that National Pollutant Discharge Elimination System (NPDES) discharge requirements are satisfied.

GEO3 A soil mitigation plan shall be prepared after final construction plans are prepared showing the lateral and vertical extent of soil excavation during construction. The soil mitigation plan shall establish soil reuse criteria, establish a sampling plan for stockpiled materials, describe the disposition of materials that do not satisfy the reuse criteria, and specify guidelines for imported materials. The soil mitigation plan shall include a provision that during grading or excavation activities, soil shall be screened for contamination by visual observations and field screening for volatile organic compounds with a photo ionization detector (PID). Soil samples that are suspected of contamination based on field observations and PID readings shall be analyzed for suspected chemicals by a California certified laboratory. If contaminated soil is found, it shall be removed, transported to an approved disposal location, and remediated or disposed according to State and federal laws.

GEO4 All hazardous materials, drums, trash, and debris shall be removed and disposed of in accordance with regulatory guidelines.

GEO5 A health and safety plan shall be developed for persons with potential exposure to the constituents of concern identified in the limited Phase II ESA.

GEO6 Historical and present site usage along the many areas of the proposed alignment included businesses that stored hazardous materials and/or waste and used USTs, from at least the 1920s to the present. It is possible that areas with soil and/or groundwater impacts may be present that were not identified in this

report, or were considered a low potential to adversely impact the subject property. In general, observations should be made during any future development activities for features of concern or areas of possible contamination such as, but not limited to, the presence of underground facilities, buried debris, waste drums, tanks, soil staining or odorous soils. Further investigation and analysis may be necessary, should such materials be encountered.

GEO7 Best Management Practices (BMPs), required as part of the NPDES permit and application of SCAQMD Rule 403, shall be implemented for the proposed project to not only reduce potential soil erosion, but also to maintain soil stability and integrity during grading, excavation, below grade construction, and installation of foundations for aerial structures, and maintenance and operations facilities. BMPs would comply with applicable Uniform Building Codes and include, but are not limited to, scheduling excavation and grading activities during dry weather, covering stockpiles of excavated soils with tarps or plastic sheeting, and debris traps on drains.

4.8.5 CEQA Determination

Under the CEQA, direct and indirect impacts must be clearly identified and described, giving due attention to both short-term (i.e., during project construction) and long-term effects. The 2008 CEQA Guidelines use the following questions related to hazards and hazardous materials, and geology and soils to determine whether a significant impact would occur.

Hazards and Hazardous Materials

Would the project:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?
- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school?
- Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?
- For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?
- For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

- Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

No Build Alternative
Elements of the No Build Alternative have the potential to create construction period impacts. However, it is assumed that all projects would be implemented in accordance with all federal and State requirements and permits during the construction process. Therefore, impacts would be less than significant.

TSM Alternative
The TSM Alternative includes transit service improvements and is not anticipated to result in exposure to subsurface hazardous materials. It is assumed that all projects would be implemented in accordance with all federal and State requirements and permits during the construction process. Therefore, impacts would be less than significant.

BRT Alternative
Potentially significant impacts would occur during the construction of the BRT Alternative. The potential for encountering contaminated soil during the grading and excavation phase would be the primary concern for exposure to hazardous materials. As discussed previously in the Environmental Impacts Section, the construction work would generally be contained to the upper 5 feet of soil, thus limiting the possibility of unearthing contaminated soil. The Harbor Subdivision alignment does include at least two aerial sections and the associated piles would require deeper excavation, thereby increasing the possibility of encountering subsurface gases, contaminated soil, and contaminated groundwater. Operation of the BRT Alternative is not anticipated to result in exposure to hazardous materials. The previous Mitigation Measures Section provides the appropriate methods for safely approaching the potentially hazardous situations. It is assumed that the project would be implemented in accordance with all federal and State requirements and permits during the construction process. Therefore, a less-than-significant impact is anticipated for exposure to hazardous materials.

There are numerous schools, day care facilities, as well as the Los Angeles International Airport located with 0.25 mile of the corridor; however, the potential for exposure to contaminated materials would be limited to the confines of the project right-of-way. The mitigation measures provide for the proper disposal of contaminated substances and thus ensure the safety of individuals at nearby schools and the airport. Therefore, a less-than-significant impact is anticipated related to exposure of hazardous materials to sensitive populations.

The project would not prohibit emergency responsiveness and may potentially increase response time and evacuation efforts should it be necessary provide a way to efficiently move people in the case of emergency evacuation situations. Therefore, a less-than-significant impact is anticipated related to an emergency response plan.

The study area is located within an entirely developed area and there are no wildlands in the vicinity that could increase exposure to fires. Therefore, a less-than-significant impact is anticipated related to wildfires.

