station designs will complement the areas in which they are located. Executing these mitigation measures will not result in any impacts after mitigation.

The opening of the LPA as a single phase under the Concurrent Construction Scenario or in three sequential phases under the Phased Construction Scenario will not result in differing visual quality impacts during operation of the LPA, as discussed in Section 4.3.3. The only difference between the two scenarios is the timing of potential for operational visual quality impacts. Under the Phased Construction Scenario, the potential for visual quality impacts along Phase 2 and Phase 3 will occur later than under the Concurrent Construction Scenario due to an extended construction timeline. The timing for potential visual quality impacts along Phase 1 of the LPA will occur earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

4.4 Air Quality

This section has been updated from the Draft EIS/EIR to focus on the analysis of the effects of the LPA on air quality. The analysis results have not changed from the Draft EIS/EIR. The LPA could either be constructed as a single phase under the America Fast Forward (30/10) Scenario (Concurrent Construction), or as three consecutive phases under the Metro Long Range Transportation Plan Scenario (Phased Construction). The opening of the LPA as a single phase or in three sequential phases does not substantially change the air quality analysis that was presented in the Draft EIS/EIR. The analysis of all the Build and TSM Alternatives in the Draft EIS/EIR is incorporated into this document by reference. Information in this section is summarized from the *Westside Subway Extension Air Quality Impacts Technical Report* (Metro 2010f), prepared in support of the Draft EIS/EIR and the *Westside Subway Extension Air Quality Memorandum* (Metro 2011f) prepared in support of the LPA.

4.4.1 Regulatory Setting

This section discusses federal, state, and local regulations that are applicable to air quality. The federal, state, and local regulatory settings for the LPA are the same whether the LPA is constructed under the Concurrent Construction Scenario or the Phased Construction Scenario.

Federal

The U.S. Environmental Protection Agency (EPA) administers the Clean Air Act. The EPA is responsible for establishing the National Ambient Air Quality Standards (NAAQS), enforcing the Clean Air Act, regulating emission sources, and establishing emission standards, including those for vehicles sold in states other than California. (Automobiles sold in California must meet requirements that exceed federal standards.)

Under the Clean Air Act Amendments of 1990 (PL 1990b), which direct the EPA to implement environmental measures to ensure acceptable levels of air quality, a project cannot

- Cause or contribute to any new violation of any NAAQS in any area
- Increase the frequency or severity of any existing violation of any NAAQS in any area

- Delay timely attainment of any NAAQS or any required interim emission reductions or other milestones in any area

NAAQSs have been established for six major air pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2), and lead. These standards are summarized in Table 4-17. The *primary* standards have been established to protect the public health. The *secondary* standards are intended to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, and vegetation.

The EPA also has certain responsibilities regarding the health effects of Mobile Source Air Toxics (MSAT). The EPA issued a *Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources* (FR 2001). This rule was issued under the authority in Section 202 of the Clean Air Act.

State and Local

The California Air Resources Board (CARB) is responsible for ensuring that provisions of the California Clean Air Act, as amended in 1992, are met; California Air Resources Board also establishes the California Ambient Air Quality Standards (CAAQS) (Table 4-17). It is also responsible for setting emission standards for vehicles sold in California and for other emission sources, such as certain off-road equipment. California Air Resources Board also oversees the local air pollution control districts (APCD) and air quality management districts, which administer air quality at the county and regional levels, respectively.

SCAQMD monitors air quality and implements and enforces programs designed to attain and maintain state and federal ambient air quality standards. Programs developed include air quality rules and regulations that regulate stationary source emissions and certain mobile source emissions.

Under the Clean Air Act, the Intermodal Surface Transportation Efficiency Act of 1991, and the Transportation Equity Act for the 21st Century, proposed transportation projects must be derived from a long-range transportation plan, known as a LRTP, which conforms to air quality plans outlined in the State Implementation Plan (SIP). The SIP sets forth the strategies for achieving air quality standards. Projects must also be included in a Transportation Improvement Program (TIP) that conforms to the SIP, and localized impacts from proposed projects must conform to state air quality plans in non-attainment and maintenance areas.

SCAG is the federally designated metropolitan planning organization for the Los Angeles metropolitan area and is required to adopt and periodically update a long-range transportation plan and develop an RTP and TIP for Los Angeles, Orange, San Bernardino, Riverside, Ventura, and Imperial Counties. The LPA was included in the regional emissions analysis SCAG conducted for the conforming 2008 RTP as Project ID #UT101, as well as Project ID #1TR1002 and #1TR1003 in Amendment 3 to the RTP.

Table 4-17. State and Federal Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[1]		Federal Standards[2]		
		Concentration[3*]	Method[4]	Primary[3*,5]	Secondary[3*,6]	Method[7]
Ozone (O_3)	1 Hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m^3)		0.075 ppm (147 µg/m^3)		
Respirable Particulate Matter (PM_{10})	24 Hour	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		—		
Fine Particulate Matter ($PM_{2.5}$)	24 Hour	No Separate State Standard		35 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	15.0 µg/m^3		
Carbon Monoxide (CO)	8 Hour	9.0 ppm (10 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	9 ppm (10 mg/m^3)	None	Non Dispersive Infrared Photometry (NDIR)
	1 Hour	20 ppm (23 mg/m^3)		35 ppm (40 mg/m^3)		
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	—
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.030 ppm (57 µg/m^3)	Gas Phase Chemiluminescence	53 ppb (100 µg/m^3) (see footnote 8)	Same as Primary Standard	Gas Phase Chemiluminescence
	1 Hour	0.18 ppm (339 µg/m^3)		100 ppb (188 µg/m^3) (see footnote 8)	None	
Sulfur Dioxide (SO_2)			Ultraviolet Fluorescence			Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)[9]
	24 Hour	0.04 ppm (105 µg/m^3)			—	
	3 Hour	—		—	0.5 ppm (1300 µg/m^3) (see footnote 9)	
	1 Hour	0.25 ppm (655 µg/m^3)		75 ppb (196 µg/m^3) (see footnote 9)	—	
Lead [10]	30 Day Average	1.5 µg/m^3	Atomic Absorption	—	—	—
	Calendar Quarter	—		1.5 µg/m^3	Same as Primary Standard	High Volume Sampler and Atomic Absorption
	Rolling 3-Month Average[11]	—		0.15 µg/m^3		
Visibility Reducing Particles	8 Hour	Extinction coefficient of 0.23 per kilometer—visibility of ten miles or more (0.07—30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent. Method: Beta Attenuation and Transmittance through Filter Tape.		No Federal Standards		
Sulfates	24 Hour	25 µg/m^3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[10]	24 Hour	0.01 ppm (26 µg/m^3)	Gas Chromatography			

For more information please call Air Resources Board-Public Information Office at (916) 322-2990. California Air Resources Board (09/08/10).
See next page for footnotes.

Table 4-17. State and Federal Ambient Air Quality Standards (continued)

Footnotes

[1]California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, suspended particulate matter—PM_{10}, $PM_{2.5}$, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Tale of Standards in Section 70200 of Title 17 of the California Code of Regulations.

[2]National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM_{10}, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m3 is equal to or less than one. For $PM_{2.5}$, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact U.S. EPA for further clarification and current federal policies.

[3*]Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr: ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

[4]Any equivalent procedure which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

[5]National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

[6]National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

[7]Reference method as described by the EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the EPA.

[8]To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010). Note that the new standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the new primary national standard to the California standard the units can be converted to ppm. In this case, the national standard of 53 ppb and 100 ppb are identical to 0.053 ppm and 0.100 ppm, respectively.

[9]On June 2, 2010, the U.S. EPA established a new 1-hour SO_2 standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. EPA also proposed a new automated Federal Reference Method (FRM) using ultraviolet technology, but will retain the older pararosaniline methods until the new FRM have adequately permeated state monitoring networks. The EPA also revoked both the existing 24-hour SO_2 standard of 0.14 ppm and the annual primary SO_2 standard of 0.030 ppm, effective August 23, 2010. The secondary SO_2 standard was not revised at that time; however, the secondary standard is undergoing a separate review by EPA. Note that the new standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the new primary national standard to the California standard, the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

[10]The Air Resources Board has identified lead and vinyl chloride as "toxic air contaminants" with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

[11]National lead standard, rolling 3-month average: final rule signed October 15, 2008.

The LPA design concept and scope have not changed significantly from the 2008 RTP and Amendment 3. The analysis found that the plan and, therefore, the individual projects in the plan, are conforming projects; air quality impacts will be consistent with those identified in the SIPs for achieving the National Ambient Air Quality Standards. SCAG adopted the 2008 RTP on May 8, 2008.

The LPA is included in Amendment #08-34 to the 2008 Regional Transportation Improvement Plan (RTIP) as Project ID #UT101, #1TR1002, and #1TR1003 (SCAG 2010). It also is included in the Metro 2009 LRTP under Candidates for Private Sector Financial Participation—Transit Projects (Metro 2009a).

4.4.2 Affected Environment/Exisiting Conditions

The Study Area is located in the South Coast Air Basin (SCAB), which includes Los Angeles and Orange Counties plus portions of Riverside and San Bernardino Counties. The SCAB is bordered by the Pacific Ocean on the west and the San Bernardino Mountains on the east. Prevailing winds are mainly from the west, and the San Bernardino Mountains often trap air masses pushed onshore into the basin, especially during summer, when a Pacific Subtropical High sits off the coast, inhibits cloud formation, and encourages daytime solar heating. The SCAB is classified as a dry-hot desert climate.

The California Air Resources Board -maintained air monitoring stations measure SCAB air pollutant levels. One monitoring station is located in the Study Area at the Veterans Affairs Hospital and another station is located on North Main Street in Los Angeles. The last three years of available data for these locations are summarized in Table 4-18.

The affected environment and existing conditions for the LPA are the same whether the LPA is constructed under the Concurrent Construction Scenario or the Phased Construction Scenario.

The 1977 Clean Air Act Amendment, Section 107 requires the EPA to publish a list of geographic areas and their compliance with the National Ambient Air Quality Standards. Areas not in National Ambient Air Quality Standards compliance are deemed non-attainment areas. Designations are based on a pollutant-by-pollutant basis. As shown in Table 4-19, the EPA has classified Los Angeles County as a severe nonattainment area for ozone, a serious nonattainment area for PM_{10}, and a nonattainment area for $PM_{2.5}$. The County is listed as a maintenance area for carbon monoxide; it was previously a nonattainment area for carbon monoxide.

4.4.3 Environmental Impacts/ Environmental Consequences

Regional and Study Area Emissions Analyses

The regional emission burden analysis of a project determines a project's overall impact on air quality levels. The emission burden of a particular alternative is the amount of pollutants predicted to be emitted by all vehicles associated with operation of that alternative. In the case of the Westside Subway Extension, the emission burden of each alternative is dependent upon the vehicles operating on the roadways within a specifically defined area.

Table 4-18. Air Quality Summary for Project Study Area Monitoring Stations

Air Pollutant	Standard/Exceedance[1]	Veterans Affairs West Los Angeles Campus			North Main Street Los Angeles		
		2007	2008	2009	2007	2008	2009
Carbon monoxide (CO)	Year coverage[2]	94%	96%	96%	95%	97%	97%
	Maximum 1-hour concentration (ppm)	2.7	2.7	2.7	3.2	2.9	2.2
	Maximum 8-hour concentration (ppm)	1.96	1.76	1.51	2.15	1.96	2.17
	# Days>Federal 1-hour standard of >35 ppm	0	0	0	0	0	0
	# Days>Federal 8-hour standard of >9 ppm	0	0	0	0	0	0
	# Days>California 8-hour standard of >9.0 ppm	0	0	0	0	0	0
Ozone (O_3)	Year coverage[2]	98%	96%	99%	97%	96%	96%
	Maximum 1-hour Concentration (ppm)	0.117	0.111	0.131	0.115	0.109	0.139
	Maximum 8-hour Concentration (ppm)	0.088	0.097	0.095	0.103	0.090	0.101
	# Days>Federal 8-hour Std. of >0.075 ppm	2	2	3	3	3	2
	# Days>California 1-hour Std. of >0.09 ppm	2	3	6	3	3	3
	# Days>California 8-hour Std. of >0.07 ppm	2	8	5	6	6	5
Nitrogen dioxide (NO_2)	Year coverage[2]	93%	96%	93%	96%	95%	94%
	Maximum 1-hour concentration (ppm)	0.082	0.090	0.077	0.104	0.122	0.115
	Annual average (ppm)	0.019	0.018	0.017	0.030	0.027	0.028
	# Days>California 1-hour standard of >0.18 ppm	0	0	0	0	0	0
Sulfur dioxide (SO_2)	Year coverage[2]	NM	NM	NM	90%	96%	96%
	Maximum 24-hour concentration (ppm)	NM	NM	NM	0.005	0.003	0.002
	Annual average (ppm)	NM	NM	NM	0.000	0.000	0.000
	# Days>Federal 24-hour standard of >0.14 ppm	NM	NM	NM	0	0	0
Suspended particulates (PM_{10})	Year coverage[2]	NM	NM	NM	93%	79%	99%
	Maximum 24-hour concentration ($\mu g/m^3$)	NM	NM	NM	78.0	66.0	72.0
	#Days>Fed. 24-hour standard of>150 $\mu g/m^3$	NM	NM	NM	0	0	0
	#Days>California 24-hour standard of>50 $\mu g/m^3$	NM	NM	NM	5	2	4
	State Annual Average ($\mu g/m^3$)	NM	NM	NM	33.0	NA	32.5
Suspended particulates ($PM_{2.5}$)	Year coverage[2]	NM	NM	NM	86%	85%	99%
	Maximum 24-hour concentration ($\mu g/m^3$)	NM	NM	NM	64.1	78.3	61.6
	State annual average ($\mu g/m^3$)	NM	NM	NM	18	16.2	15.6
	#Days>Fed. 24-hour standard of>35 $\mu g/m^3$	NM	NM	NM	20	10	7
	National annual average ($\mu g/m^3$)	NM	NM	NM	16.7	16.0	14.2
Lead	Maximum monthly concentration ($\mu g/m^3$)	NM	NM	NM	NM	NM	NM
	# Months exceeding Federal standard	NM	NM	NM	NM	NM	NM
	# Months exceeding State standard	NM	NM	NM	NM	NM	NM
Sulfates	Maximum 24-hour concentration ($\mu g/m^3$)	NM	NM	NM	NM	NM	NM
	#Samples>California 24-hour standard of >=25 $\mu g/m^3$	NM	NM	NM	NM	NM	NM

Sources: California Air Resources Board, 2010: http://www.arb.ca.gov/adam/welcome.html. EPA AIRSData (for 1-Hour CO only): http://www.epa.gov/air/data/geosel.html

NM = not measured; NA = not applicable; ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter

[1]The number of days above the standard is not necessarily the number of violations of the standard for the year.

[2]Year coverage indicates how extensive monitoring was during the time of year when high pollutant concentrations were expected.

For the Westside Subway Extension, an analysis was conducted for two specifically defined areas: the Study Area and the entire region. The "region" is the five-county region of Los Angeles, Ventura, San Bernardino, Riverside, and Orange Counties; the "Study Area" is in western Los Angeles County and encompasses approximately 38 square miles. For this Project, regional and Study Area analyses were conducted for the existing year with and without the LPA, as well as the design year (2035) for the No Build Alternative, the Concurrent Construction Scenario, and each phase of the Phased Construction Scenario.

Overall, the Project's air quality impacts are below the SCAQMD regional significance thresholds.

The analyses were based on estimated regional VMT and VHT. Emission factors were obtained from California Air Resources Board's emission factor program, EMFAC2007, the latest emission inventory model for the calculation of mobile source emission factors for vehicles operating on roads in California. EMFAC2007 takes into account future improvements in vehicle fuel efficiency, and the parameters of the program were set for Los Angeles County.

The regional analysis results are shown in Table 4-20 and the Study Area results are shown in Table 4-21. These tables present the emission burdens, or pollutant levels, for several different pollutants under the existing year without the LPA, existing year with the LPA, the No Build Alternative, the Concurrent Construction Scenario, and each phase of the Phased Construction Scenario.

Table 4-19. Project Area Attainment Status

Criteria Pollutant	Federal Attainment Status
Ozone (O_3)	Nonattainment
Nitrogen dioxide (NO_2)	Attainment
Carbon monoxide (CO)	Attainment/Maintenance
Particulate matter (PM_{10})	Nonattainment
Particulate matter ($PM_{2.5}$)	Nonattainment
All others	Attainment/Unclassified

Source: Environmental Protection Agency 2010.

No Build Alternative

The No Build Alternative does not propose construction activity beyond what is currently in construction or planned in the *RTP (SCAG 2008a)* or Metro's LRTP (Metro 2008a). The No Build Alternative is the baseline condition for comparison with the LPA. The No Build Alternative would not result in operational impacts.

Locally Preferred Alternative

As shown in Table 4-20 and Table 4-21, the existing year with LPA scenario is predicted to have lower regional pollutant burden levels on both the regional and Study Area levels, as compared to existing year without the LPA.

America Fast Forward (30/10) Scenario (Concurrent Construction)

SCAQMD has developed regional significance thresholds for each of the pollutants estimated in the regional analysis (these are presented in the last lines of Table 4-20 and Table 4-21). These thresholds apply to the difference between conditions with and without the Project. If the emission burden of a particular pollutant is estimated to increase beyond these thresholds with implementation of the Project, then the impact is considered to be significant. However, the LPA under the Concurrent Construction Scenario, including all station, alignment, and station entrance options still under consideration, will decrease regional emission burdens, as shown in Table 4-20. Therefore, no pollutants would increase in excess of SCAQMD thresholds. As such, there will be no significant impacts.

Table 4-20. Regional Emission Burden Assessment

Alternative	VMT		CO			Total Organic Gases			NO_x			PM_{10}			$PM_{2.5}$		
	Daily Vehicle Miles Traveled (millions)	Percent Change from Existing/ No Build	Emission Burden (Kg/day)	Change from Existing/No Build (Kg/day)	Percent Change from Existing/ No Build	Emission Burden (Kg/day)	Change from Existing/No Build (Kg/day)	Percent Change from Existing/ No Build	Emission Burden (Kg/day)	Change from Existing/No Build (Kg/day)	Percent Change from Existing/ No Build	Emission Burden (Kg/day)	Change from Existing/No Build (Kg/day)	Percent Change from Existing/ No Build	Emission Burden (Kg/day)	Change from Existing/No Build (Kg/day)	Percent Change from Existing/ No Build
Existing year	354.995	—	1,156,990	—	—	67,484	—	—	325,086	—	—	20,273	—	—	14,310	—	—
Existing year with LPA	354.719	-0.08%	1,156,010	-979	-0.1%	67,423	-60	-0.1%	324,830	-256	-0.1%	20,256	-17	-0.1%	14,298	-12	-0.1%
No Build	532.661	—	604,617	—	—	47,630	—	—	138,175	—	—	34,745	—	—	25,524	—	—
Concurrent Construction Scenario																	
LPA with Century City Santa Monica	532.343	-0.11%	602,210	-2,407	-0.4%	46,973	-657.2	-1.4%	137,463	-712	-0.5%	34,515	-231	-0.7%	25,299	-225	-0.9%
LPA with Century City Constellation Concurrent Construction Scenario	532.080	-0.11%	601,907	-2,710	-0.4%	46,949	-681.0	-1.4%	137,394	-782	-0.6%	34,497	-248	-0.7%	25,286	-238	-0.9%
Phased Construction Scenario																	
Phase 1	532.447	-0.04%	604,365	-251	0.0%	47,609	-21.3	0.0%	138,117	-58	0.0%	34,730	-15	0.0%	25,513	-11	0.0%
Phase 2 with Century City Santa Monica	532.514	-0.03%	604,453	-163	0.0%	47,618	-12.2	0.0%	138,138	-37	0.0%	34,736	-9	0.0%	25,517	-7	0.0%
Phase 2 with Century City Constellation	532.267	-0.07%	604,157	-459	-0.1%	47,592	-38.2	-0.1%	138,069	-106	-0.1%	34,718	-27	-0.1%	25,504	-20	-0.1%
Phase 3 with Century City Santa Monica	532.343	-0.11%	602,210	-2,407	-0.4%	46,973	-657.2	-1.4%	137,463	-712	-0.5%	34,515	-231	-0.7%	25,299	-225	-0.9%
Phase 3 with Century City Constellation	532.080	-0.11%	601,907	-2,710	-0.4%	46,949	-681.3	-1.4%	137,394	-782	-0.6%	34,497	-248	-0.7%	25,286	-238	-0.9%
SCAQMD Significance Threshold			249 (550 lbs/day)			24.9 (55 lbs/day)			24.9 (55 lbs/day)			68 (150 lbs/day)			24.9 (55 lbs/day)		

Table 4-21. Study Area Emission Burden Assessment

Alternative	VMT		CO			Total Organic Gases			NO_x			PM_{10}			$PM_{2.5}$		
	Daily Vehicle Miles Traveled	Percent Change from Existing/No Build	Emission Burden (Kg/day)	Change from Existing/No Build (Kg/day)	Percent Change from Existing/No Build	Emission Burden (Kg/day)	Change from Existing/No Build (Kg/day)	Percent Change from Existing/No Build	Emission Burden (Kg/day)	Change from Existing/No Build (Kg/day)	Percent Change from Existing/No Build	Emission Burden (Kg/day)	Change from Existing/No Build (Kg/day)	Percent Change from Existing/No Build	Emission Burden (Kg/day)	Change from Existing/No Build (Kg/day)	Percent Change from Existing/No Build
Existing year	4,347,858	—	16,746	—	—	1,117	—	—	4,242	—	—	297	—	—	220	—	—
Existing year with LPA	4,310,748	-0.9%	16,482	-265	-1.6%	1,093	-24	-2.2%	4,191	-51	-1.2%	292	-5	-1.7%	216	-4	-2.0%
No Build	5,185,000	—	5,405	—	—	348	—	—	1,198	—	—	292	—	—	206	—	—
Concurrent Construction Scenario																	
LPA with Century City Santa Monica	5,156,000	-0.6%	5,370	-35	-0.7%	345	-3	-0.7%	1,190	-8	-0.7%	291	-2	-0.7%	204	-2	-0.7%
LPA with Century City Constellation	5,152,000	-0.6%	5,365	-40	-0.7%	345	-3	-0.8%	1,189	-9	-0.7%	290	-2	-0.8%	204	-2	-0.8%
Phased Construction Scenario																	
Phase 1	5,178,000	-0.1%	5,393	-12	-0.2%	347	-1	-0.3%	1,195	-3	-0.2%	292	-1	-0.2%	205	-1	-0.3%
Phase 2 with Century City Santa Monica	5,172,000	-0.3%	5,387	-18	-0.3%	346	-1	-0.4%	1,194	-4	-0.3%	291	-1	-0.3%	205	-1	-0.4%
Phase 2 with Century City Constellation	5,166,000	-0.4%	5,380	-25	-0.5%	346	-2	-0.5%	1,192	-6	-0.5%	291	-1	-0.5%	205	-1	-0.5%
Phase 3 with Century City Santa Monica	5,156,000	-0.6%	5,370	-35	-0.7%	345	-3	-0.7%	1,190	-8	-0.7%	291	-2	-0.7%	204	-2	-0.7%
Phase 3 with Century City Constellation	5,152,000	-0.6%	5,365	-40	-0.7%	345	-3	-0.8%	1,189	-9	-0.7%	290	-2	-0.8%	204	-1	-0.8%
SCAQMD Significance Threshold			249 (550 lbs/day)			24.9 (55 lbs/day)			24.9 (55 lbs/day)			68 (150 lbs/day)			24.9 (55 lbs/day)		

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the potential for regional and study area emissions impacts is the same as under the Concurrent Construction Scenario. The only difference between the two scenarios is the timing of the potential for regional and study area emissions impacts. Under the Phased Construction Scenario, the potential for regional and study area emissions impacts along Phase 2 and Phase 3 will occur later than under the Concurrent Construction Scenario due to an extended construction timeline. The timing for potential regional and study area emissions impacts along Phase 1 of the LPA will occur earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

The LPA under the Phased Construction Scenario, including all station, alignment, and station entrance options still under consideration, will decrease regional emission burdens, as shown in Table 4-20. Therefore, no pollutants will increase in excess of SCAQMD thresholds. As such, there will be no significant impacts.

Hot Spot Assessment

CO microscale air quality modeling was performed using the most current version of California Air Resources Board's mobile source emission factor model (EMFAC2007) and the EPA CAL3QHC (Version 2.0) air quality dispersion model to estimate existing (2010) and future design year (2035) CO levels. Because CO emissions are generally localized, five intersections were selected for this microscale analysis. The sites listed in Table 4-22 and shown on Figure 4-27 are the Study Area intersections with the highest volumes, highest delays, or the highest volume increases between 2010 and 2035.