Base LRT Alternative

Potentially significant impacts would occur during the construction of the LRT alignment, specifically in the below grade and aerial sections where deeper earthwork, up to sixty feet below grade, would be required, thereby increasing the possibility of encountering subsurface gases, contaminated soil, and contaminated groundwater. Operation of the Base LRT Alternative is not anticipated to result in exposure to hazardous materials. The previous Mitigation Measures Section provides the appropriate methods for safely approaching the potentially hazardous situations and reducing this potential impact to less-than-significant levels. It is assumed that the project would be implemented in accordance with all federal and State requirements and permits during the construction process. Due to the great body of experience and techniques for remediation, it is anticipated that impacts would be less than significant.

There are numerous schools, day care facilities, as well as the Los Angeles International Airport located with 0.25 mile of the corridor; however, the potential for exposure to contaminated materials would be limited to the confines of the project right-of-way. The mitigation measures provide for the proper disposal of contaminated substances and thus ensure the safety of individuals at nearby schools and the airport. Therefore, a less-than-significant impact is anticipated related to exposure of hazardous materials to sensitive populations.

The project would not prohibit emergency responsiveness and may potentially increase response time and evacuation efforts should it be necessary provide a way to efficiently move people in the case of emergency evacuation situations. Therefore, a less-than-significant impact is anticipated related to an emergency response plan.

The study area is located within an entirely developed area and there are no wildlands in the vicinity that could increase exposure to fires. Therefore, a less-than-significant impact is anticipated related to wildfires.

LRT Alternative Design Options

As discussed previously, the LRT Alternative may include six design options. Similar to the Base LRT Alternative, these design options would not result in the risk of exposure to hazardous materials. Operations of facilities and services created under the design options would be conducted in accordance with all federal and State regulatory requirements that are intended to prevent or manage hazards. Therefore, these design options would result in a less-than-significant related to hazardous materials.

Maintenance and Operations Facility Sites

A search of environmental databases with the potential for hazardous materials indicated that there is a Cortese-listed address, 8325 Hindry Avenue Los Angeles, located on potential Maintenance Site B and a historical-listed EPA site, 1 Chapman Way El Segundo, located on potential Maintenance Site D. See Mitigation Measure Geo 6. It is unknown what potential impacts may exist with the proposed maintenance and operations facility sites at this time. It is recommended that a Phase I ESA be conducted to determine if hazardous materials have been used in these areas and if any significant impacts exist, and that any Phase II or remediation work be conducted as recommended in the Phase I ESA. Conducting the proper due diligence, identifying any contaminated

soil and removing it from the site, implementing the project in accordance with all federal and State requirements and permits during the construction process, would reduce potential impacts to less-than-significant levels.

Geology and Soils
Would the project:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault
  - Strong seismic ground shaking
  - Seismic-related ground failure, including liquefaction?
  - Landslides
- Result in substantial soil erosion or the loss of topsoil
- Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse
- Be located on expansive soil, creating substantial risks to life or property
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater

No Build Alternative
Elements of the No Build Alternative have the potential to create construction period geology and soil impacts. However, it is assumed that all projects would be implemented in accordance with all federal and State requirements and permits during the construction process. Accordingly, impacts to geology and soils would be less than significant.

TSM Alternative
The TSM Alternative includes transit service improvements and is not anticipated to result in risk of exposure from geology and soils. It is assumed that all projects would be implemented in accordance with all federal and State requirements and permits during the construction process. Therefore, impacts would be less than significant.

BRT Alternative
The project traverses the Newport-Inglewood Fault Zone, as well as a potential liquefaction zone. The project would not result in an increased exposure to the risk associated with fault lines, nor would it exacerbate pre-existing seismic conditions. However, it would be more vulnerable to damage from ground shaking during an earthquake. This would be a potentially significant impact; however, the mitigation measures described above would reduce impacts to less-than-significant levels.

The BRT Alternative is not located in areas mapped as susceptible of landslides. The alignment is relatively flat and the potential for landslides along the alignment is remote. Therefore, no adverse effects related to landslides are anticipated.

The BRT Alternative is in a flat, highly urbanized area, with an extensive drainage system and impervious surfaces. The project area is not subject to high levels of wind or rain, factors that may contribute to soil erosion. The BRT Alternative would not affect the existing drainage system and would not contribute to the loss of topsoil during operation. The BRT Alternative would not be located on expansive soil, which would create substantial risks to life or property.

In addition, the use of septic tanks or alternative wastewater disposal systems is not anticipated with the BRT Alternative due to the location of the project site in a developed area where existing sewer lines would be utilized. Implementation of Mitigation Measure **GEO6** would ensure that the potential for soil erosion and soil instability would be reduced to less-than-significant levels. Therefore, less-than-significant impacts related to the loss of topsoil, erosion, expansive soils, and the support of the use of septic tanks or alternative wastewater disposal systems, are anticipated.

Base LRT Alternative

The project traverses the Newport-Inglewood Fault Zone as well as a potential liquefaction zone. The project would not result in an increased exposure to the risk associated with fault lines, nor would it exacerbate pre-existing seismic conditions. However, it would be more vulnerable to damage from ground shaking during an earthquake. This would be a potentially significant impact; however, the mitigation measures described above would reduce impacts to less-than-significant levels.

The Base LRT Alternative is not located in areas mapped as susceptible of landslides. The alignment is relatively flat and the potential for landslides along the alignment is remote. Therefore, no adverse effects related to landslides are anticipated for the Base LRT Alternative.

The Base LRT Alternative is in a flat, highly urbanized area, with an extensive drainage system and impervious surfaces. The project area is not subject to high levels of wind or rain, factors that may contribute to soil erosion. The Base LRT Alternative would not affect the existing drainage system and would not contribute to the loss of topsoil during operation. The Base LRT Alternative would not be located on expansive soil, which would create substantial risks to life or property.

In addition, the use of septic tanks or alternative wastewater disposal systems is not anticipated with the Base LRT Alternative due to the location of the project site in a developed area where existing sewer lines would be utilized. Implementation of Mitigation Measure **GEO6** would ensure that the potential for soil erosion and soil instability would be reduced to less-than-significant levels. Therefore, less-than-significant impacts related to the loss of topsoil, erosion, expansive soils, and the support of the use of septic tanks or alternative wastewater disposal systems, are anticipated.

LRT Alternative Design Options

As discussed previously, the LRT Alternative may include six design options. These design options would not result in an increased exposure to the risk associated with fault lines, nor would it exacerbate pre-existing seismic conditions. The Aerial Station and Aerial Crossing Design Options 1 and 2 would be more vulnerable to damage from ground shaking during an earthquake than Design Options 3 through 6 and the Base LRT Alternative. This would remain a potentially significant impact for all design options; however, the mitigation measures described above would reduce impacts to less-than-significant levels.

The alignment is relatively flat and the potential for landslides along the alignment is remote. The alignment is in a flat, highly urbanized area, with an extensive drainage system and impervious surfaces and is not subject to high levels of wind or rain, factors that may contribute to soil erosion. The alignment would not be located on expansive soil, which would create substantial risks to life or property. In addition, the use of septic tanks or alternative wastewater disposal systems is not anticipated under these design options. Implementation of Mitigation Measure **GEO6** would ensure that the potential for soil erosion and soil instability would be reduced to less-than-significant levels. Therefore, less-than-significant impacts related to the loss of topsoil, erosion, expansive soils, and the support of the use of septic tanks or alternative wastewater disposal systems, are anticipated for all the design options.

Maintenance and Operations Facility Sites

The proposed maintenance and operations facility sites are near the vicinity of Newport-Inglewood Fault Zone. The use of these sites would not result in an increased exposure to the risk associated with fault lines, nor would it exacerbate pre-existing seismic conditions. However, the sites would be more vulnerable to damage from ground shaking during an earthquake. This would be a potentially significant impact; however, the mitigation measures described above would reduce impacts to less-than-significant levels.

The potential maintenance and operations facility sites are not located in areas mapped as susceptible to landslides. The alignment is relatively flat and the potential for landslides along the alignment is remote. Therefore, no adverse effects related to landslides are anticipated.

The potential maintenance and operations facility sites are in a flat, highly urbanized area, with an extensive drainage system and impervious surfaces. The sites are not subject to high levels of wind or rain, factors that may contribute to soil erosion. Construction and operation of the maintenance and operations facility sites would not affect the existing drainage system and would not contribute to the loss of topsoil during operation. The potential sites are not located on expansive soils, which would create substantial risks to life or property. In addition, the use of septic tanks or alternative wastewater disposal systems is not anticipated due to the location of the sites in a developed area, where existing sewer lines would be utilized. Implementation of Mitigation Measure **GEO6** would ensure that the potential for soil erosion and soil instability would be reduced to less-than-significant levels. Therefore, less-than-significant impacts related to the loss of topsoil, erosion, expansive soils, and the support of the use of septic tanks or alternative wastewater disposal systems, are anticipated.

4.8.6 Impacts Remaining After Mitigation

Implementation of the recommended mitigation measures would reduce the impacts related to geologic hazards and hazardous materials during the construction and operational phases of the project to less than significant for all of the alternatives.