Table 4-22. CO Microscale Analysis Sites

Site Number	Site Location
1	26th Street and Wilshire Boulevard
2	Veteran Avenue and Wilshire Boulevard
3	Glendon Avenue and Wilshire Boulevard
4	La Cienega Boulevard and Beverly Boulevard
5	La Brea Avenue and Olympic Boulevard

No Build Alternative

The No Build Alternative does not propose construction activity beyond what is currently in construction or planned in the *RTP (SCAG 2008a)* or LRTP (Metro 2008a). The No Build Alternative is the baseline condition for comparison with the LPA. The No Build Alternative would not result in operational impacts. Predicted CO concentrations for the No Build Alternative in 2035 are lower than existing year (with and without the LPA) conditions in 2010. No violations of the NAAQS are predicted under the No Build Alternative.

Locally Preferred Alternative

CO concentrations were predicted for the existing year and 2035, the design year. Maximum 1-hour CO concentrations are shown in Table 4-23. Maximum 8-hour CO concentrations are shown in Table 4-24.

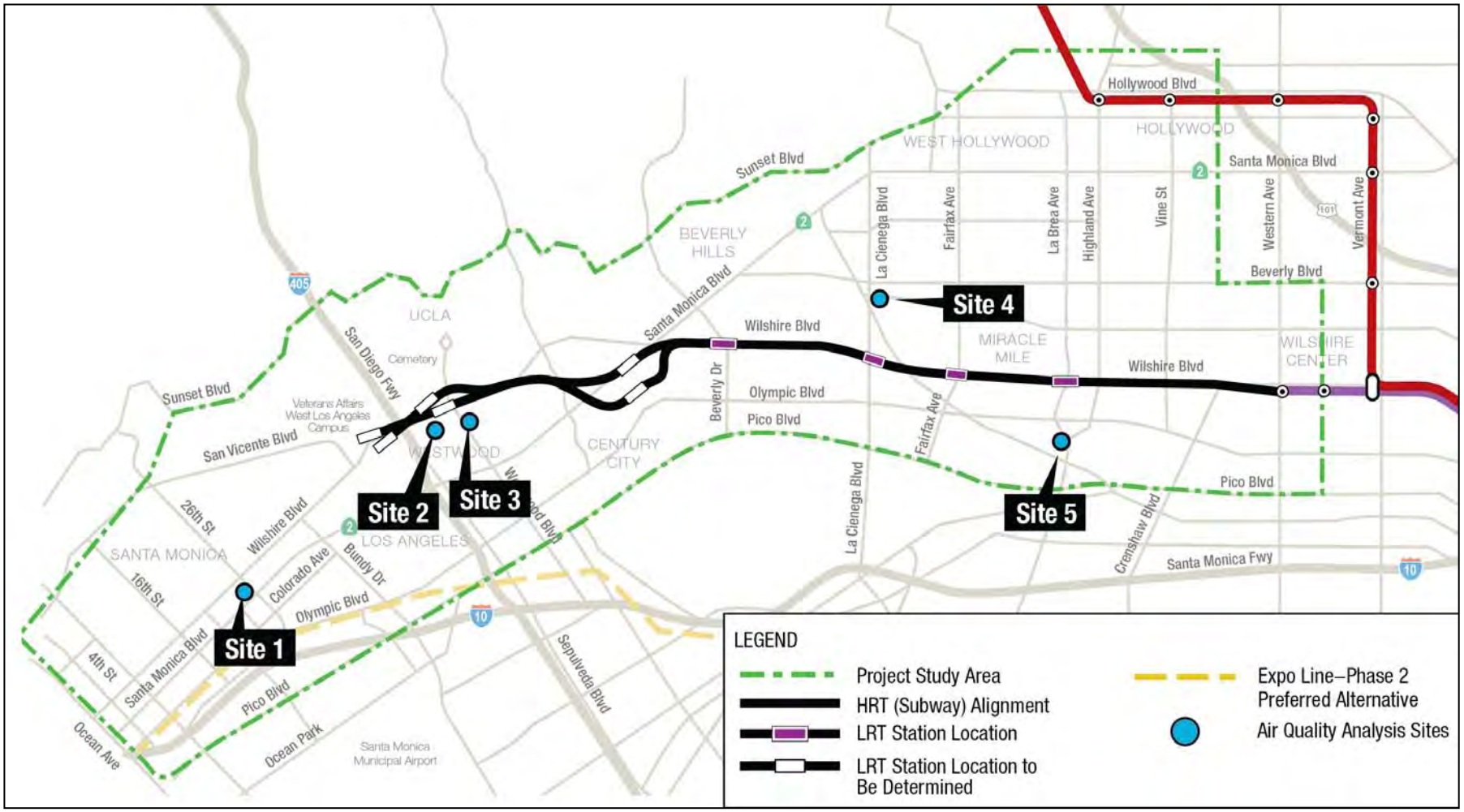


Figure 4-27. Air Quality Analysis Sites

Table 4-23. Predicted Conservative One-hour CO Concentrations (ppm)

No	Site Description	Existing (2010)		Existing w/Project (2010)		No Build (2035)		Concurrent Construction Scenario		Phased Construction Scenario					
								LPA (2035)		Phase 1 (2035)		Phase 2 (2035)		Phase 3 (2035)	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1	26th Street and Wilshire Boulevard	3.60	3.60	3.60	3.60	3.00	3.00	2.80	2.80	2.90	3.00	2.80	2.80	2.80	2.80
2	Veteran Avenue and Wilshire Boulevard	3.90	3.80	3.90	3.90	3.20	3.10	3.10	3.10	3.10	3.10	2.80	2.80	3.10	3.10
3	Glendon Avenue and Wilshire Boulevard	3.70	3.70	3.70	3.80	3.10	3.10	3.10	3.10	3.10	3.00	2.80	2.80	3.10	3.10
4	La Cienega Boulevard and Beverly Boulevard	3.60	3.70	3.70	3.70	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
5	La Brea Avenue and Olympic Boulevard	4.00	4.00	4.00	4.00	3.10	3.10	3.10	3.10	3.10	3.00	3.10	3.10	3.10	3.10

Concentrations include 1-hour CO background = 2.8 ppm
1-hour National Ambient Air Quality Standards = 35 ppm
California Ambient Air Quality Standards = 20 ppm

Table 4-24. Predicted 8-hour CO Concentrations (ppm)

No.	Site Description	Existing (2010)	Existing w/Project (2010)	No Build (2035)	Concurrent Construction Scenario	Phased Construction Scenario		
					LPA (2035)	Phase 1 (2035)	Phase 2 (2035)	Phase 3 (2035)
1	26th Street and Wilshire Boulevard	2.46	2.46	2.04	1.90	2.04	1.90	1.90
2	Veteran Avenue and Wilshire Boulevard	2.67	2.67	2.18	2.11	2.11	1.90	2.11
3	Glendon Avenue and Wilshire Boulevard	2.53	2.60	2.11	2.11	2.11	1.90	2.11
4	La Cienega Boulevard and Beverly Boulevard	2.53	2.53	2.04	2.04	2.04	2.04	2.04
5	La Brea Avenue and Olympic Boulevard	2.74	2.74	2.11	2.11	2.11	2.11	2.11

Concentrations include 8-hour CO background = 1.9 ppm
8-hour National Ambient Air Quality Standards = 9 ppm
California Ambient Air Quality Standards = 9.0 ppm

As shown in these tables, predicted CO concentrations for the existing year with the LPA, including all station, alignment, and station entrance options still under consideration, will be the same or slightly higher than those for existing year without the LPA. No violations of the NAAQS are predicted under existing year conditions (with and without the LPA).

America Fast Forward (30/10) Scenario (Concurrent Construction)

Predicted CO concentrations in 2035 for the LPA, under the Concurrent Construction Scenario, including all station, alignment, and station entrance options, will be the same or slightly lower than those for the No Build Alternative. Predicted CO concentrations for the LPA in 2035 are lower than existing year (with and without the LPA) conditions in 2010. No violations of the NAAQS are predicted for the LPA under the Concurrent Construction Scenario.

The area is classified as nonattainment for PM_{10} and $PM_{2.5}$. Therefore, a $PM_{10}/PM_{2.5}$ qualitative hot-spot analysis has been conducted following EPA guidelines (EPA 2006).

The LPA will be powered by electricity. Although the Project does not specify additional bus service, any new buses servicing the LPA's stations will be powered by compressed natural gas. As such, the LPA under the Concurrent Construction Scenario, including all station, alignment, and station entrance options, will not increase diesel traffic within the Study Area and is not considered a project of air quality concern. An interagency consultation, following SCAG procedures, is expected to confirm this finding.

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the potential for operational CO emissions impacts is the same as under the Concurrent Construction Scenario. The only difference between the two scenarios is the timing of the potential for operational CO emissions impacts. Under the Phased Construction Scenario, the potential for CO emissions along Phase 2 and Phase 3 will occur later than under the Concurrent Construction Scenario due to an extended construction timeline. The timing for potential CO emissions impacts along Phase 1 of the LPA will occur earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

Predicted CO concentrations in 2035 for Phase 1, Phase 2, and Phase 3 of the LPA will be the same or slightly lower than those for the No Build Alternative. No violations of the NAAQS are predicted for any of the three phases of the LPA under the Phased Construction Scenario.

The LPA will be powered by electricity. Although the Project does not specify additional bus service, any new buses servicing the LPA's stations will be powered by compressed natural gas. As such, the LPA under the Phased Construction Scenario, including all station, alignment, and station entrance options, will not increase diesel traffic within the Study Area and is not considered a project of air quality concern. An interagency consultation, following SCAG procedures, is expected to confirm this finding.

Mobile Source Air Toxics

EPA has identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers. These are acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. The FHWA considers these the priority MSATs.

On February 3, 2006, FHWA released *Interim Guidance on Air Toxic Analysis in NEPA Documents* (FHWA 2006). This guidance was superseded on September 30, 2009, by FHWA *Interim Guidance Update on Air Toxic Analysis in NEPA Documents* (FHWA 2009). The purpose of the FHWA guidance is to advise on when and how to analyze MSATs in the NEPA process for highways. The guidance is interim because MSAT science is still evolving.

As a result, a qualitative analysis is used to provide a basis for identifying and comparing potential differences among MSAT emissions from the No Build Alternative and the LPA under either the Concurrent Construction Scenario or the Phased Construction Scenario. The qualitative assessment presented below is derived in part from a study by the FHWA entitles *A Methodology for Evaluating Mobile Source Air Toxic Emissions among Transportation Project Alternatives* (Claggett 2006).

No Build Alternative

The No Build Alternative does not propose construction activity beyond what is currently in construction or planned in the *RTP (SCAG 2008a)* or LRTP (Metro 2008a). The No Build Alternative is the baseline condition for comparison with the LPA. The No Build Alternative would not result in operational impacts.

Locally Preferred Alternative

America Fast Forward (30/10) Scenario (Concurrent Construction)

The FHWA Interim Guidance groups projects into three tier categories, from those having the least to those having the most potential for MSAT effects. Based on this approach, the LPA falls within Tier 2: qualitative analysis for projects with low potential MSAT effects and projects proposed to be located in proximity to populated areas. In the FHWA guidance, Tier 2 includes projects that "serve to improve highway, transit or freight operations without adding substantial new capacity or without creating a facility that is likely to meaningfully increase MSAT emissions."

In 2035, the LPA will reduce regional and study area MSAT emissions as a result of reduced VMT associated with using mass transit and the EPA reduction programs.

Therefore, a qualitative analysis has been performed for the LPA as a Tier 2 project. This qualitative analysis evaluated potential MSAT emissions in relation to VMT. For the LPA, MSAT emissions will be proportional to VMT, assuming that other variables, such as fleet mix, are the same. The VMT estimates for the LPA, including all station, alignment, and station entrance options still under consideration, are lower than the VMT estimates for the No Build Alternative.

Based on these results, the LPA, including all station, alignment, and station entrance options still under consideration, is expected to reduce MSATs as compared to the No Build Alternative.

In addition, MSAT emissions under the Concurrent Construction Scenario in 2035 will likely be lower than existing year conditions, both with and without the LPA, in 2010 as a result of EPA national control programs that are projected to reduce annual MSAT emissions by 72 percent between 1999 and 2050. Although local conditions may differ from the national conditions used in the fleet mix and turnover projections, VMT growth rates, and local control measures, the projected reductions magnitude is so great that future Study Area MSAT emissions will likely be lower in nearly all cases. This is shown in Figure 4-28.

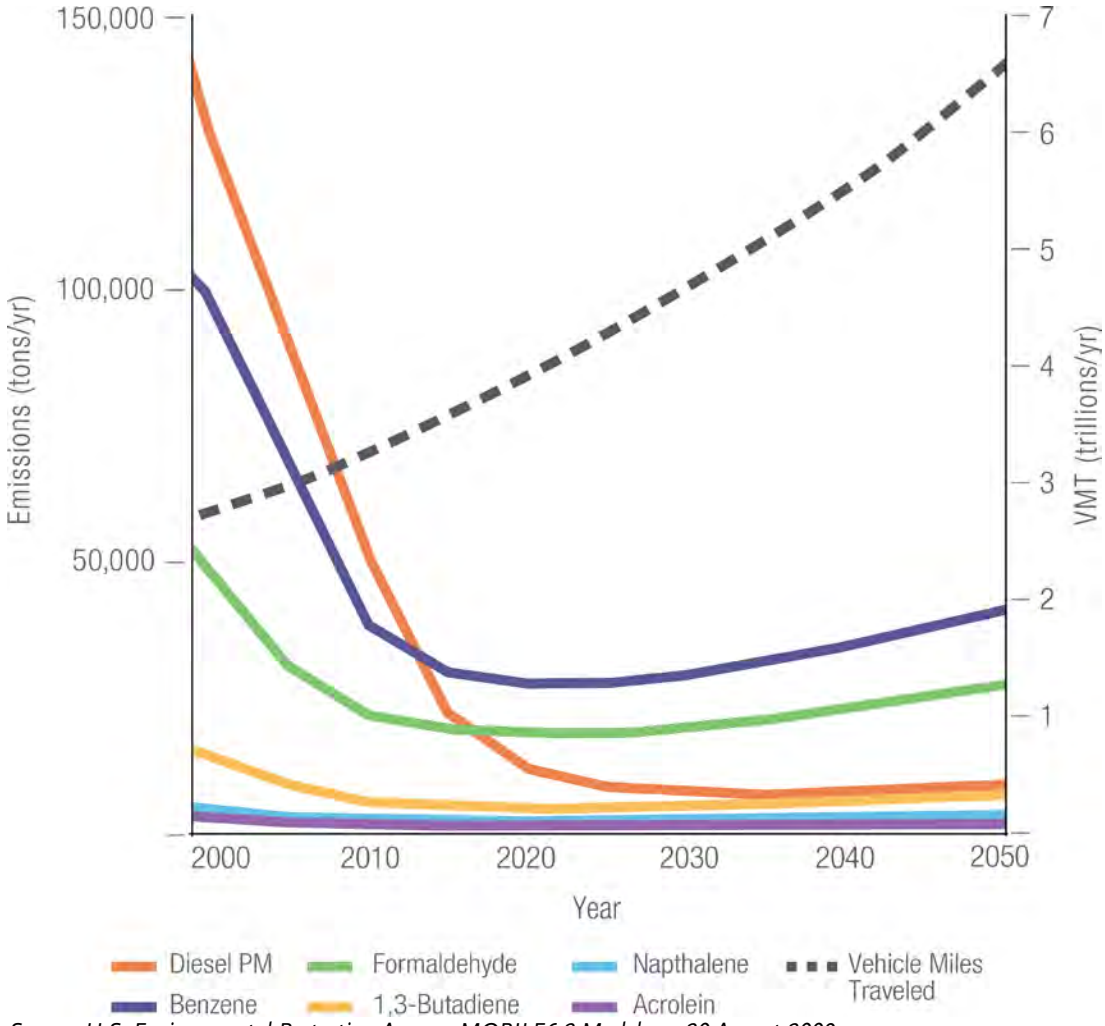
As the majority of the Project is located underground, localized MSAT impacts will be limited to areas where additional traffic may occur, generally near stations, where there will be bus and commuter traffic. Based on the traffic analysis for the LPA, the greatest increase in intersection volume (247 vehicles) will occur at the Gayley Avenue and Le Conte Avenue intersection. This intersection is predicted to operate at an LOS of B and D for the a.m. and p.m. peak periods, respectively, under both the No Build Alternative and the LPA. The highest volume intersection in the Study Area is Veteran Avenue and Wilshire Boulevard, with an overall peak volume of approximately 11,000 vehicles for both the No Build Alternative and the LPA. This intersection operates at LOS F in both peak periods under both the No Build Alternative and the LPA.

At many locations within the Study Area, however, overall traffic volumes are expected to decrease under the LPA, including all station, alignment, and station entrance options still under consideration, as compared to the No Build Alternative.

The MSAT emissions qualitative analysis acknowledges that the LPA, including all station, alignment, and station entrance options still under consideration, could increase MSAT exposure in certain locations, although the exposure concentrations and durations are uncertain. Because of these limitations, this discussion is included in accordance with Federal Council on Environmental Quality (CEQ) regulations (40 CFR 1502.22[b]) (CFR 1978) regarding incomplete or unavailable information.

It is FHWA's position that, at the present time, information is incomplete or unavailable to credibly predict the project-specific health impacts resulting from MSAT emissions changes. The EPA is responsible for protecting the public health and welfare from any known or anticipated air pollutant effect. Among the adverse health effects associated with MSAT at high exposures are cancer in humans in occupational settings; cancer in animals; and respiratory tract irritation, including the exacerbation of asthma.

Because methodologies for forecasting health impacts are limited, predicted differences in health impacts among alternatives are likely to be smaller than the uncertainties associated with such prediction. As such, assessment results would not be useful.



Source: U.S. Environmental Protection Agency. MOBILE6.2 Model run 20 August 2009.

(1) Annual emissions of polycyclic organic matter are projected to be 561 tons/year for 1999, decreasing to 373 tons/year for 2050.
(2) Trends for specific locations may be different, depending on locally derived information representing vehicle miles traveled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.

Figure 4-28. National MSAT Emission Trends 1999–2050 for Vehicles Operating on Roadways Using EPA Mobile 6.2 Model

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the potential for MSAT impacts is the same as under the Concurrent Construction Scenario. The only difference between the two scenarios is the timing of the potential for MSAT impacts. Under the Phased Construction Scenario, the potential for MSAT impacts along Phase 2 and Phase 3 will occur later than under the Concurrent Construction Scenario due to an extended construction timeline. The timing for potential MSAT impacts along Phase 1 of the LPA will occur earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

The analysis of the LPA under the Phased Construction Scenario is the same as the Concurrent Construction Scenario discussed in the section above. Under the Phased Construction Scenario, Phase 1, Phase 2, and Phase 3 of the LPA are expected to reduce MSATs as compared to the No Build Alternative.

Odors

No Build Alternative

The No Build Alternative does not propose construction activity beyond what is currently in construction or planned in the *RTP (SCAG 2008a)* and LRTP (Metro 2008a). The No Build Alternative would not result in odor-related operational impacts.

Locally Preferred Alternative

America Fast Forward (30/10) Scenario (Concurrent Construction)

The LPA operations under the Concurrent Construction Scenario, including all station, alignment, and station entrance options still under consideration, are not expected to cause any objectionable odors, as the rail system's operations will operate on electric power and will not produce emissions. However, construction will generate emissions and objectionable odors, which could be significant but will be limited to the duration of construction. For a discussion of impacts during construction and mitigation measures, refer to Section 4.15.

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the potential for operational impacts related to odors is the same as under the Concurrent Construction Scenario. The only difference between the two scenarios is the timing of the potential for impacts related to odors. Under the Phased Construction Scenario, the potential for impacts related to odors along Phase 2 and Phase 3 will occur later than under the Concurrent Construction Scenario due to an extended construction timeline. The timing for potential impacts related to odors along Phase 1 of the LPA will occur earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

Phase 1, Phase 2, and Phase 3 of the LPA, including all station, alignment, and station entrance options still under consideration, are not expected to cause any objectionable odors, as the rail system's operations will operate on electric power and will not produce emissions. However, construction will generate emissions and objectionable odors, which could be significant but will be limited to the duration of construction. For a discussion of impacts during construction and mitigation measures, refer to Section 4.15.

4.4.4 Conformity Assessment

The RTP presents the transportation vision for the six-county region of Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties through the year 2035 and provides a long-term investment framework for addressing the region's transportation and related challenges. Under the *Clean Air Act Amendments of 1990* (CAAA) (PL 1990b), the *Intermodal Surface Transportation Efficiency Act of 1991* (ISTEA) (PL 1991), and the *Transportation Equity Act for the 21st Century* (TEA-21) (PL 1998), proposed transportation projects must be derived from an LRTP or RTP that conforms

with the state air quality plans as outlined in the SIP. The SIP sets forth the state's strategies for achieving air quality standards. Projects must also be included in a TIP that conforms with the SIP, and localized impacts from proposed projects must conform to state air quality plans in non-attainment and maintenance areas.

An MPO is the designated local decision-making body that is responsible for carrying out the metropolitan transportation planning process for an urban area. SCAG, as the Federally designated MPO for most of Southern California, is required to adopt and periodically update an LRTP and develop an RTP and TIP for Los Angeles, Orange, San Bernardino, Riverside, Ventura, and Imperial Counties.

The Westside Subway Extension Project was included in the regional emissions analysis conducted by SCAG for the conforming 2008 RTP as Project ID #UT101 (SCAG 2008a) as well as Project ID #1TR1002 and #1TR1003 in Amendment #3 to the RTP (SCAG 2010). The LPA's design concept and scope, under either the Concurrent Construction Scenario or the Phased Construction Scenario, have not changed significantly from what was analyzed in the 2008 RTP and Amendment #3. This analysis found that the plan and, therefore, the individual projects contained in the plan, are conforming projects and will have air quality impacts consistent with those identified in the SIPs for achieving NAAQSs. The 2008 RTP was adopted by SCAG on May 8, 2008.

The Westside Subway Extension Project is included in Amendment #08-34 (SCAG 2010) to the 2008 RTIP (SCAG 2008d) as Project ID #UT101, #1TR1002, and #1TR1003. The Westside Subway Extension is also included in Metro's 2009 LRTP (Metro 2009a) under "Candidates for Private Sector Financial Participation—Transit Projects".

The Concurrent Construction Scenario and all phases of the Phased Construction Scenario, including all station, alignment, and station entrance options still under consideration, are not predicted to cause or exacerbate a violation of applicable ambient air quality standards. Furthermore, the Concurrent Construction Scenario and all phases of the Phased Construction Scenario are predicted to reduce regional emission levels. An application to the SCAG Transportation Conformity Working Group is being prepared to determine if the LPA is one of air quality concern for PM_{10}/$PM_{2.5}$.

4.4.5 Mitigation Measures

Based on the above analysis and results, the LPA under the Concurrent Construction Scenario and Phase 1, Phase 2, and Phase 3 of the Phased Construction Scenario will not exceed NAAQSs, CAAQSs, or SCAQMD significance thresholds during operation. The Concurrent Construction Scenario and all phases of the Phased Construction Scenario are predicted to result in lower emissions of some criteria pollutants. Therefore, mitigation measures are not required for operation. For a discussion of impacts during construction and mitigation measures, refer to Section 4.15.

4.4.6 California Environmental Quality Act Determination

The CEQA determination compares the effects of the LPA with the existing conditions described in Section 0. Based on CEQA Guidelines, the significance criteria established by the applicable air quality management or air pollution control district, in this case

SCAQMD, may be relied upon to make the following determinations. CEQA also considers that a project would result in significant impacts if the project

- Conflicts with or obstructs implementation of the applicable air quality plan
- Violates any air quality standard or contributes substantially to an existing or projected air quality violation
- Results in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)
- Exposes sensitive receptors to substantial pollutant concentrations
- Creates objectionable odors affecting a substantial number of people

The Concurrent Construction Scenario and all three phases of the Phased Construction Scenario under the existing year as compared to the existing year without the LPA will not exceed the NAAQSs, CAAQSs, or SCAQMD significance thresholds. The opening of the LPA as a single phase or in three sequential phases will not result in differing impacts related to NAAQSs, CAAQSs, or SCAQMD significance thresholds.

As discussed in Section 4.4.3 and shown in Table 4-20 and Table 4-21, the existing year with the LPA is predicted to have lower regional pollutant burden levels on both the regional and Study Area levels as compared to the existing year without the LPA. For a discussion of impacts during construction and mitigation measures, refer to Section 4.15.

The Concurrent Construction Scenario and all three phases of the Phased Construction Scenario do not conflict with local air quality plans, violate air quality standards, or contribute to existing or projected air quality violations. No sensitive receptors are predicted to experience substantial pollutant concentrations as a result of the operation of the Concurrent Construction Scenario and all three phases of the Phased Construction Scenario. Any odor-related impacts would only be associated with construction and, therefore, would be temporary. The opening of the LPA as a single phase or in three sequential phases will not result in different impacts related to local air quality plans, air quality standards, or air quality violations. As such, the LPA will not result in significant impacts under CEQA.

4.5 Climate Change

This section has been updated from the Draft EIS/EIR to focus on the analysis of the effects of the LPA on climate change. The LPA could either be constructed as a single phase under the America Fast Forward (30/10) Scenario (Concurrent Construction) or as three consecutive phases under the Metro Long Range Transportation Plan Scenario (Phased Construction). The opening of the LPA as a single phase or in three sequential phases does not substantially change the climate change analysis that was presented in the Draft EIS/EIR. The analysis results have not changed from the Draft EIS/EIR. The analysis of all the Build and TSM Alternatives in the Draft EIS/EIR is incorporated into this document by reference. Information in this section is summarized from the *Westside Subway Extension Climate Change Technical Report* (Metro 2010l) prepared for

the Draft EIS/EIR and the *Westside Subway Extension Climate Change Memorandum* (Metro 2011k) prepared for the LPA, where additional detailed information is provided

Climate change is one of the most serious environmental challenges facing the world today, as increasing concentrations of greenhouse gases (GHG) are changing the planet's climate. Greenhouse gases are gases that trap heat in the atmosphere and keep the planet's surface warmer than it otherwise would be. This is referred to as the *greenhouse effect*. As concentrations of GHGs continue to increase in the atmosphere, the Earth's temperature is climbing above historic levels. Most of the warming in recent decades is likely the result of increased emissions of GHGs resulting from human activities.

4.5.1 Regulatory Setting

The current federal, state, and local GHG regulations, at the time of analysis, is summarized based on information obtained from the EPA, CARB, SCAG, and SCAQMD. These regulations are described in the following sections.

Federal

On September 22, 2009, the EPA published the final rule that amends the Clean Air Act (PL 199b) and requires mandatory reporting of GHG emissions from large sources in the U.S. The reporting would be used by EPA to collect accurate and comprehensive emissions data to inform future policy decisions. The gases covered by the final rule are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), sulfur hexafluoride (SF_6), and other fluorinated gases, including nitrogen trifluoride (NF_3) and hydrofluorinated ethers (HFE). Currently, this is not a transportation-related regulation.

On February 18, 2010, the CEQ provided a draft guidance memorandum on ways in which federal agencies can improve their consideration of the effects of GHG emissions and climate change in their evaluation of proposals for federal actions under NEPA. This memorandum recommends that if a proposed action would be reasonably anticipated to cause direct emissions of 25,000 metric tons or more of carbon dioxide equivalent (CO_2e) GHG emissions on an annual basis, agencies should consider this an indicator that a quantitative and qualitative assessment may be meaningful to decision makers and the public.

State

California's major initiatives for reducing GHG emissions are outlined in Assembly Bill (AB) 32 (AB 2006), Executive Order S-3-05 (CEO 2005), Executive Order S-01-07 (CEO 2007), and AB 1493 (AB 2009), which regulate automobile GHG emissions. The goal is to reduce GHG emissions to 1990 levels by the year 2020—a reduction of approximately 30 percent—and an 80-percent reduction below 1990 levels by the year 2050.

AB 32 sets overall GHG emissions reduction goals and mandates that CARB create a plan, which includes market mechanisms, and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases." Executive Order S-20-06

(CEO 2006) further directs state agencies to begin implementing AB 32, including the recommendations made by the State's Climate Action Team.

With Executive Order S-01-07, Governor Schwarzenegger set forth the low carbon fuel standard for California. Under this executive order, the carbon intensity of California's transportation fuels is to be reduced by at least 10 percent by 2020.

The implementation of AB 32 resulted in Senate Bill (SB) 375 (SB 2008) that requires CARB to set regional targets for reducing GHG emissions from passenger vehicles for 2020 and 2035. The targets apply to the regions in the state covered by the 18 metropolitan planning organizations.

SB 97 (SB 2007) established GHGs and their effects to be subjected to CEQA analysis and directed OPR to develop draft CEQA guidelines "for the mitigation of greenhouse gas emissions or the effects of greenhouse emissions." OPR released proposed guidelines in April 2009 and they became law effective March 18, 2010 (CCR 2010).

Local

SCAQMD adopted *Interim CEQA GHG Significance Thresholds for Stationary Sources, Rules, and Plans* (SCAQMD 2008) on December 5, 2008. Under these guidelines, interim GHG significance thresholds would apply to stationary source/industrial projects where SCAQMD is the lead agency under CEQA. The types of projects this rule affects include SCAQMD rules, rule amendments, and plans (e.g., Air Quality Management Plans). In addition, SCAQMD may be the lead agency under CEQA for projects that require discretionary approval (i.e., projects that require discretionary air quality permits from SCAQMD.)

4.5.2 Affected Environment/Existing Conditions

Greenhouse gases are necessary to life as they keep the planet's surface warmer than it otherwise would be. This is referred to as the greenhouse effect (Figure 4-29). As concentrations of GHGs increase, however, the Earth's temperature increases.

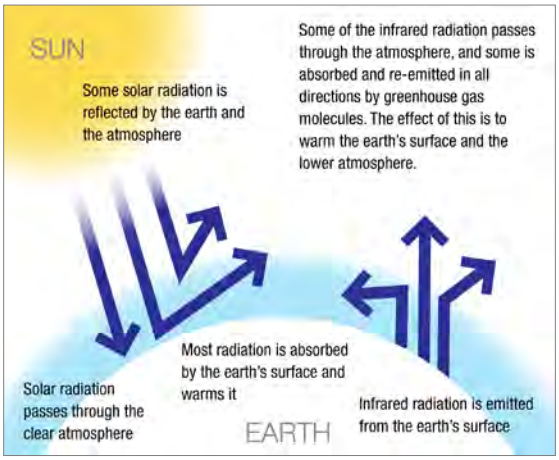


Figure 4-29. The Greenhouse Effect

According to National Oceanic and Atmospheric Administration and National Aeronautics and Space Administration data, the Earth's average surface temperature has increased by 1.2 to 1.4 degrees Fahrenheit in the last 100 years. Most of the warming in recent decades is likely the result of human activities. Other aspects of the climate are also changing, such as rainfall patterns, snow and ice cover, and sea level.

Some GHGs, such as CO_2, occur naturally and are emitted to the atmosphere through natural processes and human activities. Other GHGs (e.g., fluorinated gases) are created and emitted solely through human activities. Greenhouse gases differ in their ability to trap heat. For example, one ton of CO_2 emissions has a different effect than one ton of CH_4 emissions. To compare emissions of different GHGs, inventory compilers use a weighting factor called a *global warming potential* (GWP). To use a GWP, the heat-trapping ability of one metric ton (1,000 kilograms) of CO_2 is taken as the standard, and emissions are expressed in terms of CO_2 equivalent (CO_2e) but can also be expressed in terms of carbon equivalent.

The principal GHGs that enter the atmosphere because of human activities are as follows:

- **Carbon Dioxide (CO_2)**—CO_2 enters the atmosphere via the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and also as a result of other chemical reactions (e.g., manufacture of cement). CO_2 is also removed from the atmosphere (or *sequestered*) when it is absorbed by plants as part of the biological carbon cycle.
- **Methane (CH_4)**—CH_4 is emitted during the production and transport of coal, natural gas, and oil. CH_4 emissions also result from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills.
- **Nitrous Oxide (N_2O)**—N_2O is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.
- **Fluorinated Gases**—Hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are synthetic, powerful GHGs that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances (e.g., chlorofluorocarbons [CFC], hydrochlorofluorocarbons [HCFC], and halons). These gases are typically emitted in smaller quantities but, because they are potent GHGs, they are sometimes referred to as high GWP gases.

An inventory of GHG emission sources compiled by CARB for the years 2002–2008 is shown in Table 4-25. Transportation accounts for approximately 39 percent of California's GHG inventory, based on this data. The U.S. average is 28 percent for the same time period. As such, reducing GHG emissions resulting from transportation is a key element in reducing overall GHG emissions in the State of California.

Table 4-25. California Greenhouse Gas Inventory for 2002–2008 by Category

	2002	2003	2004	2005	2006	2007	2008
Transportation	180.36	178.03	181.71	184.32	184.11	183.84	174.99
On road	168.40	166.17	169.22	170.82	170.49	170.79	163.30
Passenger vehicles	135.43	132.83	134.24	134.51	133.80	133.34	128.51
Heavy duty trucks	32.97	33.34	34.98	36.31	36.68	37.45	34.79
Ships and commercial boats	3.87	4.04	4.06	4.36	4.45	4.38	4.32
Aviation (intrastate)	2.66	2.59	2.64	2.7	2.68	2.96	2.42
Rail	2.48	2.41	2.89	3.32	3.5	3.15	2.52
Unspecified	2.94	2.81	2.9	3.11	3.00	2.56	2.44

Table 4-25. California Greenhouse Gas Inventory for 2002–2008 by Category (continued)

	2002	2003	2004	2005	2006	2007	2008
Electric Power	106.49	109.89	119.96	110.98	107.66	111.10	116.35
In-state generation	50.87	49.08	57.40	51.75	56.28	55.16	55.12
Natural gas	42.42	41.01	48.66	43.21	47.62	47.20	48.07
Other fuels	8.45	8.07	8.74	8.54	8.67	7.96	7.05
Imported electricity	55.26	60.81	62.56	59.22	51.38	55.94	61.24
Coal imports	29.99	30.43	31.07	30.61	24.81	23.97	23.34
Natural gas imports	0.12	0.09	0.08	0.08	0.08	1.32	2.64
Geothermal imports	0.07	0.06	0.07	0.07	0.07	0.07	0.06
Distillate imports	0.02	0.02	0.02	0.02	0.01	0.01	0.01
Unspecified imports	25.42	30.21	31.32	28.44	26.4	30.57	35.19
Commercial and Residential	43.79	41.38	42.54	40.79	41.47	41.83	43.13
Residential fuel use	29.35	28.31	29.34	28.08	28.46	28.61	28.45
Natural gas	28.03	26.59	27.30	25.89	26.52	26.65	26.10
Other fuels	1.32	1.72	2.04	2.19	1.93	1.96	2.35
Commercial fuel use	13.37	12.81	12.71	12.56	12.84	12.73	14.31
Natural gas	12.11	11.34	11.13	10.90	11.58	11.35	12.51
Other fuels	1.26	1.46	1.59	1.66	1.26	1.38	1.80
Commercial cogeneration heat output	1.08	0.26	0.49	0.15	0.17	0.49	0.37
Industrial	96.73	96.14	90.87	90.72	90.47	93.82	92.66
Refineries	33.87	34.80	34.06	35.31	36.09	36.07	35.65
General fuel use	19.53	16.39	16.28	14.8	15.17	14.78	14.82
Natural gas	12.80	10.26	10.53	9.86	9.90	9.76	9.14
Other fuels	6.73	6.13	5.76	4.93	5.27	5.02	5.69
Oil and gas extraction[1]	17.37	19.51	19.31	18.01	16.48	16.52	17.04
Fuel use	16.64	118.78	18.94	17.66	15.72	15.75	16.27
Fugitive emissions	0.73	0.74	0.37	0.35	0.77	0.77	0.78
Cement plants	9.61	9.72	9.82	9.92	9.75	9.17	8.61
Clinker production	5.6	5.68	5.77	5.85	5.8	5.55	5.31
Fuel use	4.01	4.03	4.05	4.07	3.95	3.62	3.30
Cogeneration heat output	10.84	10.79	6.19	6.91	6.90	11.22	10.47
Other process emissions	5.50	4.94	5.22	5.78	6.08	6.07	6.06
Recycling and Waste	6.21	6.29	6.23	6.52	6.59	6.53	6.71
Landfills[2]	6.21	6.29	6.23	6.52	6.59	6.53	6.71
High Global Warming Potential	11.97	12.75	13.57	14.23	14.92	15.27	15.65
Ozone depleting substance substitutes	10.12	10.92	11.74	12.41	13.05	13.47	13.89
Electricity grid SF6 losses[3]	1.07	1.05	1.05	1.04	1.00	0.97	0.96
Semiconductor manufacturing[2]	0.78	0.78	0.78	0.78	0.87	0.84	0.80

Table 4-25. California Greenhouse Gas Inventory for 2002–2008 by Category (continued)

	2002	2003	2004	2005	2006	2007	2008
Agriculture[4]	28.42	28.49	28.82	28.99	29.90	28.26	28.06
Livestock	14.56	14.88	14.81	15.36	15.63	15.96	16.28
Enteric fermentation (digestive process)	7.86	7.97	7.97	8.26	8.33	8.52	8.7
Manure management	6.7	6.91	6.84	7.10	7.30	7.44	7.58
Crop growing and harvesting	9.48	9.41	9.51	9.03	9.08	8.53	7.95
Fertilizers	8.06	8.02	8.03	7.58	7.44	7.08	6.72
Soil preparation and disturbances	1.34	1.31	1.41	1.37	1.56	1.36	1.15
Crop residue burning	0.07	0.08	0.07	0.08	0.08	0.09	0.09
General fuel use	4.39	4.20	4.50	4.60	5.19	3.78	3.82
Diesel	3.02	2.94	3.15	3.38	3.85	2.66	2.93
Natural gas	0.95	0.85	0.82	0.69	0.77	0.79	0.72
Gasoline	0.40	0.41	0.52	0.52	0.57	0.32	0.17
Other fuels	0.00	0.00	0.00	0.00	0.01	0.00	0.01
Forestry	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Wildfire (CH_4 and N_2o emissions)	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Total Gross Emissions	**474.15**	**473.15**	**483.88**	**476.73**	**475.31**	**480.85**	**477.74**
Forestry net emissions	-4.40	-4.33	-4.32	-4.17	-4.04	-4.07	-3.98
Total Net Emissions	**169.75**	**168.82**	**479.56**	**472.56**	**471.27**	**476.77**	**473.76**

[1]Reflects emissions from combustion of natural gas, diesel, and lease fuel plus fugitive emissions.
[2]These categories are listed in the Industrial sector of California Air Resources Board's Greenhouse Gas Emissions Inventory sectors.
[3]This category is listed in the Electric Power sector of California Air Resources Board's Greenhouse Gas Emissions Inventory sectors.
[4]Reflects use of updated USEPA models for determining emissions from livestock and fertilizers.
Note: Million tons of CO_2 equivalent–based upon IPCC Second Assessment Report's Global Warming Potentials.

4.5.3 Environmental Impacts/Environmental Consequences

LPA operations could affect GHG emissions from two major sources—roadway traffic and power requirements. As the power requirements for the LPA when fully operational could generate as much as 25,000 metric tons or more of CO_2e, a qualitative analysis was conducted, as recommended by CEQ's *Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions* (CEQ 2010).

The roadway traffic impact would be reflected in changes in the Study Area's VMT and associated vehicular speed. GHG emission burdens, the amounts of GHGs emitted by a particular alternative, are estimated based on the on-road fleet's GHG emission factors multiplied by VMT. Emission factors were obtained from California Air Resources Board's emission factor program (EMFAC2007), the latest emission inventory model for the calculation of mobile source emission factors for vehicles operating on roads in California. EMFAC2007 takes into account future improvements in vehicle fuel efficiency, and the parameters of the program were set for Los Angeles County.

The results for the region are shown in Table 4-26. This table presents the emission burdens, or GHG levels, under the existing year and existing year with the LPA conditions in 2010, as well as for the No Build Alternative, Concurrent Construction Scenario, and Phased Construction Scenario for the Project's design year of 2035.

Table 4-26. Regional Roadway CO_2e Emission Burden Assessment (metric tons/day)

Alternative	VMT		CO_2e	
	Daily VMT	Change from Existing/No Build	Emission Burden (metric tons/day)	Change from Existing/No Build (metric tons/day)
Existing year	354,994,812	—	176,403	—
Existing year with LPA	354,718,551	-276,261	176,254	-149
No Build	532,661,000	—	405,431	—
Concurrent Construction Scenario				
LPA with Century City Santa Monica	532,343,000	-318,000	402,782	-2,649
LPA with Century City Constellation	532,080,000	-581,000	402,578	-2,854
Phased Construction Scenario				
Phase 1	532,447,000	-214,000	405,258	-173
Phase 2 with Century City Santa Monica	532,514,000	-147,000	405,323	-108
Phase 2 with Century City Constellation	532,267,000	-394,000	405,117	-314
Phase 3 with Century City Santa Monica	532,343,000	-318,000	402,782	-2,649
Phase 3 with Century City Constellation	532,080,000	-581,000	402,578	-2,854

The LPA would require electrical power for vehicle propulsion and station operations. The generation of this power would result in increased GHG emissions. To determine the increased GHG burden, emission factors from EPA's eGRID program were obtained for the State of California and multiplied by the estimated daily power demand calculated in the energy analysis and documented in the *Westside Subway Extension Energy Technical Report* (Metro 2010k). The estimated GHG emission burden generated due to the increased power usage is shown in Table 4-27.

The CO_2e emission factors represent the current energy profile of California. In the future, it is anticipated that the energy profile of California would have a lower CO_2e emission rate per kilowatt hour due to the state's policy to increase using green energy sources. As such, it is anticipated that the CO_2e emissions from future power requirements for the system would be lower than those used in this analysis. Therefore, the emission burdens presented in Table 4-28 are conservative estimates due to the use of CO_2e emission factors representing the current California conditions.

Table 4-27. CO_2e Emission Burdens from Power Requirements (metric tons/day)

Alternative	Emission Factor CO_2e (metric tons/MWH)	Estimated Electric Usage	Total CO_2e (metric tons/day)
Existing year	0.31	—	0
Existing year with LPA	0.31	497	154
No Build	0.31	502	156
Concurrent Construction Scenario			
LPA with Century City Santa Monica	0.31	826	256
LPA with Century City Constellation	0.31	834	259
Phased Construction Scenario			
Phase 1	0.31	672	208
Phase 2 with Century City Santa Monica	0.31	742	230
Phase 2 with Century City Constellation	0.31	750	233
Phase 3 with Century City Santa Monica	0.31	826	256
Phase 3 with Century City Constellation	0.31	834	259

Table 4-28. Regional CO_2e Emission Burden Assessment (metric tons/day)

Alternative	Roadways Contribution (metric tons/day)	Power Contribution (metric tons/day)	Total (metric tons/day)	% Change from Existing/ No Build
Existing year	176,403	0	176,403	
Existing year with LPA	176,254	154	176,408	0.0%
No Build	405,431	156	405,587	—
Concurrent Construction Scenario				
LPA with Century City Santa Monica	402,782	256	403,038	-0.6%
LPA with Century City Constellation	402,578	259	402,836	-0.7%
Phased Construction Scenario				
Phase 1	405,258	208	405,467	0.0%
Phase 2 with Century City Santa Monica	405,323	230	405,347	-0.1%
Phase 2 with Century City Constellation	405,117	233	405,556	0.0%
Phase 3 with Century City Santa Monica	402,782	256	403,038	-0.6%
Phase 3 with Century City Constellation	402,578	259	402,836	-0.7%

No Build Alternative

The No Build Alternative does not propose construction activity beyond what is currently in construction or planned in the *RTP (SCAG 2008a)* or Metro's LRTP (Metro 2008a). The No Build Alternative is the baseline condition for comparison with the LPA. The No Build Alternative would not result in operational impacts.

Locally Preferred Alternative

America Fast Forward (30/10) Scenario (Concurrent Construction)

The overall impact of the LPA with regard to GHGs can be determined by combining the various elements analyzed. The elements analyzed include roadway VMT and the power requirements of the LPA. The LPA under the Concurrent Construction Scenario is predicted to reduce roadway VMT and, therefore, the GHGs associated with roadway VMT, as compared to the No Build Alternative.

The LPA, including all station, alignment, and station entrance options still under consideration, is predicted to increase power requirements and, therefore, the GHGs associated with the increased power usage, as compared to the No Build Alternative. By combining the emission reductions from reduced roadway VMT (Table 4-26) with the emission increases due to power usage (Table 4-27), the LPA, including all station, alignment, and station entrance options still under consideration, are predicted to slightly reduce the regional CO_2e emission burden as compared to the No Build Alternative (Table 4-28).

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the potential for operational climate change impacts is the same as under the Concurrent Construction Scenario. The only difference between the two scenarios is the timing of the potential for operational climate change impacts. Under the Phased Construction Scenario, the potential for climate change impacts along Phase 2 and Phase 3 would occur later than under the Concurrent Construction Scenario due to an extended construction timeline. The timing for potential climate change impacts along Phase 1 of the LPA would occur earlier than under the Concurrent Construction Scenario since Phase 1 would open for operation in 2020.

The LPA under the Phased Construction Scenario is predicted to reduce roadway VMT and, therefore, the GHGs associated with roadway VMT, as compared to the No Build Alternative. Phase 1, Phase 2, and Phase 3, including all station, alignment, and station entrance options, are predicted to increase power requirements and, therefore, the GHGs associated with the increased power usage, as compared to the No Build Alternative. By combining the emission reductions from reduced roadway VMT (Table 4-26) with the emission increases due to power usage (Table 4-27), Phase 1, Phase 2, and Phase 3, including all station, alignment, and station entrance options, are predicted to slightly reduce the regional CO_2e emission burden as compared to the No Build Alternative (Table 4-28). Due to the extended construction timeline under the Phased Construction Scenario, the full reduction in regional CO_2e emission burden would occur later than under the Concurrent Construction Scenario.

4.5.4 Mitigation Measures

The No Build Alternative would not result in operational impacts. No mitigation is required for the No Build Alternative. For a discussion of impacts during construction and mitigation measures, refer to Section 4.15.

The Concurrent Construction Scenario and the Phased Construction Scenario (all phases), including all station, alignment, and station entrance options still under consideration, would result in beneficial impacts. No mitigation is required. However, Metro recognizes that climate change is a serious issue. The following measures would be implemented to further ensure beneficial impacts.

- **CC-1—Implement Pedestrian and Transit-Oriented Development at Stations**

  Metro would continue to promote and support implementation of pedestrian-oriented and transit-oriented development at stations.

- **CC-2—Energy Conservation**

  Energy conservation would be implemented throughout design and construction.

- **CC-3—Promote Transit Ridership**

  Metro would continue to promote transit ridership through marketing and educational programs.

- **CC-4—Green Power**

  Metro would use green power when/where available and priced competitively with other energy sources.

4.5.5 California Environmental Quality Act Determination

The CEQA determination compares the effects of the LPA with the existing conditions described in the affected environment/existing conditions section. Under CEQA Guidelines (Appendix G, Memorandum of Understanding for Paleontological Resources), a project would result in significant impact if the project

- Generates GHG emissions, either directly or indirectly, that may have a significant impact on the environment
- Conflicts with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHGs

Significance thresholds have not yet been established for transportation-related GHG emissions. Therefore, the predicted emission burden levels for the LPA under existing conditions have been compared to the emission burden levels calculated for existing year conditions without the LPA.

The overall impact of the LPA with regard to GHGs can be determined by combining the various elements analyzed. The LPA elements analyzed include roadway VMT and the power requirements of the LPA. The LPA under existing conditions is predicted to reduce roadway VMT and, therefore, the GHGs associated with roadway VMT, as compared to existing year conditions. The LPA is predicted to increase power requirements and, therefore, the GHGs associated with the increased power usage, as compared to existing year conditions. By combining the emission reductions from

reduced roadway VMT (Table 4-26) with the emission increases due to power usage (Table 4-27), the existing year with the LPA, including all station, alignment, and station entrance options still under consideration, is predicted to slightly increase the regional CO_2e emission burden as compared to existing year conditions (Table 4-28). This increase is very slight, however, and can be considered less than significance. Therefore, the opening of the LPA as a single phase or in three sequential phases would not result in differing effects related to GHG emissions compared to existing year conditions.

It is expected that the Project would aid the region in achieving its goal of compliance and consistency with the *Global Warming Solution Act of 2006* (AB 2006), with regard to the regional GHG reduction targets and potential sustainable communities strategies in the RTP and with SB 97 (2007 Statutes, Ch.18) (SB 2007) and the resultant new CEQA Guidelines addressing GHG emissions.

4.6 Noise and Vibration

This section has been updated from the Draft EIS/EIR to focus on the analysis of the effects of the LPA on noise and vibration. Following the Draft EIS/EIR, further noise and vibration studies were done as part of this Final EIS/EIR, and the results of the additional tests and studies are summarized in this section. The LPA could either be constructed as a single phase under the America Fast Forward (30/10) Scenario (Concurrent Construction) or as three consecutive phases under the Metro Long Range Transportation Plan Scenario (Phased Construction). The opening of the LPA as a single phase or in three sequential phases does not substantially change the noise and vibration analysis that was presented in the Draft EIS/EIR. The analysis of all the Build and TSM Alternatives in the Draft EIS/EIR is incorporated into this document by reference. Information in this section is summarized from the *Westside Subway Extension Noise and Vibration Technical Report* (Metro 2010g) and the *Westside Subway Extension Noise and Vibration Study* (Metro 2011g), where additional detailed information is provided.

4.6.1 Background and Methodology

This noise and vibration impact analysis is based on criteria defined in the FTA's guidance manual *Transit Noise and Vibration Impact Assessment* (FTA 2006). The approach also addresses the requirements of CEQA, uses Metro Design Criteria, and reviewed noise regulations of local jurisdictions, primarily the County and City of Los Angeles and the City of Beverly Hills.

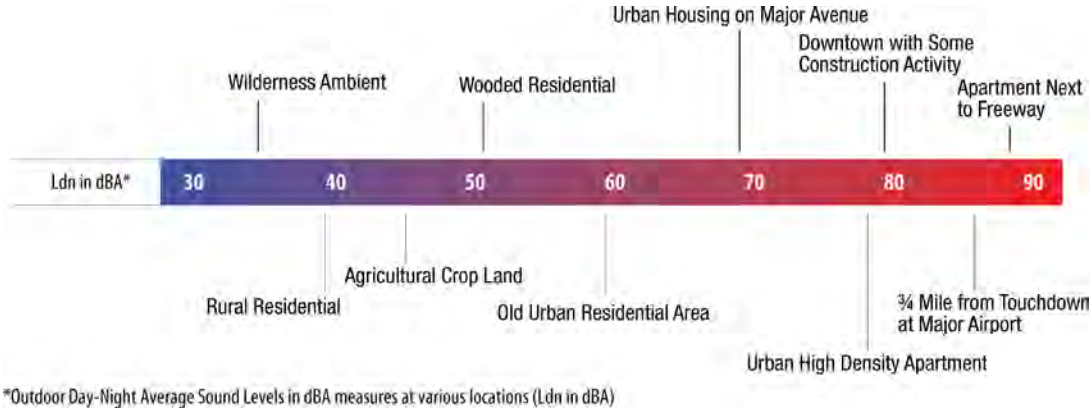
Noise Criteria

Sound and noise (unwanted sound) are measured in units of decibels. A-weighted decibels (dBA) account for the human perception of sound with less sensitivity to low pitch and very high pitch sounds. FTA guidelines assess noise impacts using different descriptors:

- L_{eq} refers to the equivalent continuous sound level. It is a measure of the total noise energy of all the sound during a period of time.
- $L_{eq(h)}$ is the L_{eq} for a one-hour period. For land uses involving daytime and evening use only, the noise impact analysis uses $L_{eq(h)}$ representing the noisiest hour of transit-related activity during which human activities occur at noise sensitive locations.

- L_{dn} is also known as the average day-night noise level. This represents the cumulative 24-hour day-night noise level and accounts for the greater sensitivity to noise at night when people are sleeping by applying a 10-decibel (dB) penalty to nighttime noise. Typical L_{dn} sound levels are shown below in Figure 4-30.

Some land use types and activities are more sensitive to noise than others (e.g., residences, parks, schools, and places of worship are typically more noise-sensitive than industrial and commercial areas). The FTA noise impact criteria classify noise-sensitive land uses into three categories, as indicated in Table 4-29



Source: U.S. EPA.

Figure 4-30. Typical Day-Night (L_{dn}) Sound Levels

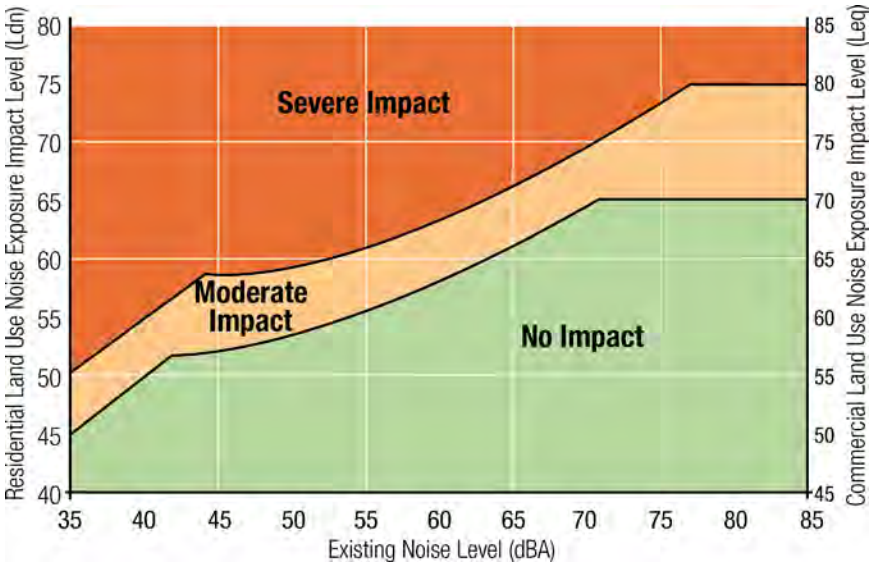
Table 4-29. FTA Land Use Categories and Metrics for Transit Noise

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor $L_{eq(h)}$[1]	Tracts of land where quiet is an essential element in their intended purpose—includes lands set aside for serenity and quiet and land used for outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use.
2	Outdoor L_{dn}	Residences and buildings where people normally sleep—includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor $_{Leq(h)}$[1]	Institutional land uses with primary daytime and evening use—includes schools, libraries, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material.

Source: Transit Noise and Vibration Impact Assessment (FTA 2006a).

[1] $L_{eq(h)}$ is the L_{eq} for the noisiest hour of transit-related activity during hours of noise sensitivity.

Figure 4-31 shows the FTA noise criteria used to determine *moderate* and *severe* impact levels. The impact level from project-generated noise depends on the existing noise environment and the current land use. For example, if a residential land use has an existing noise level of 50 dBA and a project generates a noise level of 56 dBA, then the project would result in a moderate noise impact. Severe noise impacts are considered adverse impacts under NEPA. Severe impacts have the greatest adverse effect on the community; thus, FTA presumes that mitigation will be incorporated into the project unless there are extenuating circumstances that prevent its incorporation. While moderate impacts are not of the same magnitude as severe impacts, they require consideration and implementation of mitigation measures when reasonable.



Source: Transit Noise and Vibration Impact Assessment (FTA 2006a)

Figure 4-31. Noise Impact Criteria for Transit Projects

Vibration Criteria

Ground-borne vibration from transit vehicles is characterized using root mean squared (RMS) vibration velocity amplitude. When assessing the potential for building damage, ground-borne vibration is usually expressed using peak particle velocity (PPV) in units of inches per second, but may also be expressed using velocity decibels (VdB), which are vibration amplitudes referenced to 1 micro inch/second. The vibration perception threshold for most humans is around an RMS vibration level of 65 to 70 VdB. Levels from 70 to 75 VdB are typically noticeable but acceptable to most persons. Levels higher than 80 VdB are often considered unacceptable.

Following FTA guidance, vibration impacts are determined using the vibration level, the type of land use, and frequent, occasional, or infrequent vibration events for the different land use categories. Frequent events are more than 70 vibration events of the same source per day. Most rapid transit projects, including this one, fall into this category. 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. Lastly, infrequent events are

defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.

Excessive ground vibration from transit subway operations can sometimes result in a low-pitched rumbling sound occurring within a nearby building during the train pass-by called ground-borne noise. The FTA ground-borne vibration (GBV) and ground-borne noise (GBN) impact criteria are shown in Table 4-30.

Some buildings, such as concert halls, television and recording studios, and theaters, can be very sensitive to vibration but do not fit into any of the three standard land use categories. The GBV and GBN criteria for these special buildings are shown in Table 4-31.

If the building will rarely be occupied when the trains are operating, there is no need to consider impact. As an example, consider locating a commuter rail line next to a concert hall. If no commuter trains will operate after 7 pm, it should be rare that the trains interfere with the use of the hall.

Table 4-30. FTA Ground-borne Vibration and Ground-borne Noise Impact Criteria for General Assessment

Land Use Category	Ground-borne Vibration Levels (VdB re 1 micro-inch/second)			Ground-borne Noise Impact Levels (dB re 20 micro Pascals)		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]	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]	N/A[5]	N/A[5]	N/A[5]
Category 2: Residences and buildings where people normally sleep	72 VdB	75 VdB	80 VdB	35 dBA	38 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use	75 VdB	78 VdB	83 VdB	40 dBA	43 dBA	48 dBA

Source: Transit Noise and Vibration Impact Assessment (FTA 2006a)

[1]Frequent Events is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.
[2]Occasional Events is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.
[3]Infrequent Events is 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 manufacturer or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.
[5]Vibration-sensitive equipment is generally not sensitive to ground-borne noise.

Table 4-31. FTA Ground-borne Vibration and Ground-borne Noise Impact Criteria for Special Buildings

Land Use Category	Ground-borne Vibration Levels (VdB re 1 micro-inch/second)		Ground-borne Noise Impact Levels (dB re 20 micro Pascals)	
	Frequent Events[1]	Occasional or Infrequent Events[2]	Frequent Events[1]	Occasional or Infrequent Events[2]
Concert halls	65 VdB	65 VdB	25 dBA	25 dBA
TV studios	65 VdB	65 VdB	25 dBA	25 dBA
Recording studios	65 VdB	65 VdB	25 dBA	25 dBA
Auditoriums	72 VdB	80 VdB	30 dBA	38 dBA
Theaters	72 VdB	80 VdB	35 dBA	43 dBA

Source: Transit Noise and Vibration Impact Assessment (FTA 2006a)

[1]Frequent Events is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.
[2]Occasional or Infrequent Events is defined as equal to or fewer than 70 vibration events per day. This category includes most commuter rail systems.

4.6.2 Affected Environment/Existing Conditions

Noise-sensitive land uses, such as residences, parks, schools, hospitals, places of worship, and theaters, were identified in the vicinity of each station location and near any LPA at-grade facilities, such as emergency generators. These locations are considered in this study because of the potential for different sources of operations noise at street level. These sources include ventilation fans and train noise transmitted through the ventilation shafts to the open gratings at street level. The other sources are the periodic testing of the two emergency generators at the Wilshire/La Brea and Westwood/VA Hospital Stations and the testing of the emergency ventilation fans located at each of the stations.

The affected environment and existing conditions for the LPA are the same whether the LPA is constructed under the Concurrent Construction Scenario or the Phased Construction Scenario. Under the Phased Construction Scenario, the emergency generator at Wilshire/La Brea will be constructed as part of Phase 1, and the emergency generator at Westwood/VA Hospital will be constructed as part of Phase 3. The remaining elements with potential for producing noise will be constructed in phases as the stations are phased (e.g., ventilation shafts at the Wilshire/Fairfax Station will be constructed in Phase 1).

Existing Noise Environment

Additional noise monitoring was conducted to reflect the shift in station locations adopted as part of the LPA. The existing conditions of the noise environment at these sensitive land uses adjoining the stations were based on long-term (24-hour) and short-term (15-minute) measurements. These measurements were conducted following the Draft EIS/EIR at eight sites primarily in areas near sensitive uses, including residences and other buildings where people normally sleep, such as hospitals and hotels/motels. All noise measurements were conducted in a manner consistent with applicable

American National Standards Institute (ANSI) procedures for community noise measurements.

The existing environmental noise levels at the LPA stations are typical of an urban environment, with 24-hour day/night (Ldn) levels ranging from 60 to 74 dBA. Measured noise levels are presented in Table 4-32, which indicates the phases for each location if the LPA is constructed under the Phased Construction Scenario. The measurements were taken at residences, a hospital, and a theater directly adjoining the stations and station options as shown in Figure 4-32. The measurements were performed at the stations because that is where potential surface noise from the LPA may be expected to cause a noise impact. Measurements were not conducted above tunnel sections of the LPA because noise from subway operations in the tunnels will be underground and inaudible at the surface. Therefore, there will be no potential for causing a noise impact.

As summarized in Table 4-32, multi-family residential units, either apartments or condominiums, occur near all the stations, with the exception of the Century City Santa Monica and Westwood VA/Hospital Station options. The VA Hospital is in close proximity to the Westwood/VA Hospital South Station option, and the Wadsworth Theatre is in close proximity to the Westwood/VA Hospital North Station option.

Table 4-32. Existing Noise Levels

Phase	Measure-ment Site	Station	Address	Land Uses	Average Day-Night Noise L_{dn}	Peak-hour Noise $L_{eq(h)}$	Time of Peak-hour Noise
Phase 1	N2	Wilshire/Fairfax	6122 Wilshire Boulevard	Residential	68	65	7:00 a.m.
	N3	Wilshire/La Cienega	8601 Wilshire Boulevard	Residential	71	78	1:00 p.m.
Phase 2	N4	Wilshire/Rodeo	120 Canon Drive	Residential	64	66	3:00 p.m.
	N5	Century City Constellation	Future residence at Avenue of the Stars and Constellation Boulevard	Residential	74	78	4:00 p.m.
	—	Century City Santa Monica	No noise-sensitive receivers located near this station				
Phase 3	N6	Westwood/UCLA (On-Street and Off-Street)	Veteran Avenue and Wilshire Boulevard	Residential	74	79	3:00 p.m.
	N7	Westwood/VA Hospital South	VA Hospital	Institutional	60	64	3:00 p.m.
	N8	Westwood/VA Hospital North	Wadsworth Theatre	Theater	72	70	7:00 a.m.

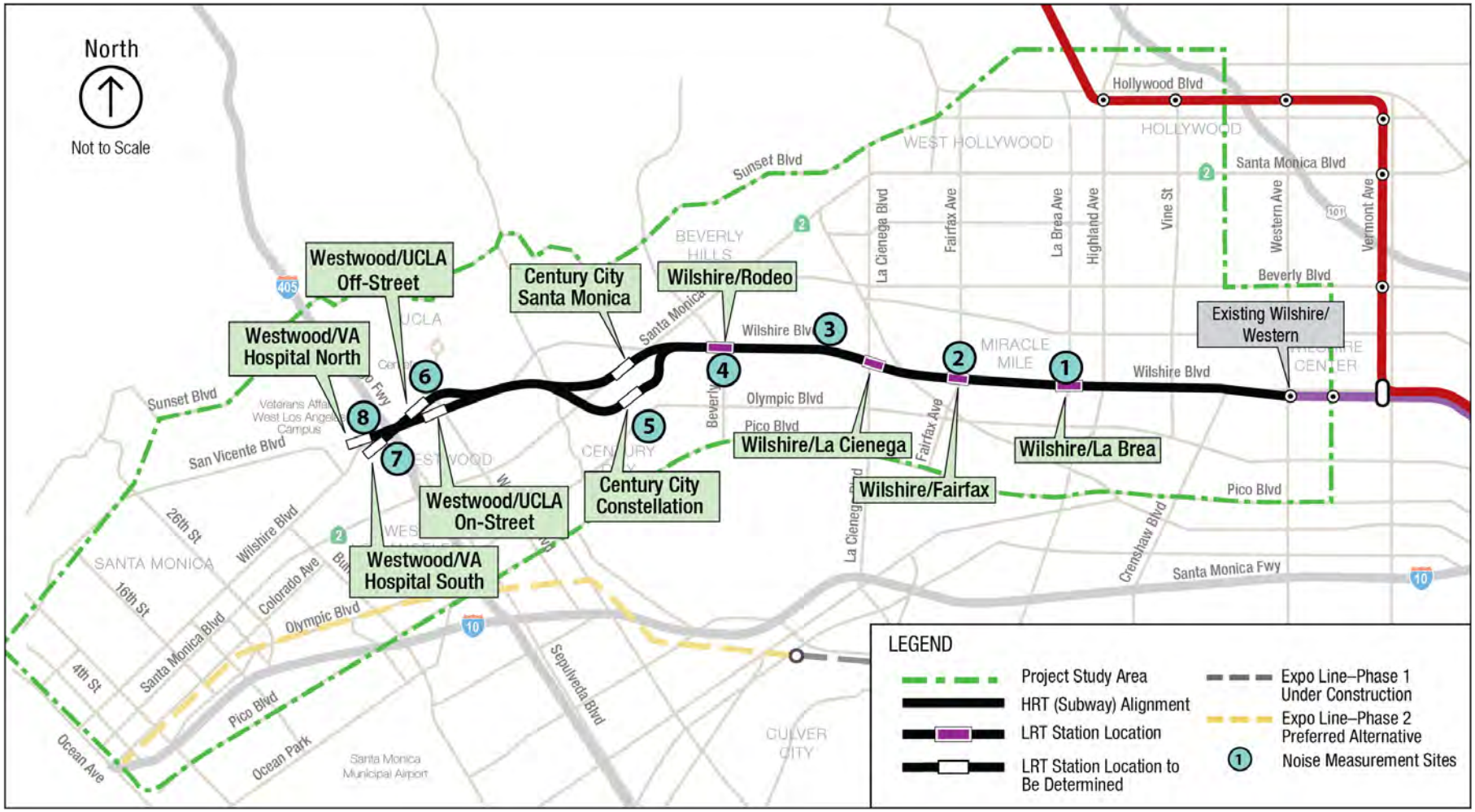
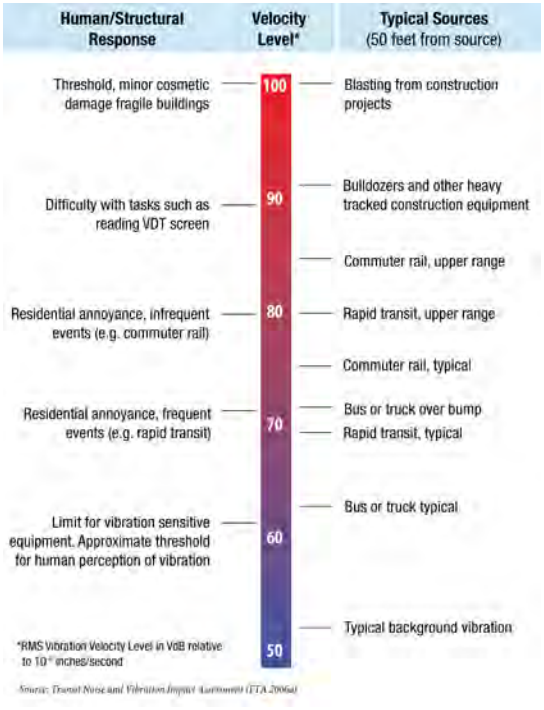


Figure 4-32. Map of Noise Measurement Sites

Existing Vibration Environment

The LPA is located in the urban core of the Cities of Los Angeles and Beverly Hills and unincorporated portions of Los Angeles County. The existing ground vibration levels are typical of an urban environment, with the background VdB levels expected to range from 50 to 65 according to the FTA guidance manual. Figure 4-33 presents the typical range of ground-borne vibration levels.



Source: Transit Noise and Vibration Impact Assessment (FTA 2006a)

Figure 4-33. Typical Ground Vibration Levels

Ambient vibration levels were not measured as part of this study. The FTA Vibration Impact Criteria were used to identify vibration-sensitive receivers at the surface above the subway tunnel alignments where impacts may occur, based on existing land use activities, which include residential areas (in Los Angeles, Century City, Westwood, and Beverly Hills), schools, hotels, and motels. Medical facilities, houses of worship, and potentially vibration-sensitive buildings were identified along the proposed alignments. Representative sensitive uses in the Study Area near the alignments include the Beverly Hills High School classrooms and auditorium, Mid-Wilshire Surgical Center, VA Hospital Campus, Wilshire Ebell Theatre, Saban Theatre, and the Wadsworth Theatre. Auditoriums and theaters are considered uses especially sensitive to ground-borne noise. The potential for vibration generated by the underground operation of the trains has been analyzed at these receiver locations.

An important factor in projecting levels of ground-borne vibration is the rate at which the vibration attenuates as it propagates away from the source. The relationship between a vibration source and the resulting vibration of the ground is known as the transfer mobility. The transfer mobility was determined by conducting vibration measurements in which the vibration pulses from a dropped weight were measured at various distances from the source. A load cell (force transducer) is used to measure the force input to the ground from the dropped weight, and calibrated vibration transducers are used to measure the vibration pulses at various distances from the source, as shown in Figure 4-34. The frequency-dependent propagation characteristics are derived from the transfer function relationships of the ground surface vibration and the force. The tests were conducted by dropping the weight down a borehole to the depth of the subway tunnel invert.

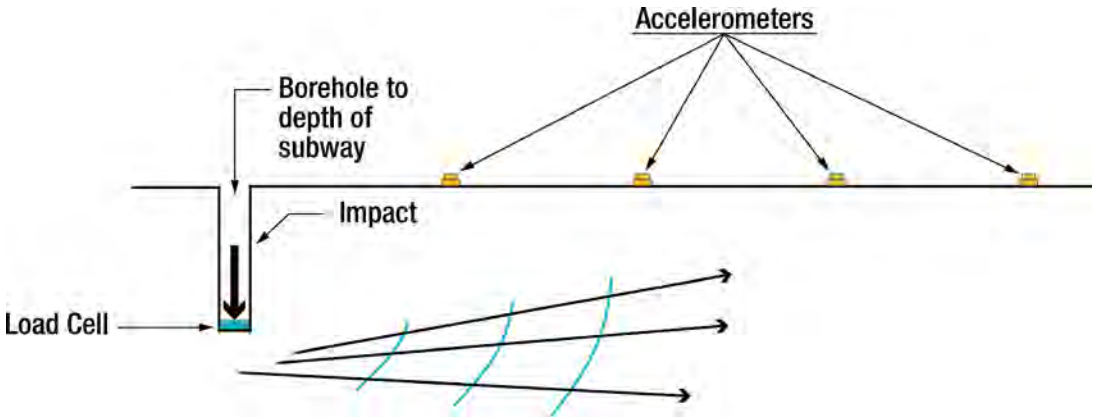


Figure 4-34. Transfer Mobility Determined by Vibration Measurements

New vibration propagation tests were conducted as part of the geotechnical studies at the following locations along the LPA alignment (Table 4-33, Figure 4-35). These locations can be found in Appendix A, Plan and Profile, and Typical Section Drawings, using the stationing (Sta.) numbers. Table 4-33 shows the phase of the alignment along which the transfer mobility test locations are located if the LPA is constructed under the Phased Construction Scenario.

Table 4-33. Location of Transfer Mobility Tests

Phase	Location	Stationing Numbers
Phase 1	Wilshire Boulevard and Arden Boulevard	Sta. 48+50
	Wilshire Boulevard and Fairfax Avenue	Sta. 156+00
Phase 2	Wilshire Boulevard and Hamel Drive	Sta. 218+70
	Wilshire Boulevard and El Camino Drive	Sta. 275+50
	South Moreno Drive and Young Drive	Sta. 319+00
	Beverly Hills High School classrooms and playing fields	Sta. 325+00
	Santa Monica Boulevard and Wilshire Boulevard	Sta. 303+00
Phase 3	Fox Hills Drive and Missouri Avenue	Sta. 358+00
	Wilshire Boulevard and Manning Avenue	Sta. 403+00
	Warner Avenue and Thayer Avenue	Sta. 372+50
	VA Hospital	Sta. 430+00

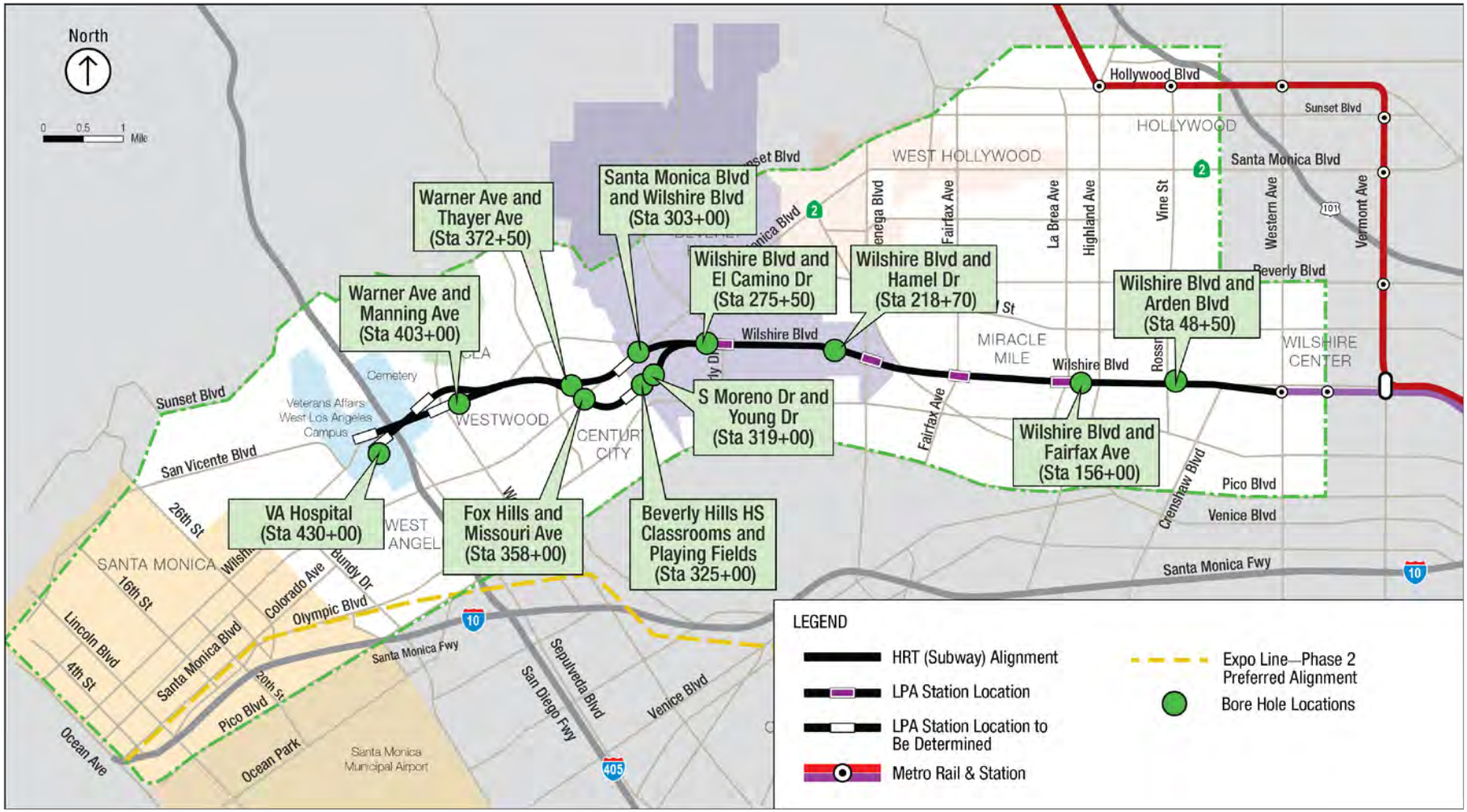


Figure 4-35. Location of Transfer Mobility Tests

4.6.3 Environmental Impacts/Environmental Consequences

Transit Noise Assessment Methodology

Noise generated by the LPA will not be substantially different from noise generated by at-grade and elevated heavy rapid transit (HRT) projects with one important difference: the Westside Subway Extension is a deep subway. The subway train tracks are at least 30 to 70 feet below the ground surface. The noise generated below ground from rail transit operations will be from the interaction of train wheels on track, motive power, signaling and warning systems, and the operation of TPSSs. This noise will transmit to the surface through the ventilation shaft outlets at the sidewalk gratings.

Additional noise that will be generated above ground level by transit operations includes at-grade portions of stations, including station entrances to the underground stations, fan and vent shaft discharge locations, and emergency electrical power generators. Noise from these above-ground components of the LPA was evaluated, along with noise from the emergency egress locations and maintenance facilities, such as yard and shop uses and the tracks servicing these facilities.

Future traffic increases at the station locations will be minimal and will not add to the existing measured noise levels presented in Table 4-32

Transit Vibration Assessment Methodology

Vibration impacts from transit operations are generated by motions/actions at the wheel/rail interface. The smoothness of these motions/actions is influenced by wheel and rail roughness, transit vehicle suspension, train speed, track construction (including types of fixation), the location of switches and crossovers, and the geologic strata (layers of rock and soil) underlying the track. Vibration from a passing train has a relatively small potential to move through the geologic strata and result in building vibration from energy transferred through the building's foundation. Transit operation vibration levels are not high enough to cause any building damage, even minor cosmetic damage is extremely unlikely.

Ground-borne noise is a low-frequency rumble noise related to operational vibration that may occur when excessive levels of vibration of a building's floors and walls result from transit system operations. The ground-borne noise is not generally a concern for at-grade or aboveground transit operations because the level of airborne noise from a passing at-grade or elevated train that is transmitted through the windows or walls of a building would exceed the ground-borne noise level occurring inside the building. However, a deep subway produces no appreciable airborne noise above the ground surface. So, the analysis considers the ground-borne noise related to the operational vibration, since the ground-borne noise may be slightly audible within a building that otherwise has low internal background noise. Because ground-borne noise is directly related to ground-borne vibration, the level of ground-borne noise is a function of the distance from the tracks to the building.

The process used to evaluate potential impacts from ground-borne vibration and ground-borne noise follows those outlined in *Transit Noise and Vibration Impact Assessment* (FTA 2006). The projections are based on characterizing the magnitude of the vibration

forces generated by a transit train in terms of a force density and characterizing the propagation through the soil with a transfer mobility function. The force density is assumed to represent the combined effects of the vehicle suspension, the wheel and rail condition, and the track support system and is assumed to be independent of the local geologic conditions. Force density level measurements of the Breda vehicle, which would likely be the heavy rail vehicle used for the Westside Subway Extension, was conducted by Wilson Ihrig & Associates as part of the *Ground Vibration Measurements of Train Operations on Segment 2A of the Los Angeles Metro Red Line* (Metro 1996). The force density levels were measured at 40 mph and, based on the different trackwork geometeries, were adjusted to the projected train operating speeds in the range of 40 to 70 mph following the FTA Detailed Vibration Analysis methodogy. The maximum train speed for the Metro Red Line vehicle is 70 mph. The force density level at 60 mph is shown in Figure 4-36.

The transfer mobility function data used for this analysis are presented in the *Westside Subway Extension Noise and Vibration Study* (Metro 2011g).

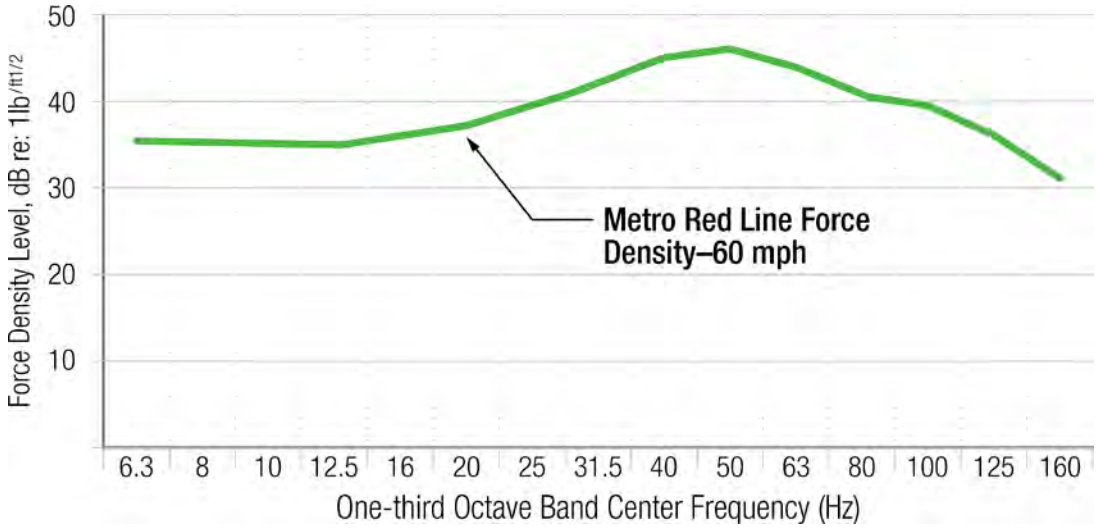


Figure 4-36. Measured Metro Red Line Force Density Level

The ground-borne vibration and ground-borne noise were calculated at 80 vibration-sensitive receivers along the LPA . Table 4-34 and Table 4-35 present the predicted levels and FTA impact criteria for tangent track and crossover track, respectively, for vibration-sensitive receivers. Figure 4-37 and Figure 4-38 show the locations of the receivers. Crossover track are known to generate higher levels of ground-borne vibration and ground-borne noise. A significant impact will occur in locations where FTA ground-borne noise criteria are exceeded, as highlighted in Table 4-34 and Table 4-35.

Table 4-34. Predicted Ground-borne Vibration and Ground-borne Noise along Tangent Track at Vibration-sensitive Receivers

Phase	ID #	Receiver	Tunnel Depth (feet)	Horizontal Distance (feet)	Predicted Ground-borne Vibration Level (VdB)	FTA Ground-borne Vibration Criteria (VdB)	Predicted Ground-borne Noise Level (dBA)	FTA Ground-borne Noise Criteria (dBA)	Train Speed (mph)
Phase 1	V1	Ramada Inn	54	35	65	72	33	35	70
	V2	St. James' Church	54	30	65	75	33	40	70
	V3	Apartments	58	40	65	72	32	35	70
	V4	Los Altos Hotel	62	30	65	72	32	35	70
	V5	Dunes Inn	55	35	65	72	33	35	70
	V6	Wilshire United Methodist Church	60	40	64	75	31	40	70
	V7	Scottish Rite Masonic Temple	60	40	64	75	31	40	70
	V8	Wilshire Ebell Theatre	64	40	64	72	**31**	30	70
	V9	Apartments	66	40	64	72	31	35	70
	V10	Apartments	72	35	64	72	31	35	70
	V11	Apartments	68	30	64	72	31	35	70
	V12	Apartments	65	60	64	72	30	35	70
	V13	Apartments	84	40	64	72	30	35	70
	V14	Apartments	71	50	64	72	30	35	70
	V15	Wilshire Private School	70	60	64	75	30	40	70
	V16	Apartments	69	30	64	72	31	35	40
	V17	Apartments	66	40	59	72	26	35	40
	V18	Korea Center	70	40	65	75	32	40	70
	V19	Apartments	75	35	65	72	32	35	70
	V20	Mid Wilshire Surgery Center	75	60	65	75	30	40	70
	V21	Craft and Farm Art Museum	75	35	65	75	32	40	70
	V22	LA County Museum of Art	67	50	65	75	32	40	70
	V23	Apartments	58	40	60	72	27	35	40
	V24	Los Angeles Museum of the Holocaust	71	40	62	75	28	40	55
	V25	Saban Theatre	58	30	65	72	**33**	30	40
	V26	Fine Arts Movie Theater	60	30	67	72	35	35	55

Table 4-34. Predicted Ground-borne Vibration and Ground-borne Noise along Tangent Track at Vibration-sensitive Receivers (continued)

Phase	ID #	Receiver	Tunnel Depth (feet)	Horizontal Distance (feet)	Predicted Ground-borne Vibration Level (VdB)	FTA Ground-borne Vibration Criteria (VdB)	Predicted Ground-borne Noise Level (dBA)	FTA Ground-borne Noise Criteria (dBA)	Train Speed (mph)
Phase 2	V27	Apartments	60	30	67	72	35	35	55
	V28	Specialty Surgical Center	65	35	67	75	34	40	55
	V29	Montage Hotel and Condos	63	60	60	72	21	35	40
	V30	Beverly Wilshire Hotel	66	35	62	72	24	35	45
	V31	Apartments	92	0	62	72	32	35	65
	V32	Hotel	93	0	62	72	32	35	65
	V33	Medical Office	91	0	62	75	32	40	65
	V34	Apartments	86	15	63	72	34	35	45
	V35	Beverly Hills High School offices and classrooms	77	0	64	75	33	40	45
	V36	Beverly Hills High School classrooms	85	0	63	75	30	40	45
	V37	Future office buildings	78	40	59	72	29	35	40
Phase 3	V38	Single-family residence	96	0	63	72	33	35	70
	V39	Apartments	88	0	64	72	35	35	70
	V40	Pacific Crossroads Church	87	0	64	75	35	40	70
	V41	Single-family residence	92	0	63	72	33	35	70
	V42	Apartments	120	0	61	72	30	35	70
	V43	Single-family residences	121	0	61	72	30	35	70
	V44	Single-family residence	100	0	62	72	32	35	70
	V45	Single-family residences	89	0	64	72	35	35	70
	V46	Apartments	81	0	64	72	35	35	70
	V47	Apartments	86	0	63	72	34	35	65
	V48	Apartments	96	70	59	72	29	35	55
	V49	Apartments	103	70	59	72	28	35	55
	V50	Apartments	108	60	59	72	28	35	55
	V51	Apartments	110	80	59	72	27	35	55
	V52	Apartments	108	50	59	72	29	35	55
	V53	Apartments	102	50	59	72	27	35	55
	V54	Apartments	102	60	59	72	27	35	55
	V55	University Bible Church	100	60	59	75	27	40	55
	V56	Concord School of Law	86	45	61	75	32	40	55
	V57	Armand Hammer Museum	64	50	63	75	34	40	40
	V58	Federal Building	64	110	58	75	25	40	55
	V59	VA Hospital	73	400	53	72	20	35	55

Table 4-34. Predicted Ground-borne Vibration and Ground-borne Noise along Tangent Track at Vibration-sensitive Receivers (continued)

Phase	ID #	Receiver	Tunnel Depth (feet)	Horizontal Distance (feet)	Predicted Ground-borne Vibration Level (VdB)	FTA Ground-borne Vibration Criteria (VdB)	Predicted Ground-borne Noise Level (dBA)	FTA Ground-borne Noise Criteria (dBA)	Train Speed (mph)
Century City Santa Monica Station Option and Westwood/VA Hospital North Station Option									
Ph 2	V60	The Peninsula Hotel	79	120	59	72	29	35	40
	V61	The Beverly Hilton	76	85	58	72	27	35	40
Phase 3	V62	Single-family residences	103	0	57	72	27	35	40
	V63	Single-family residence s	108	0	57	72	27	35	40
	V64	Single-family residence s	90	0	58	72	28	35	40
	V65	Condominiums	85	0	59	72	30	35	40
	V66	Single-family residence s	80–104	0	57-61	72	27-31	35	40
	V67	Single-family residence	96	0	58	72	28	35	40
Westwood/UCLA Off-Street Option to Westwood/VA Hospital South Station Option									
Phase 3	V68	Park Wilshire Hotel	105	30	57	72	27	35	40
	V69	Palomar Hotel	105	15	57	72	27	35	40
	V70	University Bible Church	115	0	57	75	26	40	40
	V71	Multi-family residence	115	0	57	72	26	35	40
	V72	Multi-family residence	118	0	57	72	26	35	40
	V73	UCLA Extension	114	18	56	75	25	40	40
Westwood/UCLA On-Street Station Option to Westwood/VA Hospital North Station Option									
Ph 3	V74	Wadsworth Theatre	88	65	57	72	27	30	40
Westwood/UCLA Off-Street Station Option to Westwood/VA Hospital North Station Option									
Phase 3	V75	Park Wilshire Hotel	105	30	57	72	27	35	55
	V76	Palomar Hotel	105	15	57	72	27	35	55
	V77	University Bible Church	115	0	57	75	26	40	40
	V78	Multi-family residence	115	0	57	72	26	35	40
	V79	Multi-family residence	118	0	57	72	26	35	40
	V80	UCLA Extension	114	18	56	75	25	40	40

XX = Predicted ground-borne noise levels that exceed the FTA criteria.
ID numbers are shown on Figure 4-37 and Figure 4-38.

Table 4-35. Predicted Ground-borne Vibration and Ground-borne Noise along Crossover Track at Vibration-sensitive Receivers

Phase	ID #	Receiver	Tunnel Depth (feet)	Horizontal Distance (feet)	Predicted Ground-borne Vibration Level (VdB)	FTA Ground-borne Vibration Criteria (VdB)	Predicted Ground-borne Noise Level (dBA)	FTA Ground-borne Noise Criteria (dBA)	Train Speed (mph)
Phase 1	V16	Apartments	69	30	69	72	**38**	35	27
Phase 2	V37	Future Office Buildings	78	40	67	72	37	35	27
Phase 3	V58	Federal Building	64	110	66	75	34	40	37

XX = Predicted ground-borne noise levels that exceed the FTA criteria.
ID numbers are shown on Figure 4-37 and Figure 4-38.

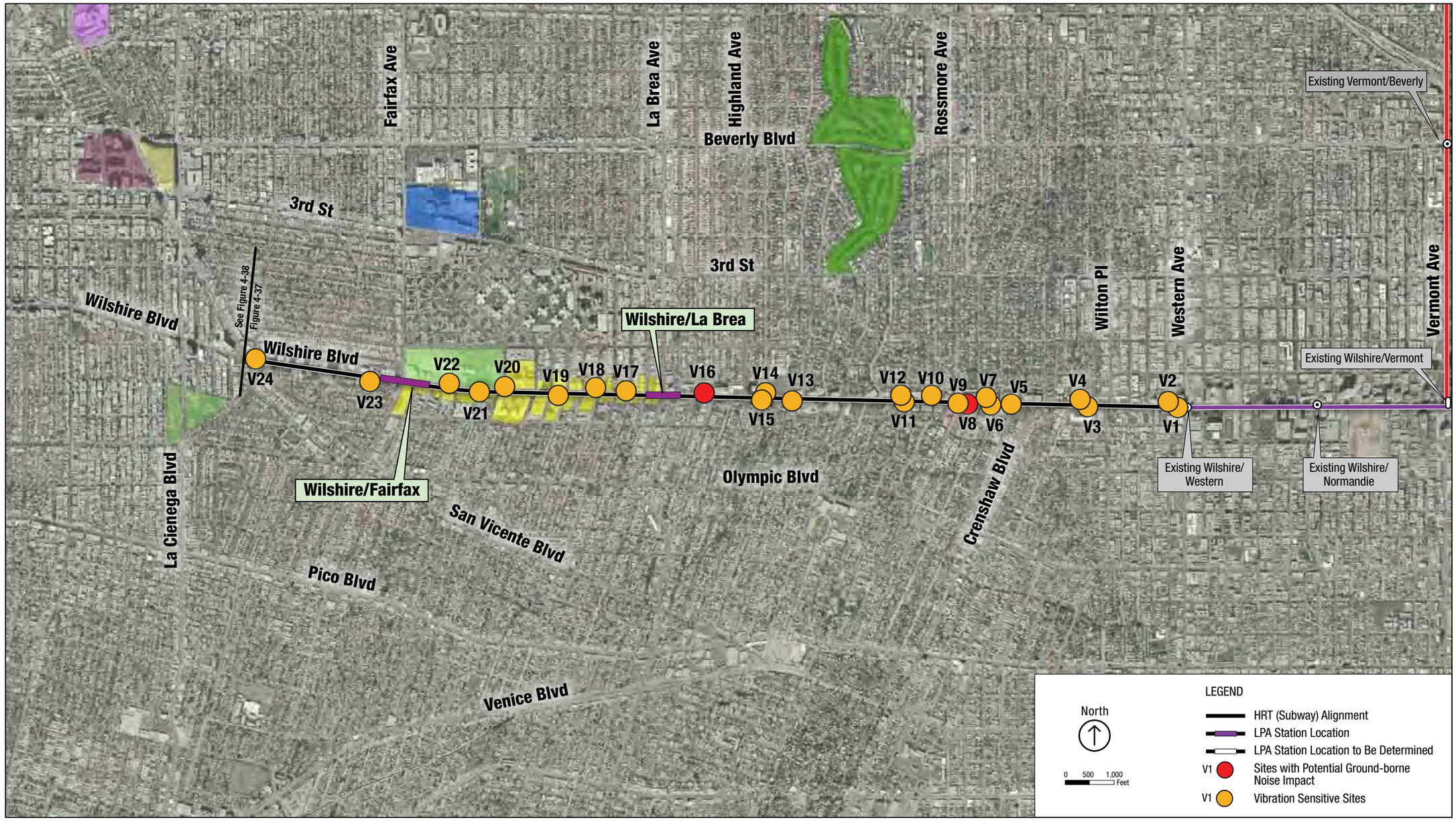


Figure 4-37. Vibration Sensitive Locations (Existing Wilshire/Western Station to Wilshire/La Cienega Station)

Figure 4-38. Vibration Sensitive Locations (Wilshire/La Cienega Station to Wilshire/VA Hospital Station)

High vibration levels can damage historic structures located very close to operation of rail systems (Metro 2010m; Metro 2012b). Furthermore, vibration may interfere with vibration-sensitive equipment. Thus, the potential for transit operations to affect historic structures and vibration-sensitive uses was evaluated. To be conservative, the FTA criterion level of 90 VdB for the most sensitive class of historic structure (extremely fragile) was used in the impact analysis of historic buildings generally. The predicted ground-borne vibration levels, as presented in Table 4-34 and Table 4-35, will not exceed the FTA criterion of 90 VdB.

Noise Impacts

No Build Alternative

Under the No Build Alternative, no new major transportation infrastructure would be built within the Study Area, aside from projects currently under construction or projects funded for construction, environmentally cleared, planned to be in operation by 2035, and identified in the RTP (SCAG 2008) and LRTP (Metro 2008a). Noise that would result from this alternative would be a continuation of the current baseline Study Area noise levels.

Noise from motor vehicles travelling on the existing surface road network dominates the Study Area's noise environment. The traffic studies, *Westside Subway Extension Existing Plus Project Traffic Impact Analysis Report (Metro 2011ai)* and *Westside Subway Extension Transportation Impacts Technical Report (Metro 2010a)*, suggest that the existing traffic patterns and volumes would remain essentially unchanged. Because traffic-carrying capacity is already at or near saturation, there is almost no opportunity for any appreciable increase in traffic volumes on the existing network. Any slight traffic volume increase would be accompanied by vehicle speeds being reduced, thus the net effect on Ldn is neutral with a slight bias toward a non-perceptible (<1 dBA) traffic noise increase, if any change at all. The No Build Alternative would not result in a noise impact.

Locally Preferred Alternative

The LPA could either be constructed as a single phase under the Concurrent Construction Scenario or as three consecutive phases under the Phased Construction Scenario. The opening of the LPA as a single phase or in three sequential phases will not result in substantially different noise impacts during operation of the LPA.

America Fast Forward (30/10) Scenario (Concurrent Construction)

Under the Concurrent Construction Scenario, the LPA will be operational in its entirety to Westwood/VA Hospital in 2022. Components of the LPA with the potential to generate noise that will be audible at the surface are the station ventilation system fans and the emergency ventilation system fans, which are subject to periodic testing. Noise from rail operations, including the interaction of wheels on tracks, motive power, signaling and warning systems, and the TPSS, will occur well below ground.

The station ventilation system fans will be designed using sound attenuators on the fan outlets and sound-absorptive treatment in the ventilation shafts to comply with Metro Design Criteria for noise from transit system ancillary facilities. The Metro design levels will ensure that fan noise does not exceed the FTA Noise Impact Criteria at the noise-sensitive receivers identified near the stations (Table 4-32).

Emergency ventilation fans will be periodically tested during the time of day when the existing ambient noise is at its maximum level.

Testing of emergency electrical power generating equipment will be limited to 10 minutes once a week or less during the time of day when existing ambient noise is at its maximum level. In accordance with Metro's *Design Criteria for Emergency Power Generation Equipment,* the emergency power generator equipment shall be limited to no more than 10 dBA sound level above the ambient noise levels.

The non-train-noise associated with HRT subway operations typically occurs at station locations where increased street-grade activity, such as parking lot use, may generate noise. The LPA does not include any station-related parking facilities, so there will not be a noise impact.

The Division 20 Vehicle Storage and Maintenance Facility is already used for the same or similar purposes. There are no noise-sensitive uses near this facility or the track accessing this facility. Therefore, there will be no noise impacts associated with improvements to these facilities.

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the potential for operational noise impacts is the same as under the Concurrent Construction Scenario. The only difference between the two scenarios is the timing of the potential for operational noise impacts. Under the Phased Construction Scenario, the potential for noise impacts along Phase 2 and Phase 3 will occur later than under the Concurrent Construction Scenario due to an extended construction timeline. The timing for potential noise impacts along Phase 1 of the LPA will occur earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

Phase 1 to La Cienega

Under Phase 1, the LPA will operate to the Wilshire/La Cienega Station. Components of Phase 1 with the potential to generate noise that will be audible at the surface are the station ventilation system fans and the emergency ventilation system fans, which are subject to periodic testing, at the Wilshire/La Brea, Wilshire/Fairfax, and Wilshire/La Cienega Stations. Noise from rail operations, including the interaction of wheels on tracks, motive power, signaling and warning systems, and the TPSS, will occur well below ground.

The station ventilation system fans will be designed using sound attenuators on the fan outlets and sound-absorptive treatment in the ventilation shafts to comply with Metro Design Criteria for noise from transit system ancillary facilities. The Metro design levels will ensure that fan noise does not exceed the FTA Noise Impact Criteria at the two noise-sensitive receivers identified near the Wilshire/Fairfax and Wilshire/La Cienega Stations (Table 4-32).

Emergency ventilation fans at the Wilshire/La Brea, Wilshire/Fairfax, and Wilshire/ La Cienega Stations will be periodically tested during the time of day when the existing ambient noise is at its maximum level.

Testing of emergency electrical power generating equipment will be limited to 10 minutes once a week or less during the time of day when existing ambient noise is at its maximum level. In accordance with Metro's *Design Criteria for Emergency Power Generation Equipment,* noise from the emergency power generator shall be no more than 10 dBA above ambient noise levels.

Non-train-noise associated with HRT subway operations typically occurs at station locations where increased street-grade activity, such as parking lot use, may generate noise. Phase 1 does not include any station-related parking facilities, so there will not be a noise impact.

The Division 20 Vehicle Storage and Maintenance Facility will be expanded under Phase 1 and is already used for the same or similar purposes. There are no noise-sensitive uses near this facility or the track accessing this facility. Therefore, there will be no noise impacts associated with improvements to these facilities.

Phase 2 to Century City

Under Phase 2, the LPA will operate to the Century City Station (Santa Monica or Constellation). Components of Phase 2 with the potential to generate noise that will be audible at the surface are the station ventilation system fans and the emergency ventilation system fans, which are subject to periodic testing, at the Wilshire/Rodeo and Century City Stations. Noise from rail operations, including the interaction of wheels on tracks, motive power, signaling and warning systems, and the TPSS, will occur well below ground.

The station ventilation system fans will be designed using sound attenuators on the fan outlets and sound-absorptive treatment in the ventilation shafts to comply with Metro Design Criteria for noise from transit system ancillary facilities. The Metro design levels will ensure that fan noise does not exceed the FTA Noise Impact Criteria at the three noise-sensitive receivers identified near the Wilshire/Rodeo and Century City Stations (Table 4-32).

Emergency ventilation fans at the Wilshire/Rodeo and Century City Stations will be periodically tested during the time of day when the existing ambient noise is at its maximum level.

Testing of emergency electrical power generating equipment will be limited to 10 minutes once a week or less during the time of day when existing ambient noise is at its maximum level. In accordance with Metro's *Design Criteria for Emergency Power*

Generation Equipment, noise from the emergency power generator shall be no more than 10 dBA above ambient noise levels.

Non-train-noise associated with HRT subway operations typically occurs at station locations where increased street-grade activity, such as parking lot use, may generate noise. Phase 2 does not include any station-related parking facilities, so there will not be a noise impact.

Phase 3 to Westwood/VA Hospital

Under Phase 3, the LPA will be opened in its entirety to the Westwood/VA Hospital Station. Components of Phase 3 with the potential to generate noise that will be audible at the surface are the station ventilation system fans and the emergency ventilation system fans, which are subject to periodic testing, at the Westwood/UCLA and Westwood/VA Hospital Stations. Noise from rail operations, including the interaction of wheels on tracks, motive power, signaling and warning systems, and the TPSS, will occur well below ground.

The station ventilation system fans will be designed using sound attenuators on the fan outlets and sound-absorptive treatment in the ventilation shafts to comply with Metro Design Criteria for noise from transit system ancillary facilities. The Metro design levels will ensure that fan noise does not exceed the FTA Noise Impact Criteria at the three noise-sensitive receivers identified near the Westwood/UCLA and Westwood/VA Hospital Stations (Table 4-32).

Emergency ventilation fans at the Westwood/UCLA and Westwood/VA Hospital Stations will be periodically tested during the time of day when the existing ambient noise is at its maximum level.

Testing of emergency electrical power generating equipment will be limited to 10 minutes once a week or less during the time of day when existing ambient noise is at its maximum level. In accordance with Metro's *Design Criteria for Emergency Power Generation Equipment,* noise from the emergency power generator shall be no more than 10 dBA above ambient noise levels.

The non-train-noise associated with HRT subway operations typically occurs at station locations where increased street-grade activity, such as parking lot use, may generate noise. Phase 3 does not include any station-related parking facilities, so there will not be a noise impact.

Transit Vibration Impact

No Build Alternative

The No Build Alternative would not result in a vibration impact.

Locally Preferred Alternative

The opening of the LPA as a single phase or in three sequential phases will not result in substantially different vibration impacts during operation of the LPA.

America Fast Forward (30/10) Scenario (Concurrent Construction)

Under the Concurrent Construction Scenario, there are no vibration-sensitive receivers along the LPA that are predicted to exceed the FTA ground-borne vibration criteria. The locations along the LPA where exceedance of the FTA ground-borne noise criteria will occur due to train operations along tangent track or through crossovers, if mitigation measures are not implemented, are presented in Table 4-36.

Table 4-36. Receivers Exceeding the FTA Ground-borne Noise Criteria

Phase	ID#	Receiver	Street Location	Cross Street	Source of Impact
Phase 1	V8	Wilshire Ebell Theatre	Wilshire Boulevard	S. Lucerne Boulevard	Tangent Track
	V16	Apartments	Wilshire Boulevard	S. Orange Drive	Crossover Track
	V25	Saban Theatre	Wilshire Boulevard	S. Hamilton Drive	Tangent and Crossover Tracks

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the potential for operational vibration impacts is the same as under the Concurrent Construction Scenario. The only difference between the two scenarios is the timing of the potential for operational vibration impacts. Under the Phased Construction Scenario, the potential for vibration impacts along Phase 2 and Phase 3 will occur later than under the Concurrent Construction Scenario due to an extended construction timeline. The timing for potential vibration impacts along Phase 1 of the LPA will occur earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

Phase 1 to Wilshire/La Cienega

Under Phase 1, the LPA will operate to the Wilshire/La Cienega Station. There are no vibration-sensitive receivers that are predicted to exceed the FTA ground-borne vibration criteria along Phase 1. There are three locations along Phase 1 where exceedance of the FTA ground-borne noise criteria will occur if mitigation measures are not implemented (Table 4-36).

Phase 2 to Century City

Under Phase 2, the LPA will operate to the Century City Station. There are no vibration-sensitive receivers that are predicted to exceed the FTA ground-borne vibration criteria or FTA ground-borne noise criteria along Phase 2.

Phase 3 to Westwood/VA Hospital

Under Phase 3, the LPA will be opened in its entirety to the Westwood/VA Hospital Station. There are no vibration-sensitive receivers that are predicted to exceed the FTA ground-borne vibration criteria or FTA ground-borne noise criteria along Phase 3.

4.6.4 Mitigation Measures

Mitigation Measures for LPA Operations Noise

Noise from operation of the LPA, including all station, alignment, and station entrance options still under consideration, from such sources as station ventilation system fans, emergency ventilation fans, TPSSs, and emergency generators will be designed to meet

the noise-level limits specified in *Metro's Design Criteria* and will not result in any noise impacts; therefore, no mitigation measures are required. No mitigation measures are required under either the Concurrent Construction Scenario or the Phased Construction Scenario. For a more detailed discussion of impacts during construction and mitigation measures, refer to Section 4.15.

Mitigation Measures for LPA Operations Vibration

To mitigate the potential for ground-borne noise impacts to theatre and residential uses above the subway tunnel due to train operation along tangent track and crossover track, the following mitigation measures will be included in the final design of the LPA:

VIB-1—Use of High Compliance Direct Fixation Resilient Rail Fasteners

High compliance direct fixation resilient rail fasteners will be incorporated into the design of the trackwork at the locations listed below, which will reduce ground-borne noise by 5 to 7 dBA:

- Wilshire Ebell Theatre at Site V8 (Figure 4-38)
- Saban Theatre at Site V25 (Figure 4-38)

VIB-2—Use of a Low Impact Crossover

A low impact crossover, such as a moveable point frog or a spring-loaded frog, will be used in the design of the following crossover, which will reduce ground-borne noise by 5 to 6 dBA:

- Wilshire/La Brea No. 10 Double Crossover for the apartments at Site V16 (Figure 4-38)

If the LPA is constructed under the Phased Construction Scenario, both of these mitigation measures will be required under Phase 1 as all three sites are located along Phase 1. No mitigation measures will be required under Phase 2 or Phase 3.

For a more detailed discussion of impacts during construction and mitigation measures, refer to Section 4.15.

4.6.5 California Environmental Quality Act Determination

The CEQA determination compares the effects of the LPA, under the Concurrent Construction Scenario and the Phased Construction Scenario, with the existing conditions described in Section 4.6.2. Applying CEQA guidelines, any vibration or noise impacts identified as a significant impact must be mitigated unless mitigation is infeasible or no mitigation provided if no abatement measures are available due to economic, social, environmental, legal, or technological conditions. The City of Los Angeles and County of Los Angeles and the City of Beverly Hills Noise Ordinances are not applicable to any vehicles that operate on any public highway, street, or right-of-way. Since CEQA does not provide specific thresholds for significant noise or vibration impact, the applicable standard for the Westside Subway Extension, the noise and vibration impact criterion, as defined by FTA, was applied as the CEQA threshold for significance.

CEQA guidelines indicate significant impacts would occur if a project results in the following:

- Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance or applicable standards of other agencies
- Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project
- For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, exposure of people residing or working in the project area to excessive noise levels
- For a project within the vicinity of a private airstrip, exposure of people residing or working in the project area to excessive noise levels

In conformance with CEQA, the LPA's operational noise and operational vibration were evaluated to determine if the LPA will cause significant impacts to the environment. The evaluation of both the operational noise impacts of the LPA, under both the Concurrent Construction Scenario and the Phased Construction Scenario, is provided above. The LPA's impact analyses concluded that the LPA, as described, including resilient rail fasteners and low impact crossover trackwork, will mitigate these impacts to a level less than significant. The LPA also

- Will not expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance or applicable standards of other agencies
- Will not expose persons to or generate excessive ground-borne vibration but will exceed thresholds of significance for ground-borne noise levels
- Will not result in a substantial permanent increase in ambient noise levels in the LPA vicinity above levels existing without the LPA
- Will not result in a substantial temporary or periodic increase in ambient noise levels in the LPA vicinity above levels existing without the LPA

The LPA is not located within 2 miles of an airport and is not located within the vicinity of a private airstrip.

No operational noise impacts are anticipated from the LPA, including all station, alignment, and station entrance options under either the Concurrent Construction Scenario or the Phased Construction Scenario, and no mitigation is required in accordance with CEQA.

The opening of the LPA as a single phase under the Concurrent Construction Scenario or in three sequential phases under the Phased Construction Scenario will not result in different noise or vibration impacts during operation of the LPA, as discussed in Section 4.1.1. The only difference between the two scenarios is the timing of potential for operational noise and vibration impacts. Under the Phased Construction Scenario, the potential for noise and vibration impacts along Phase 2 and Phase 3 will occur later

than under the Concurrent Construction Scenario due to an extended construction timeline. The timing for potential noise impacts along Phase 1 of the LPA will occur earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

If future LPA design changes could result in airborne noise impact, vibration impacts, or ground-borne noise impacts, a reanalysis should be conducted using the FTA Detailed Methodology (FTA 2006), as appropriate, to determine if the redesigned LPA would result in impacts and if mitigation would be required.

Impacts Remaining after Mitigation

The ground-borne noise and vibration impacts will be mitigated to a level below the threshold of significance. The same mitigation measures will be applied for the Concurrent Construction Scenario or the Phased Construction Scenario. No operational noise impacts from the LPA, including all station, alignment, and station entrance options still under consideration, are anticipated; therefore, there are no impacts that remain. The opening of the LPA as a single phase under the Concurrent Construction Scenario or in three sequential phases under the Phased Construction Scenario will not result in different noise or vibration impacts during operation of the LPA.

4.7 Energy

This section has been updated from the Draft EIS/EIR to focus on the analysis of the effects of the LPA, including all station, alignment, and station entrance options, on energy. The LPA could either be constructed as a single phase under the America Fast Forward (30/10) Scenario (Concurrent Construction), or as three consecutive phases under the Metro LRTP Scenario (Phased Construction). The opening of the LPA as a single phase or in three sequential phases does not substantially change the energy analysis that was presented in the Draft EIS/EIR. The analysis of all the Build and TSM Alternatives in the Draft EIS/EIR is incorporated into this document by reference. Information in this section is summarized from the *Westside Subway Extension Energy Technical Report* (Metro 2010k) and the *Westside Subway Extension Energy Technical Report Memorandum*. (Metro 2011j) This section quantitatively discusses the energy consumption characteristics associated with the LPA.

4.7.1 Regulatory Setting

This section discusses state and local regulations that are applicable to energy resources. The state and local regulatory settings for the LPA are the same whether the LPA is constructed under the Concurrent Construction Scenario or the Phased Construction Scenario.

State

The California Energy Commission is the state's primary energy policy and planning agency. Created by the Legislature in 1974, the commission has the following five major responsibilities:

- Forecasting future energy needs and keeping historical energy data
- Licensing thermal power plants 50 megawatts or larger

- Promoting energy efficiency through appliance and building standards
- Developing energy technologies and supporting renewable energy
- Planning for and directing the state's response to energy emergencies

The commission published the *2007 Integrated Energy Policy Report* (CEC 2007) in October 2007. The report was prepared in response to SB 1389, Chapter 568, Statutes of 2002, which requires the commission to prepare a biennial integrated energy policy report. This report contains an integrated assessment of major energy trends and issues facing the state's electricity, natural gas, and transportation fuel sectors and provides policy recommendations to conserve resources; protect the environment; ensure reliable, secure, and diverse energy supplies; enhance the state's economy; and protect public health and safety.

Local

SCAG is required by state and federal mandates to prepare an RTP (SCAG 2008a) every three years. The 2008 RTP is a long-range regional transportation plan that provides a blueprint to help achieve a coordinated and balanced regional transportation system. The SCAG 2008 RTP describes energy production and consumption throughout the SCAG region and provides VMT by county. VMT is an indicator of the extent to which vehicles are used, providing a valuable factor in calculating the amount of energy consumed by transportation. SCAB is a subregion of SCAQMD, the agency principally responsible for comprehensive air pollution control in the southern, coastal portions of the state, and covers 6,745 square miles. SCAB includes all of Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino Counties.

Metro has adopted an Energy and Sustainability Policy (Metro 2007). The purposes of the Energy and Sustainability Policy are to control energy consumption and to embrace energy efficiency, energy conservation, and sustainability in order to avoid unnecessary expenditures; help in protecting the environment; improve cost-effectiveness, productivity, and working conditions; and prolong the useful life of fossil fuels by using resources more efficiently. Adherence to the Energy and Sustainability Policy will not only help to immediately lower electrical and water bills, but will provide the baseline and business case to further Metro's sustainability goals. Metro's general long-term objectives are as follows:

- Buy fuels and electricity at the most economical cost
- Reduce, whenever possible, Metro's use of fossil fuels through the use of ambient and renewable energy sources
- Use fuels and electricity as efficiently as possible
- Reduce the amount of emissions, especially CO_2, caused by Metro's required consumption

4.7.2 Affected Environment/Existing Conditions

This section discusses the energy requirements for various modes of transportation, including automobile, bus, and rail transit. Energy needs are measured in petroleum and equivalent BTUs. A BTU is approximately the amount of energy needed to heat one pound of water one degree Fahrenheit. Other units of energy can be converted into

equivalent BTU units and, therefore, the BTU is used as the basis for comparing energy consumption associated with different resources.

Table 4-37. Energy Comparisons

Energy Type	Energy Unit	Equivalent BTU Units
Electrical	Kilowatt-hour (kWh)	3,412
Natural gas	Cubic-foot	1,034
Crude oil	Barrel (42 gallons)	5,800,000
Gasoline	Gallon	125,000

Source: California Energy Commission, 2009

Table 4-37 compares various types of energy and their equivalent BTUs.

Energy resources for transportation include petroleum, natural gas, electricity, liquefied petroleum gas, hydrogen, and biofuels such as ethanol. Currently, California's gasoline and diesel markets are characterized by increasing demands, tight supplies, and volatile prices. California imports more than 50 percent of its crude oil and over 15 percent of its refined products. The state's dependence on this increasingly expensive energy resource continues to grow. Moreover, fossil fuel-based transportation of products and people are a major contributor of CO_2, the principal catalyst to climate change. Changes in energy supply and demand are affected by factors such as energy prices, the United States' economic growth, advances in technologies, changes in weather patterns, and future public policy decisions.

Transportation-related energy consumption in the United States is anticipated to grow annually by 0.7 percent from 2008 to 2035. Energy consumption in California continues to be dominated by growth in passenger vehicles; approximately 40 percent of all energy consumed in the state is used for transportation. California is the third largest consumer of transportation fuels in the world (behind the United States as a whole and China); more than 16 billion gallons of gasoline and 4 billion gallons of diesel fuels are consumed each year (CEC 2007). California is expected to increase transportation fuel demand by 149 million barrels from 2005 to 2020. California must address its petroleum infrastructure problems to secure transportation fuels to meet the needs of a growing population by adjusting choices of transportation, land use policies, and alternative fuels. Currently, energy use within the SCAG area is approximately 950 trillion BTUs. Energy usage associated with transportation could approach 1,383 trillion BTUs by 2035.

Transportation energy consumption reflects the types and numbers of vehicles, the extent of their use (represented in VMT), and their fuel economy (miles per gallon). Implementation of the LPA is expected to result in changing the dynamics of all vehicle classes with regard to VMT. Changes in VMT, in turn, will affect energy consumption. VMT is also an important indicator of demand for infrastructure improvements. Urban growth patterns have caused California's VMT to increase more than 3 percent a year between 1975 and 2004. In 2005, SCAG data showed automobile VMT in California at 372 million, which is equivalent to 2.14 trillion BTUs or 368,966 barrels of oil. SCAG estimates the VMT for RTPs. SCAG projections show a 29 percent increase in VMT from 2008 to 2035. VMT is directly related to energy use and is the main contributor to air quality pollutants in the SCAG region. A reduction in VMT through alternative modes of transportation will lower energy needs and reduce pollutant emissions.

4.7.3 Environmental Impacts/Environmental Consequences

The LPA, including all station, alignment, and station entrance options still under consideration, will remove passenger cars from the regional roadway network, easing the increase in VMT and the usage of fuels. The LPA may also reduce regional energy consumption depending on ridership forecasts for the various modes of transportation.

Table 4-38. Transportation Energy Intensity

Transport Mode	BTU/Passenger-Mile	BTU/VMT
Automobile	3,538	5,484
Transit Bus (all vehicle types)	4,242	39,160
Commuter Rail	2,812	91,936
Urban Rail	2,516	61,663

Operational energy use for the LPA was calculated based on the BTU per VMT rate. Energy required for train travel will be the primary source of energy use during operation of the LPA. Table 4-38 displays the energy requirements for various modes of transportation, including automobile, bus, and rail transit.

The analysis of station energy is based on an FTA annual rate of 175 million BTUs per station (*FTA's Technical Guidance on Section 5309 New Starts Criteria, July 1999* (FTA 1999)).

No Build Alternative

The No Build Alternative will not include any physical changes to the corridor, aside from the projects currently underway or planned under the RTP and LRTP. This alternative will not result in new activity and will not have an adverse energy impact. The 2008 mobile vehicle energy use in the SCAG region is 949,680 billion BTU and is estimated to increase to 1,077,365 billion BTU in 2035 under the No Build Alternative.

Locally Preferred Alternative

America Fast Forward (30/10) Scenario (Concurrent Construction)

The primary source of energy use for the LPA will be train travel. The LPA will increase rail vehicle miles traveled and decrease automobile and bus vehicle miles traveled. Table 4-39 shows the daily vehicle miles by mode of transportation compared to the No Build Alternative. The LPA includes decreased system-wide VMT, which results in less energy consumption as compared to the No Build Alternative. Under the Concurrent Construction Scenario, the LPA will add between approximately 15,600 and 16,000 urban rail VMT to the region while removing between approximately 318,000 and 581,000 automobile VMT compared to the No Build Alternative. The LPA will reduce bus VMT by approximately 8,400. In total, mobile source BTU consumption (i.e., rail, automobile, and bus sources) will decrease by between approximately 405 billion and 921 billion BTUs per year compared to the No Build Alternative.

Table 4-39. 2035 Regional Daily Vehicle Miles and Energy Consumption Compared to No Build Alternative

Scenario/Phase	Regional Daily Vehicle Miles by Transportation Mode Compared to No Build Alternative			Total Estimated Mobile Source Energy Consumption Compared to No Build Alternative (million BTUs/year)
	Automobile	Rail	Bus	
Phased Construction Scenario				
LPA with Century City Constellation	(581,000)	16,057	(8,390)	(921,491)
LPA with Century City Santa Monica	(318,000)	15,622	(8,390)	(404,845)
Concurrent Construction Scenario				
Phase 1	(214,000)	8,888	(8,390)	(348,235)
Phase 2 with Century City Constellation	(394,000)	12,910	(8,390)	(618,010)
Phase 2 with Century City Santa Monica	(147,000)	12,452	(8,390)	(133,909)
Phase 3 with Century City Constellation	(581,000)	16,057	(8,390)	(921,491)
Phase 3 with Century City Santa Monica	(318,000)	15,622	(8,390)	(404,845)

Source: Parsons Brinckerhoff. 2011

The LPA will include seven stations and associated stationary energy consumption. Each of the seven stations will use approximately 175 million BTUs per year during operational activity. The total energy consumption associated with all seven stations will be approximately 1.2 billion BTUs per year.

The California Department of Transportation has estimated that operation of a maintenance and storage facility will result in the use of approximately 8.7 billion BTUs per year. This represents less than 0.00001 percent of overall operational energy consumption. Energy use associated with the Division 20 Vehicle Storage and Maintenance Facility will not substantially affect overall regional energy use.

Therefore, the LPA, including all station, alignment, and station entrance options still under consideration, will result in a beneficial energy impact as the reduction in mobile source energy consumption will be greater than the energy consumption associated with operation of new stations and expansion of the Division 20 Vehicle Storage and Maintenance Facility.

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the potential for operational energy impacts is the same as under the Concurrent Construction Scenario. The only difference between the two scenarios is the timing of the potential for operational energy impacts. Under the Phased Construction Scenario, the potential for energy impacts along Phase 2 and Phase 3 will occur later than under the Concurrent Construction Scenario due to an extended construction timeline. The timing for potential energy impacts along Phase 1 of the LPA will occur earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

Phase 1 to Wilshire/La Cienega

Under Phase 1, the LPA will operate to the Wilshire/La Cienega Station. Table 4-39 shows the daily vehicle miles by mode of transportation for Phase 1 compared to the No Build Alternative. Phase 1 will add approximately 9,000 urban rail VMT to the region while removing approximately 214,000 automobile VMT compared to the No Build Alternative. Phase 1 will reduce bus VMT by approximately 8,400. In total, mobile source BTU consumption will decrease by approximately 348 billion BTUs per year compared to the No Build Alternative.

Phase 1 will include three new stations and associated stationary energy consumption. Each of the three stations will use approximately 175 million BTUs per year during operational activity. The total energy consumption associated with all three stations will be approximately 525 million BTUs per year.

The Division 20 Vehicle Storage and Maintenance Facility will be expanded as part of Phase 1. The California Department of Transportation has estimated that operation of a maintenance and storage facility will result in the use of approximately 8.7 billion BTUs per year. This represents less than 0.00001 percent of overall operational energy consumption. Energy use associated with the Division 20 Vehicle Storage and Maintenance Facility will not substantially affect overall regional energy use.

Therefore, operation of Phase 1 will result in a beneficial energy impact as the reduction in mobile source energy consumption will be greater than the energy consumption associated with operation of new stations and expansion of the Division 20 Vehicle Storage and Maintenance Facility.

Phase 2 to Century City

Under Phase 2, the LPA will operate to the Century City Station. Table 4-39 shows the daily vehicle miles by mode of transportation for Phase 2, with either the Century City Constellation or Century City Santa Monica option, compared to the No Build Alternative. Phase 2 will add between approximately 12,400 and 13,000 urban rail VMT to the region while removing between approximately 147,000 and 394,000 automobile VMT compared to the No Build Alternative. Phase 2 will reduce bus VMT by approximately 8,400. In total, mobile source BTU consumption will decrease by between approximately 134 billion and 618 billion BTUs per year compared to the No Build Alternative.

Phase 2 will include operation of five stations and associated stationary energy consumption (including those constructed during Phase 1). Each of the five stations will use approximately 175 million BTUs per year during operational activity. The total energy consumption associated with all five stations will be approximately 875 million BTUs per year.

The Division 20 Vehicle Storage and Maintenance Facility will continue to operate as part of Phase 2. The California Department of Transportation has estimated that operation of a maintenance and storage facility will result in the use of approximately 8.7 billion BTUs per year. This represents less than 0.00001 percent of overall operational

energy consumption. Energy use associated with the Division 20 Vehicle Storage and Maintenance Facility will not substantially affect overall regional energy use.

Therefore, operation of Phase 2 will result in a beneficial energy impact as the reduction in mobile source energy consumption will be greater than the energy consumption associated with operation of new stations and the Division 20 Vehicle Storage and Maintenance Facility.

Phase 3 to Westwood/VA Hospital

Under Phase 3, the LPA will operate in its entirety to the Westwood/VA Hospital Station. Table 4-39 shows the daily vehicle miles by mode of transportation for Phase 3, with either the Century City Constellation or Century City Santa Monica option, compared to the No Build Alternative. Phase 3 will add between approximately 15,600 and 16,000 urban rail VMT to the region while removing between approximately 318,000 and 581,000 automobile VMT compared to the No Build Alternative. Phase 3 will reduce bus VMT by approximately 8,400. In total, mobile source BTU consumption will decrease by between approximately 405 billion and 921 billion BTUs per year compared to the No Build Alternative.

Phase 3 will include operation of all seven stations and associated stationary energy consumption (including those constructed during Phase 1 and Phase 2). Each of the seven stations will use approximately 175 million BTUs per year during operational activity. The total energy consumption associated with all seven stations will be approximately 1.2 billion BTUs per year.

The Division 20 Vehicle Storage and Maintenance Facility will continue to operate as part of Phase 3. The California Department of Transportation has estimated that operation of a maintenance and storage facility will result in the use of approximately 8.7 billion BTUs per year. This represents less than 0.00001 percent of overall operational energy consumption. Energy use associated with the maintenance yard will not substantially affect overall regional energy use.

Therefore, operation of Phase 3 will result in a beneficial energy impact as the reduction in mobile source energy consumption will be greater than the energy consumption associated with the operation of new stations and the Division 20 Vehicle Storage and Maintenance Facility.

4.7.4 Mitigation Measures

Operational activity associated with the LPA, including all station, alignment, and station entrance options still under consideration for both the Concurrent Construction Scenario and the Phased Construction Scenario, will decrease regional energy consumption and will result in beneficial energy impacts. As a result, mitigation measures are not required under either scenario. For a detailed discussion of energy impacts during construction and mitigation measures, refer to Section 4.15.

4.7.5 California Environmental Quality Act Determination

The CEQA determination compares the effects of the LPA, under the Concurrent Construction Scenario and the Phased Construction Scenario, with the existing conditions described in the affected environment/existing conditions section. To ensure

that energy implications are considered in project decisions, CEQA requires that environmental documents include a discussion of potential energy impacts of proposed projects, with particular emphasis on avoiding or reducing inefficient, wasteful, and unnecessary consumption of energy (see Public Resources Code, Section 21100(b)(3)). Energy conservation implies that a project's cost-effectiveness be reviewed not only in dollars, but also in terms of energy requirements.

Appendix F (Energy Conservation) of the CEQA Guidelines states that the goal of conserving energy implies the wise and efficient use of energy. The means of achieving this goal include decreasing overall per capita energy consumption, decreasing reliance on fossil fuels, and increasing reliance on renewable energy sources. The analysis considered:

- The effects of the project on existing energy resources
- The project's projected transportation energy use requirements and its overall use of efficient transportation alternatives

The evaluation of operational energy impacts of the LPA, under both the Concurrent Construction Scenario and the Phased Construction Scenario, is provided above. As previously discussed, the LPA, including all station, alignment, and station entrance options still under consideration for both the Concurrent Construction Scenario or the Phased Construction Scenario, will decrease per capita energy consumption by removing automobile VMT and increasing transit ridership. As shown in Table 4-38, this analysis took into account that transit activity uses more BTUs per vehicle mile than automobiles but consumes considerably less per passenger mile.

CEQA requires a comparison of existing conditions to existing plus project conditions. Existing plus LPA conditions includes decreased system-wide VMT, which results in less energy consumption as compared to the existing conditions. Existing plus LPA conditions will decrease automobile VMT by 276,000 but will not change bus VMT. Rail VMT are expected to increase by between approximately 15,600 and 16,000.

It is assumed that existing plus LPA conditions will include seven stations and associated stationary energy consumption. Each of the seven stations will use approximately 175 million BTUs per year during operational activity (FTA's Technical Guidance Section 5309 New Starts Criteria, July 1999 (FTA 1999)). The total energy consumption associated with all seven stations will be approximately 1.2 billion BTUs per year. Based on the BTU per VMT rates shown in Table 4-38, mobile source BTU consumption (i.e., rail, automobile, and bus sources) will decrease by approximately 196 billion BTUs per year compared to existing conditions. As such, the existing plus LPA conditions, including all station, alignment, and station entrance options still under consideration, will result in a beneficial energy impact. The opening of the LPA as a single phase or in three sequential phases will not result in significantly different impacts related to energy consumption compared to existing conditions.

The regional shift from automobiles to transit will also shift fuel use from gasoline for on-road vehicles to electricity for powering rail movements. Gasoline and the majority of electricity are created from fossil fuels. It is important to note that renewable energy can be used to create electricity but not gasoline. The LPA will assist in the regional goal of

decreasing fossil fuel reliance by decreasing per capita energy consumption. In addition, development of the LPA will not preclude regional electricity suppliers from obtaining a higher percentage of electricity from renewable sources. The LPA will increase peak hour electricity demand but it will not lead to wasteful, inefficient, or unnecessary usage of fuel or energy. Operation of the LPA, including all station, alignment, and station entrance options still under consideration for both the Concurrent Construction Scenario and the Phased Construction Scenario, will not result in significant energy impacts.

The opening of the LPA as a single phase under the Concurrent Construction Scenario or in three sequential phases under the Phased Construction Scenario will not result in different energy impacts during operation of the LPA, as discussed in Section 4.7.3. The only difference between the two scenarios is the timing of potential for operational energy impacts. Under the Phased Construction Scenario, the potential for energy impacts along Phase 2 and Phase 3 will occur later than under the Concurrent Construction Scenario due to an extended construction timeline. The timing for potential energy impacts along Phase 1 of the LPA will occur earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

4.8 Geologic Hazards

This section evaluates the potential for geologic hazard impacts in the following areas:

- Seismic ground shaking
- Surface fault rupture
- Seismic settlement
- Liquefaction and lateral spreading
- Unsuitable soils
- Subsidence
- Tar sand
- Subsurface gas and oil fields

This section has been updated from the Draft EIS/EIR to incorporate the results of further geotechnical investigations carried out following the October 2010 Metro Board of Directors meeting. The Metro Board of Directors directed that certain additional studies be conducted to respond to several questions and concerns raised during the Draft EIS/EIR public comment period. In addition to borings along the LPA alignment, investigations were carried out in the Century City area to address the Metro Board of Director's motion to study tunneling safety in the LPA reach between Beverly Hills and Westwood. Two reports, the *Westside Subway Extension Century City Area Tunneling Safety Report* (Metro 2011x) and the *Westside Subway Extension Century City Area Fault Investigation Report* (Metro 2011w) were prepared to present the results of these studies in detail. This information was presented to the Metro Board of Directors on October 19, 2011, and was released to the general public on the same day. The *Westside Subway Extension Geotechnical and Environmental Report* (Metro 2011ad) contains the soil borings, gas monitoring wells, and detailed geologic profiles along the LPA.

The LPA could either be constructed as a single phase under the America Fast Forward (30/10) Scenario (Concurrent Construction), or as three consecutive phases under the

Metro Long Range Transportation Plan Scenario (Phased Construction). The opening of the LPA as a single phase or in three sequential phases does not substantially change the analysis of geologic hazards. The geologic hazards analysis of all the Build and Transportation Systems Management (TSM) Alternatives in the Draft EIS/EIR is incorporated into this document by reference. Information in this section is summarized from the *Westside Subway Extension Geotechnical and Hazardous Materials Technical Report* (Metro 2010i), the *Addendum to the Westside Subway Extension Geotechnical and Hazardous Materials Technical Report* (Metro 2011h), the *Westside Subway Extension Preliminary Geotechnical and Environmental Report* (Metro 2011ad), the *Westside Subway Extension Century City Area Fault Investigation Report* (Metro 2011w), and the *Westside Subway Extension Century City Area Tunneling Safety Report* (Metro 2011x) where additional detailed information is provided.

4.8.1 Regulatory Setting

This section provides local and state regulations that are applicable to the geologic concerns of the LPA and its Study Area. The LPA will run through the incorporated Cities of Los Angeles and Beverly Hills, and unincorporated portions of Los Angeles County. The regulatory settings for the LPA are the same whether the LPA is constructed under the Concurrent Construction Scenario or the Phased Construction Scenario. Under the Phased Construction Scenario, Phase 1 and Phase 2 will extend through the cities of Los Angeles and Beverly Hills, and Phase 3 will extend through the City of Los Angeles and unincorporated portions of Los Angeles County.

In addition to the National Environmental Policy Act of 1969 (USC 1969), a federal regulation, and the California Environmental Quality Act (PRC 2009), a state regulation, the sections below discuss applicable local and state regulations.

State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (PRC 1972) is the state's principal guidance to prevent the construction of habitable structures on the surface trace of active earthquake faults. The Alquist-Priolo Earthquake Fault Zoning Act only addresses the hazard of surface fault rupture and does not consider other earthquake hazards.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 (PRC 1990) addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides.

California Laws for Conservation of Petroleum and Gas

Division 3, Oil and Gas, Chapter 1, Oil and Gas Conservation, Article 4, Sections 3228, 3229, 3230, and 3232 related to abandonment of oil wells.

California Health and Safety Code

Section 25316 and 25317 of the California Health and Safety Code identify hazardous materials, substances, and wastes that require removal, including petroleum and petroleum byproducts.

Local

Municipal Regulatory Approach

The incorporated Cities of Los Angeles and Beverly Hills and the County of Los Angeles have engineering departments that administer and oversee geotechnical, subsurface, and seismic concerns. Each of these entities has general plan geologic elements and zoning codes to address geotechnical, subsurface, and seismic concerns.

4.8.2 Affected Environment/Existing Conditions

The affected environment and existing conditions for the LPA are the same whether the LPA is constructed under the Concurrent Construction Scenario or the Phased Construction Scenario.

Study Area Topography

The LPA is located on the coastal plain of the Los Angeles Basin in an area that ranges between one-third and three miles south of the Santa Monica Mountains. Study Area elevations range between 400 and 85 feet above mean sea level (AMSL) from east to west. Study Area topography is mildly undulated to relatively flat from east to west. Table 4-40 shows the amount of topographic change in the Study Area. As shown in the table, the greatest difference in elevation of the alignment segment is 71 feet over an approximate 4-mile segment.

Table 4-40. Topography of Alternatives along Wilshire Boulevard

Phase	Segment		Approximate Distance (in miles)	Approximate Change in Elevation (in feet)
	From	To		
Phase 1	Western Avenue	La Brea Avenue	1.7	-5
Phases 1 and 2	La Brea Avenue	Santa Monica Boulevard and Wilshire Boulevard intersection	3.5	+71
Phase 3	Santa Monica Boulevard and Wilshire Boulevard intersection	Westwood	2.2	+37
	Westwood	I-405 Freeway	0.7	+17

Source: Westside Subway Extension Geotechnical and Hazardous Materials Technical Report (Metro 2010i), Section 3.1, with distances checked in GIS.

Study Area Geology

Geological Setting

The LPA area lies at the northern end of the northwesterly trending Peninsular Ranges physiographic province, to the south of the east-west trending Transverse Ranges physiographic province. The Peninsular Ranges physiographic province includes the nearby San Jacinto and Santa Ana Mountains. The Transverse Ranges physiographic province includes the Santa Monica Mountains.

The Los Angeles Basin, which lies at the northwest end of the Peninsular Ranges physiographic province, is an elongated northwest-trending, sediment-filled trough that is nearly 6 miles deep. At its surface the Los Angeles Basin is an alluvial coastal plain comprised mainly of river-deposited sediments originating from the nearby mountains. In the LPA area, the sediments originated primarily from the south flank of the Santa Monica Mountains.

Geology

A geological unit is a volume of rock or soil of an identifiable origin and age that is defined by its distinctive and dominant features. Five geologic units exist within the tunnel and station depth horizon within the LPA area, as shown in Table 4-41. Geology in the LPA area is shown on Figure 4-39. Geology in relation to the LPA tunnel is shown on Figure 4-40.

Table 4-41. Geologic Units

Age	Geologic Formation (age)	Age (Thousands of years)	Symbol	Composition	Location in Project Area
Youngest	Younger Alluvium (Holocene)	Recent to 1-11	Qal	Poorly consolidated, interlayered silts, clays, and silty sands with some sand layers and gravel	Western half of Beverly Hills, and younger-alluvium-filled ravines from Western to La Jolla, and in the Maintenance Yard along the Los Angeles River
	Older Alluvium/ Alluvial Fan/ Shallow Marine (Late Pleistocene)	11-350	Qalo	Non-marine and marine sediments	All areas
	Lakewood (Pleistocene)	100-500	Qlw	Upper portion: Interbedded silts and clays, sands, silty sands with some clayey sand layers. Lower portion: interlayered silts and sandy clays with some silty sand	Hancock Park/La Brea Tar Pits area to an area between South Crescent Heights and South La Jolla Boulevards
	San Pedro (Pleistocene)	500-900	Qsp	Fine-grained sand and silty sand with few interbeds of medium- to course-grained sand and some local silt layers. Some asphaltic sand	Wilshire Boulevard. from Western to La Jolla
Oldest	Fernando (Pliocene)	900-4,950	Tf	Predominantly massive siltstone and claystone with few rare sandstone interbeds	Hancock Park Area, Windsor to Fairfax Avenue

Sources: Westside Subway Extension Geotechnical and Hazardous Materials Technical Report (Metro 2010i), Section 3.2.2.

Geologic Units = units appearing at any depths ranging from the ground surface to bottom of the tunnel

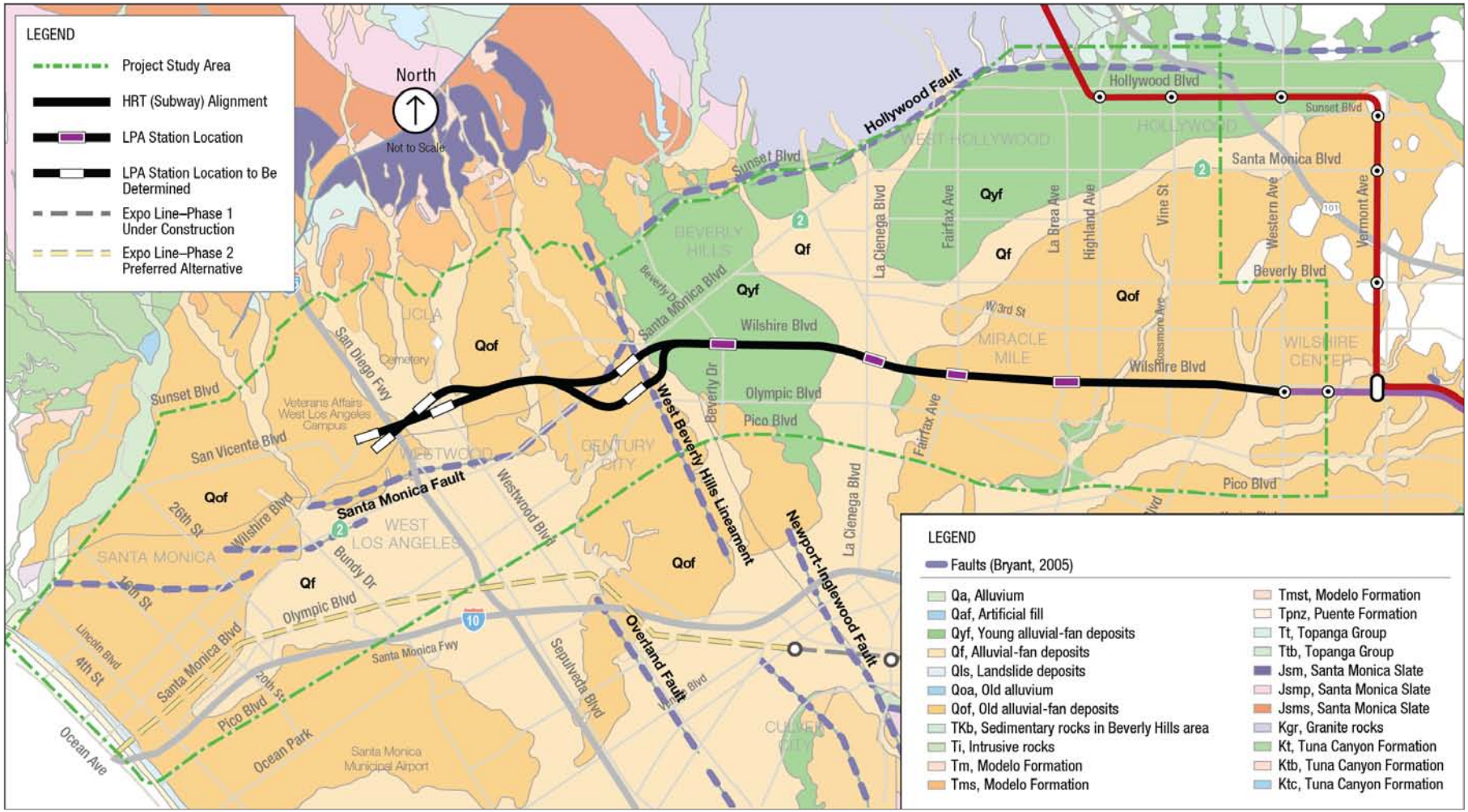


Figure 4-39. Surface Geology and Earthquake Faults

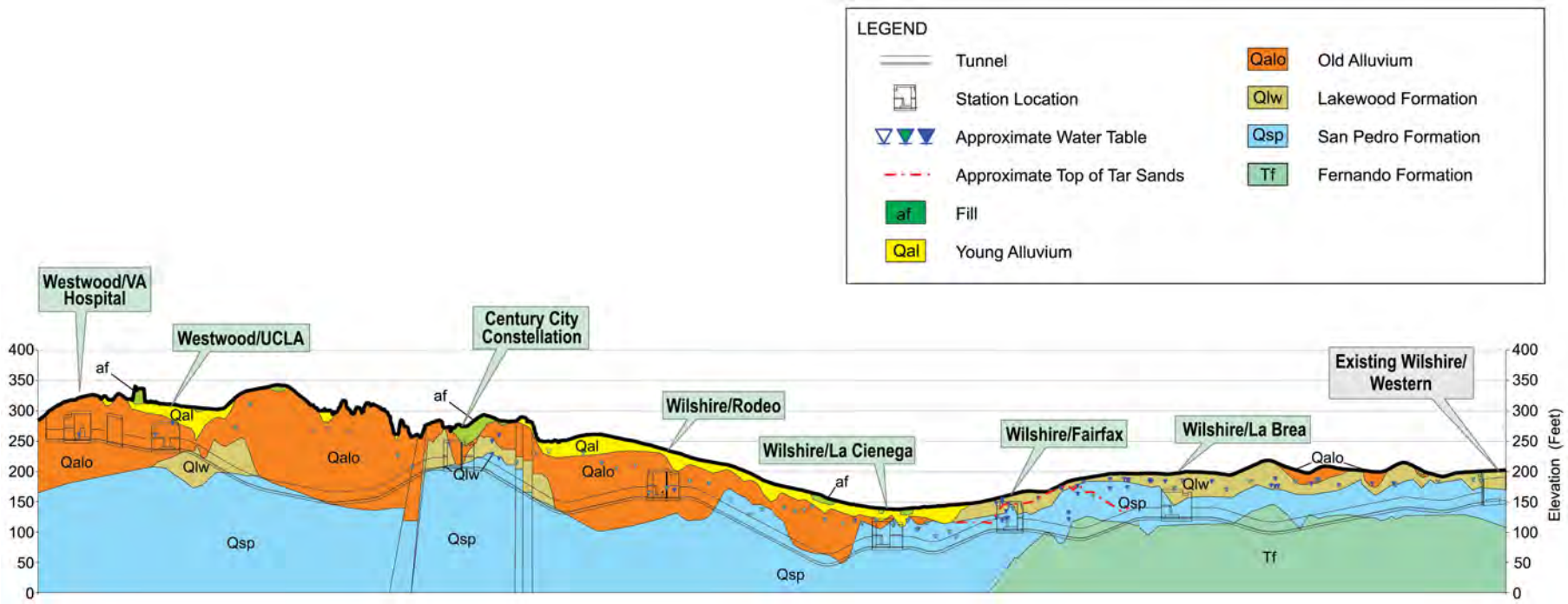


Figure 4-40. Geologic Cross Section (with Century City Constellation option)

Study Area Faulting, Seismicity, Seismic Hazards, and Other Hazards

The Project Study Area lies within a seismically active region. The most significant seismic sources related to the LPA are listed in Table 4-42. Fault traces are delineated by the United States and California Geological Surveys (USGS and CGS). These faults are listed in Table 4-42, and those in the Study Area are shown in Figure 4-39.

The magnitude is a number that characterizes the relative size of an earthquake. Magnitude is based on measurement of the maximum motion recorded by a seismograph, which records the trembling of the ground. Basically, this scale is exponential, where each magnitude number is 10 times the strength of the magnitude number below it (for example, a magnitude 6 earthquake is 10 times stronger than the magnitude 5 earthquake). For perspective, the 1994 Northridge earthquake was 6.7 magnitude.

Table 4-42. Active Faults and Fault Segments

Fault or Fault Segment	Approximate Distance to Study Area (in miles)[1]	Approximate Maximum Credible Earthquake Magnitude (Mw)[2, 3]
Santa Monica	0	6.6
Hollywood	0.25	6.4
Newport-Inglewood	0[4]	7.2
Malibu Coast	2	6.7
Upper Elysian Park	2	6.4
Puente Hills	2.5	6.6—single segment rupture 7.1—multi-segment rupture
Raymond	4.5	6.5
Palos Verdes	5.5	7.3
Compton	6	6.8
Verdugo-Eagle Rock	10	6.9
Sierra Madre	11	7.2
Anacapa-Dume	11.75	7.5
Northridge	13.75	7.0
San Fernando	14.25	6.7
Whittier	14.75	6.8
Santa Susana	17	6.7
San Andreas (Mojave)	33	7.4

Source: Westside Subway Extension Geotechnical and Hazardous Materials Technical Report (Metro 2010i), Table 3.1, Summary of Potential Seismic Sources. Distances shown originally in kilometers were converted to miles and approximated.

[1]Distances represent the distance from the closest trace of the fault to the closest portion of any of the Project alternative alignments.

[2]The moment magnitude scale (denoted as Mw) is now used by seismologists rather than the former Richter scale. Magnitude is based on the moment of the earthquake, which is equal to the rigidity of the Earth multiplied by the average amount of slip on the fault and the size of the area that slipped. The scale retains the familiar magnitude scale of 1 to 10 defined by Richter.

[3]Magnitude from CGS 2003

[4]The Newport-Inglewood fault zone includes the West Beverly Hills Lineament, as discussed in the *Century City Area Fault Investigation Report* (Metro 2011w).

Faults Crossing the Project Area

Known faults crossing the LPA alignment options include the Santa Monica fault zone and the West Beverly Hills Lineament, both fault zones are shown in Figure 4-39, which is now thought to be the northern extension of the Newport-Inglewood fault zone. The area along Santa Monica Boulevard between several hundred feet east of South Moreno Drive in Beverly Hills and Century Park West, and continuing to the west, is geologically complex due to this faulting.

The standard of practice for evaluation of a fault is to first establish whether a fault is active, potentially active, or inactive, based primarily on the timing of the last rupture event. If a fault is active or potentially active, then the magnitude of future events is estimated. The shaking hazard from an earthquake on the fault is estimated by the "slip rate" which indicates on average how much potential earthquake energy is stored up in the fault per year. The greater the slip rate, the greater the likelihood of earthquakes on the fault. The risk of rupture hazard is evaluated based on the magnitude estimated for the fault, as well as the slip rate. The fault is categorized based on these two values.

The State of California identifies the Santa Monica fault zone as an active fault within the most recent geologic epoch (the Holocene, which extends from about 11,000 years ago until the present). The State of California bases this conclusion on the most thorough scientific research published to date on the fault zone (Dolan 2000a and Dolan 2000b). This information and the recent fault investigations performed as part of the Project are used as the primary sources for scientific information about the fault zone.

The Santa Monica fault zone is an oblique-left-lateral reverse fault that would displace in an east-west and vertical direction. The concept of displacement during an earthquake is shown in Figure 4-41. As shown in Table 4-42, the Santa Monica fault zone could have a maximum credible earthquake magnitude (Mw) of 6.6 based on estimates from the State of California (CGS 2003).

Extensive additional studies were conducted as part of the Final EIS/EIR evaluation of the LPA to provide more data on the Santa Monica fault zone in the vicinity of the Century City Station options (Metro 2011w). These studies provided additional scientific/technical analysis that confirmed, and in some cases amplified, the geotechnical and geological information existing in the environmental review record (see information in Section 4.8 of the Draft EIS/EIR).

Findings to date have located the fault zone in three locations related to the LPA options:

- South of Santa Monica Boulevard in zones crossing Century Park West Boulevard
- Crossing of Avenue of the Stars running subparallel (in an east-west direction)
- Crossing Santa Monica Boulevard at about Avenue of the Stars

The investigation also concluded that the fault zones, several hundred feet wide, would be subject to both vertical distortion and shearing horizontally during large earthquakes. In other words, there is a broad zone along Santa Monica Boulevard in Century City in which there could be both vertical and horizontal ground rupture movement. Figure 4-42 shows the Santa Monica fault zone in the Century City area.

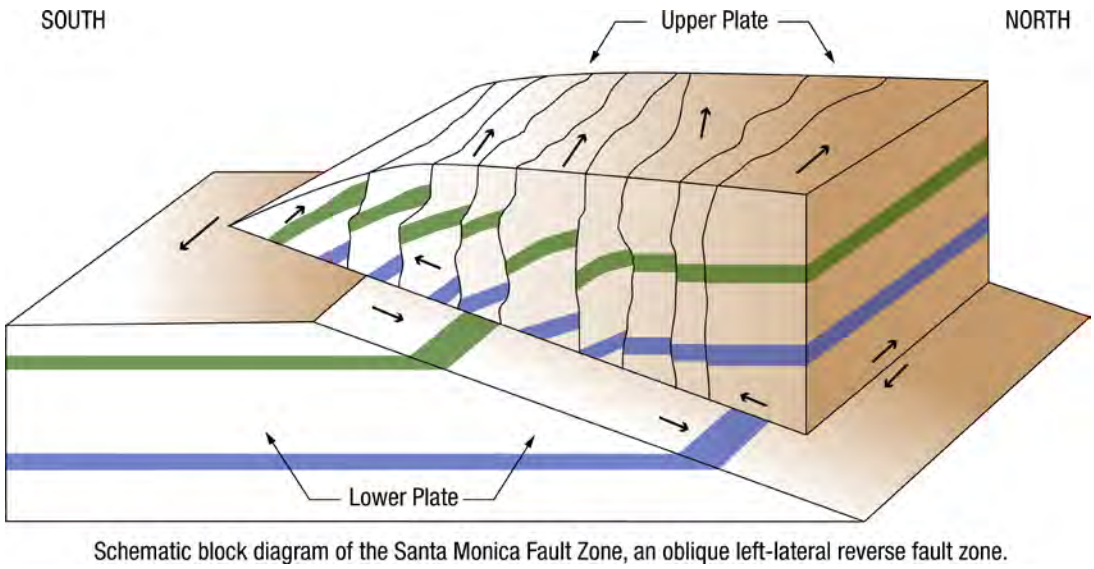


Figure 4-41. Santa Monica Fault Zone Schematic

In addition to the Santa Monica fault zone, the Metro investigations confirmed that the West Beverly Hills Lineament is a north-northwest trending fault that will cross the alignment in the vicinity of South Moreno Drive in the Century City area—either at the Century City Santa Monica Station location or about where tunnels would run under the Beverly Hills High School lacrosse fields, depending on the alignment option. Prior to the Final EIS/EIR studies, the West Beverly Hills Lineament had been delineated by discontinuous east-facing scarps (sharp topographic changes), but not through subsurface geologic investigations. Since the Draft EIS/EIR, the West Beverly Hills Lineament and its potential impact on the LPA were further evaluated through subsurface geologic investigation along Santa Monica Boulevard and Durant Drive. Geophysical seismic reflection results and bore hole and cone petrometer test (CPT) data indicate that faulting and folding have occurred in the vicinity of South Moreno Drive. This provides further evidence that the West Beverly Hills Lineament is the surface expression of an active fault.

These investigations also conclude that the West Beverly Hills Lineament is the northern extension of the active Newport-Inglewood fault zone. The Newport-Inglewood fault zone is a primarily right lateral strike slip fault zone. Right lateral means that if one is standing facing the fault, the other side will move toward the right during a major earthquake. Figure 4-42 shows the location of the West Beverly Hills Lineament zone along with the Santa Monica fault zone in the area of Santa Monica Boulevard and South Moreno Drive.

If the LPA is constructed under the Phased Construction Scenario, the Beverly Hills Lineament/Newport-Inglewood fault zone will be located in Phase 2 and the Santa Monica fault zone will be located in Phase 3 of the LPA.

These investigations and studies provide fully sufficient data (1) to support a reasonable conclusion that the adverse environmental impacts and safety risks of the Century City Santa Monica Station render that alternative infeasible, and (2) to influence, if not determine, the selection of the Century City Constellation Station.

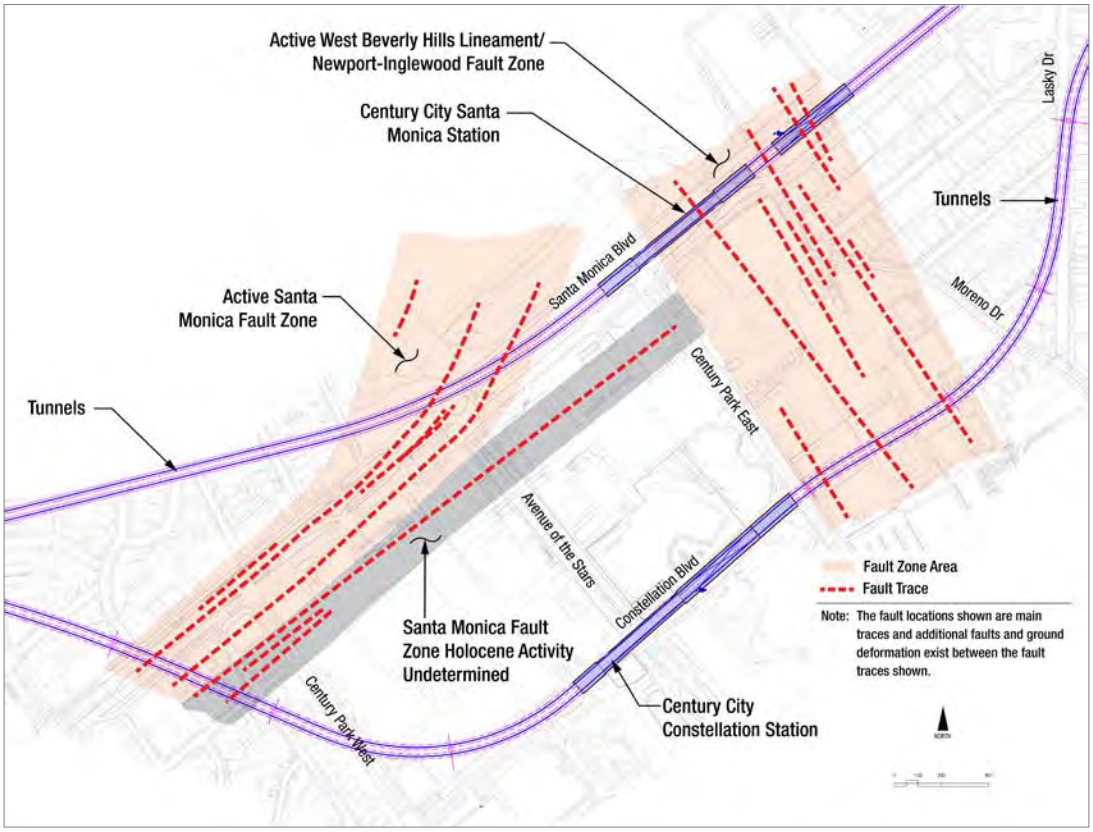


Figure 4-42. Fault Zones in Century City Area

Seismic Ground Shaking

Ground shaking is a term used to describe the vibration of the ground during an earthquake. The intensity of ground motion is dependent on the distance from the fault rupture. Ground motions induced by a seismic event are typically characterized by a value of horizontal peak ground acceleration (PGA), which is expressed as a fraction (or multiple) of the acceleration of gravity (g). Ground acceleration is a measure of how hard the earth shakes at a given location (the intensity). In an earthquake, damage to buildings and infrastructure is related more closely to the ground motion at the particular location of the building or infrastructure, rather than the magnitude of the earthquake. All of the Study Area would be subject to ground shaking during an earthquake on an active fault in the area. The intensity of shaking is a function of the distance from the fault, the earthquake magnitude, and soil conditions.

To estimate ground shaking hazard for design, Metro design criteria uses a probabilistic seismic hazard analysis (PSHA) that considers the combined effects of all nearby faults to estimate ground shaking levels for the LPA. USGS PSHA computations were used as the basis for evaluating the ground motion levels along the alternative alignments. Two

different levels of ground shaking hazard are considered: the Operating Design Earthquake, having a 50-percent probability of exceedance in 100 years; and the Maximum Design Earthquake, having a 4-percent probability of exceedance in 100 years (Table 4-43).

Table 4-43. Estimated Ground Shaking Levels in the Study Area

Earthquake Level	Probability of Exceedance in 100 years (percent)	Average Return Period (years)[1]	Ground Acceleration (g)[2]
Operating design earthquake	50	150	0.26-0.30
Maximum design earthquake	4	2,500	0.85-0.91

[1]Return period is the average time between occurrences of ground shaking at this level
[2] Ground acceleration is a measure of how hard the earth shakes at a given location (the intensity). In an earthquake, damage to buildings and infrastructure is related more closely to the ground motion at the particular location of the building or infrastructure, rather than the magnitude of the earthquake.

An alternative method to consider the ground-shaking hazard levels is to compute the Average Return Period (the average time) between ground shaking of the specified level. Computed in this manner, the Operating Design Earthquake has an average return time of about 150 years, and the Maximum Design Earthquake has an average return time of about 2,500 years.

The probability of exceedance is the chance that the level of shaking computed will be exceeded during the timeframe specified. One hundred years is considered the design life of the Metro underground structures and, therefore, it is the specified timeframe. Section 4.8.3 provides further discussion of the earthquake design criteria.

Surface Fault Rupture

During moderate-to-large earthquakes, the fault slip usually creates breaks (or ruptures) of the ground. If the rupture extends to the surface, there is visible movement on a fault (surface rupture) that produces a scarp or step at the surface if there is vertical movement. Both the Santa Monica fault zone and the West Beverly Hills Lineament cross the LPA alignment in the Century City area. These locations represent surface fault rupture hazards to the LPA. Based on a an analysis performed by Dolan et al. (Dolan 2000), the Santa Monica fault zone is capable of generating earthquakes in the magnitude range M6.9 to M7.2, with average surface displacements of approximately 3 to 6 feet. The magnitude range is higher than the CGS (2003) estimate as it assumes a potentially longer rupture length. A major event on the West Beverly Hills Lineament could be between M6.4 (generally the lower end of the magnitude range for surface rupture) and M7.2, also with average surface displacements of up to 3 to 6 feet, depending on the length of rupture on the northernmost portion of the Newport-Inglewood-West Beverly Hills Lineament fault zone.

No known faults cross the maintenance yard.

Seismic Settlement

Seismic settlement is the settlement of the ground surface due to densification of soils during earthquake-induced ground shaking. Densification can occur in saturated loosely packed, sandy or silty soil, which is known as liquefaction, or as seismic settlement in unsaturated (occurring above the water table) or moist loosely packed, sandy or silty

soils. Seismic settlement does not result in a hazard if the ground over a large area settles uniformly. However, if more seismic densification occurs beneath one area than beneath an adjacent area, differential seismic settlement can occur, which could result in distress to structures, paving, and utilities.

Liquefaction and Lateral Spreading

Liquefaction occurs when loosely packed sandy or silty materials saturated with water are shaken hard enough to lose strength and stiffness. Liquefied soils can behave like a liquid and, depending on the amount of liquefaction occurring, can cause substantial damage in an earthquake, in some cases causing pipes to leak, roads and airport runways to buckle, and building foundations to be damaged (ABAG 2011). Liquefaction can also result in deformations of the ground: vertical deformations are referred-to as seismic settlement (discussed in the previous section), and horizontal deformations are referred-to as lateral spreading. Lateral spreading could occur in locations where a liquefiable layer exists at depth below a sloping ground surface or near an embankment, such as a river or channel. Figure 4-43 shows the liquefaction hazard zones in and around the LPA alignment.

The Division 20 maintenance yard expansion area is not in an area of potentially liquefiable soil.

Subsidence

Subsidence (as opposed to ground settlement resulting from tunneling) is the reduction of pore space in the ground that was formerly occupied by a fluid such as oil or water, or in some cases, organic materials. When this occurs, the ground elevation becomes lower and, if there is differential subsidence between two adjacent areas, can become unstable for structural support of structures between those two areas. The LPA area runs near oil extraction areas and is in a basin with water extraction activities. However, during research and surveys no current subsidence problems have been noted in the LPA area. Construction dewatering and potential subsidence is addressed in Section 4.15. Surface settlement due to tunneling is also addressed in Section 4.15 and in Appendix E, Construction Methods.

Tsunamis

Tsunamis are large ocean waves generated by earthquakes or underwater landslides. The waves are of a very long period, meaning that when the wave reaches the coastline, the tsunami is observed as a retreat of water away from the coastline and then a surge of water similar to a flood. Tsunamis are a hazard in low-lying coastal areas.

The Tsunami Inundation Map of the Beverly Hills Quadrangle (CEMA 2009) indicates the location of the modeled tsunami inundation area and line along Santa Monica Beach, about 500 feet west of the western end of Wilshire Boulevard and Second Street in Santa Monica. The tsunami inundation line is shown on the map along Santa Monica Beach at approximately 20 feet above sea level, adjacent to Pacific Coast Highway and near the base of the ocean-front bluff below Ocean Avenue. Therefore, based on the published mapping, the LPA is not subject to tsunami hazard.

Figure 4-43. Liquefaction Hazard Zones

Landsliding

Landsliding can occur when the stability of slopes underlain by soil or bedrock is decreased during prolonged rainfall or by other factors, including seismic activity. The subsurface geology within the Study Area does not indicate the presence of historic landsliding activity, and the proposed grading along the alignment is relatively flat; therefore landslides are not expected to occur and are not considered a significant geologic hazard for the LPA.

Unsuitable Soils

Some soils may expand as water content increases; some may collapse or settle upon being wetted; and others may be corrosive to building materials. With the exception of corrosive soils, thus far unsuitable soils affecting the LPA have not been identified in the study area.

Tar Sands

Tar sands are a naturally-occurring mixture of sand, clay and water that contains bitumen. Bitumen is a highly viscous, black, oily, and sticky petroleum compound that resembles tar due to its physical characteristics and odor. Tar sands are also referred to as either oil sands or bituminous sands. Oil sands tend to be a little less viscous and compositionally have a higher percentage (i.e., greater than 10 percent) of hydrocarbons). In the area of Central Los Angeles near the La Brea Tar Pits, both Tar Sands and Oil Sands occur.

Study Area Groundwater

Groundwater Basins in the Project Study Area

The Study Area traverses three of the four main groundwater basins of the coastal plain of Los Angeles County. From east to west these are the Hollywood, Central, and Santa Monica Basins. Groundwater in the Hollywood Basin is found within the sands and gravels of several aquifers of the Lakewood and San Pedro Formations.

Shallower groundwater may be found at or near the surface in the north and east portions of the Hollywood Basin. Deeper groundwater is found in the Central Basin, which is also within the sands and gravels of the Lakewood and San Pedro Formations. Some relatively shallow areas of groundwater may be found in this basin overlying these formations in more recent alluvium. The Santa Monica Basin is separated from the Hollywood and Central Basins to the east by the Newport-Inglewood fault zone, which acts as a barrier to groundwater.

Local Groundwater Conditions

The LPA area includes several locations where water will rest on top of a layer of impermeable geologic material above the underlying groundwater basins (perched aquifers). In these locations, groundwater will be closer to the surface than the groundwater in the underlying basin. Table 4-44 shows the areas and depths to local groundwater. Because groundwater may fluctuate based on seasonal, yearly, and geologic conditions, the dates that the various groundwater depths were observed are included in Table 4-44.

Table 4-44. Groundwater Measurements

Phase	General Location		Approximate Depth to Groundwater (in feet below grade)		Year Observed
	From	To	From	To	
Phase 1	Western Avenue	Fairfax Avenue	10	35	1977 to 1981
			16	44	2009
			1	40	2011
	Crenshaw Boulevard	Burnside Avenue	12	40	2007
			11	40	2011
	Curson Avenue	Orange Grove Avenue	5	10	1983
			1	15	2011
Phases 1 and 2	Fairfax Avenue	Santa Monica Boulevard	21	59	2009
			2	51	2011
Phase 3	Santa Monica Boulevard	I-405 Freeway	16	69	2009
			25	46	2011
	I-405 Freeway	VA Hospital	21	31	2008–09
			40	75	1974–75
			65	65	2011

Sources: Section 3.2.3, Geotechnical and Hazardous Material Technical Report (Metro 2010i)

Study Area Subsurface Gas Conditions and Oil Wells

The LPA will pass through or near several active or abandoned oil fields, and existing oil wells (active and abandoned) are also present in the Study Area. The rocks and soils overlying the oil fields are known to commonly contain naturally occurring methane and/or hydrogen sulfide gases. Methane and hydrogen sulfide are considered hazardous because of their explosive properties. Hydrogen sulfide is highly toxic when inhaled, and can be smelled at lower, non-toxic, levels . These gases can seep into tunnels and other excavations from the surrounding soil and also through discontinuities (fractures, faults, etc.) in bedrock. Figure 4-44 and Figure 4-45 show the oil fields in and around the LPA area and Century City Area, respectively.

The City of Los Angeles Department of Public Works Bureau of Engineering has mapped Potential Methane Zones and buffer zones, and most recently updated its map in 2004, as shown with respect to the Study Area in Figure 4-46. The City's Municipal Code, Chapter IX, Building Regulations, Article 1, Division 71, Methane Seepage Regulations, requires construction projects located within the Methane Zone or Methane Buffer Zone to comply with the City's Methane Mitigation Standards to control methane intrusion emanating from geologic formations. Mitigation requirements are determined according to the actual methane levels and pressures detected on a site within the Methane Zone or Buffer Zone. Mitigation measures include both active and

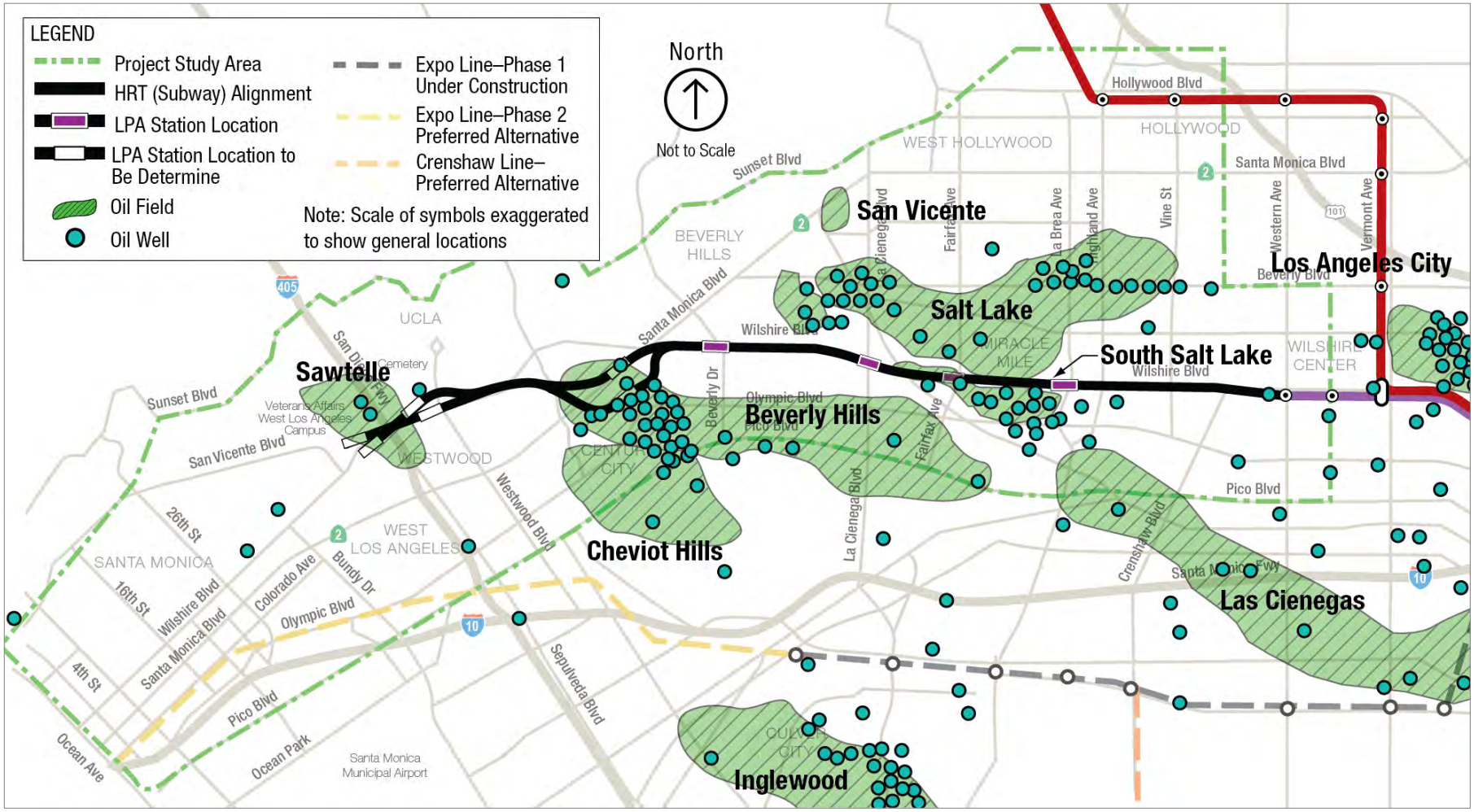


Figure 4-44. Oil Fields/Wells in Project Study Area

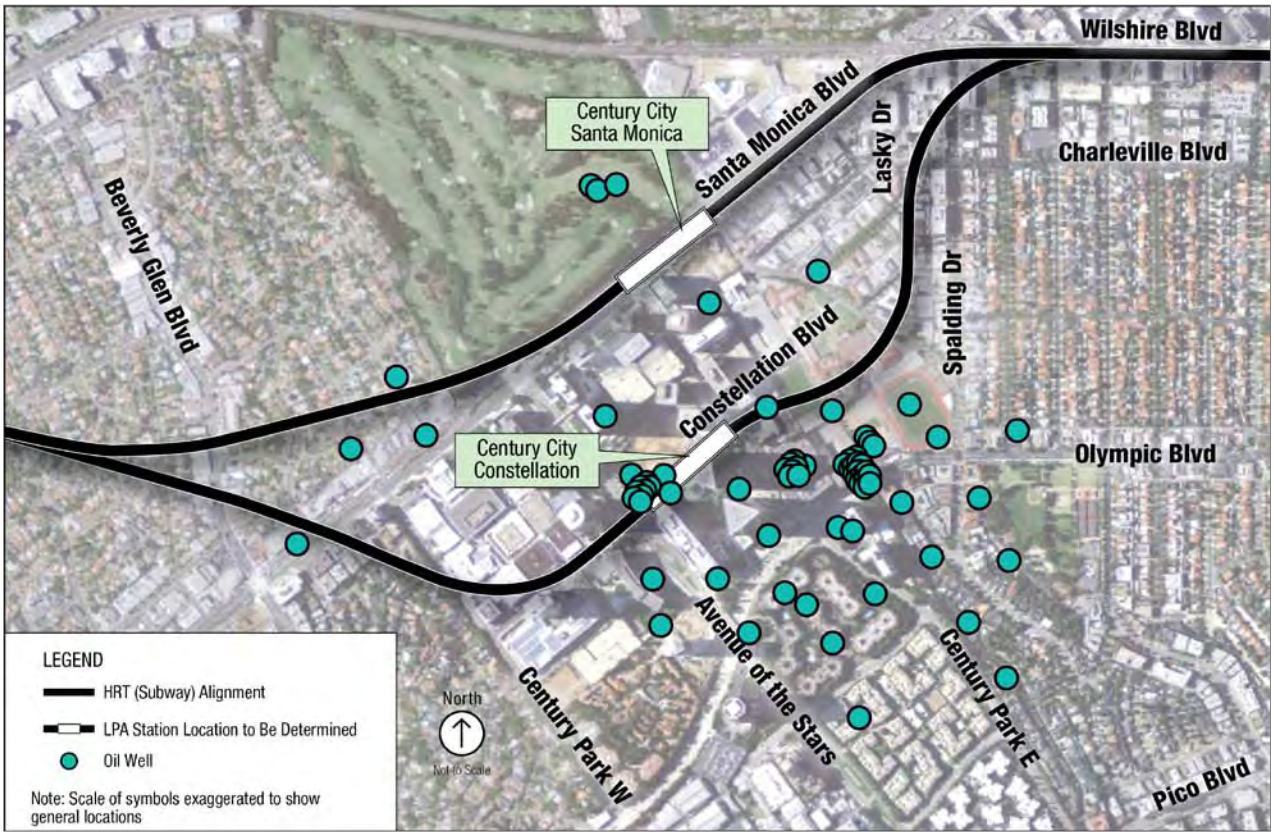


Figure 4-45. Mapped Oil Wells in Century City Area

passive ventilation systems to ensure exchange of air, gas barriers (membranes around basements and foundations), and sensors in interior spaces to monitor the presence of gas and its pressure. Several existing buildings have been constructed with up to five levels of underground parking in the Wilshire/Fairfax Area. Construction of the subterranean walls has included water and gas-proof membranes.

As part of this study, Metro examined existing data along the Study Area and installed new gas monitoring wells at 48 locations along the alternative alignments to evaluate the presence of hazardous gases and their potential to affect construction and design of the LPA (Metro 2011ad). Locations of gas monitoring wells were selected in known methane areas referenced above. Based on the readings from the Metro monitoring wells, the segment of Wilshire Boulevard from South Burnside Avenue to South La Jolla Avenue indicated elevated gas measurements and levels of pressure for methane and hydrogen sulfide gases. This segment of Wilshire Boulevard is near the La Brea Tar Pits and is characterized by having extensive soils containing asphalt (bitumen), often referred to as tar sands. The area generally corresponds to the former High Potential Methane Zone (1986) shown on Figure 4-46. If the LPA is constructed under the Phased Construction Scenario, the La Brea Tar Pits will be located along Phase 1 of the alignment. Other locations in the Study Area have gas concentrations ranging from very low to non-detectable.

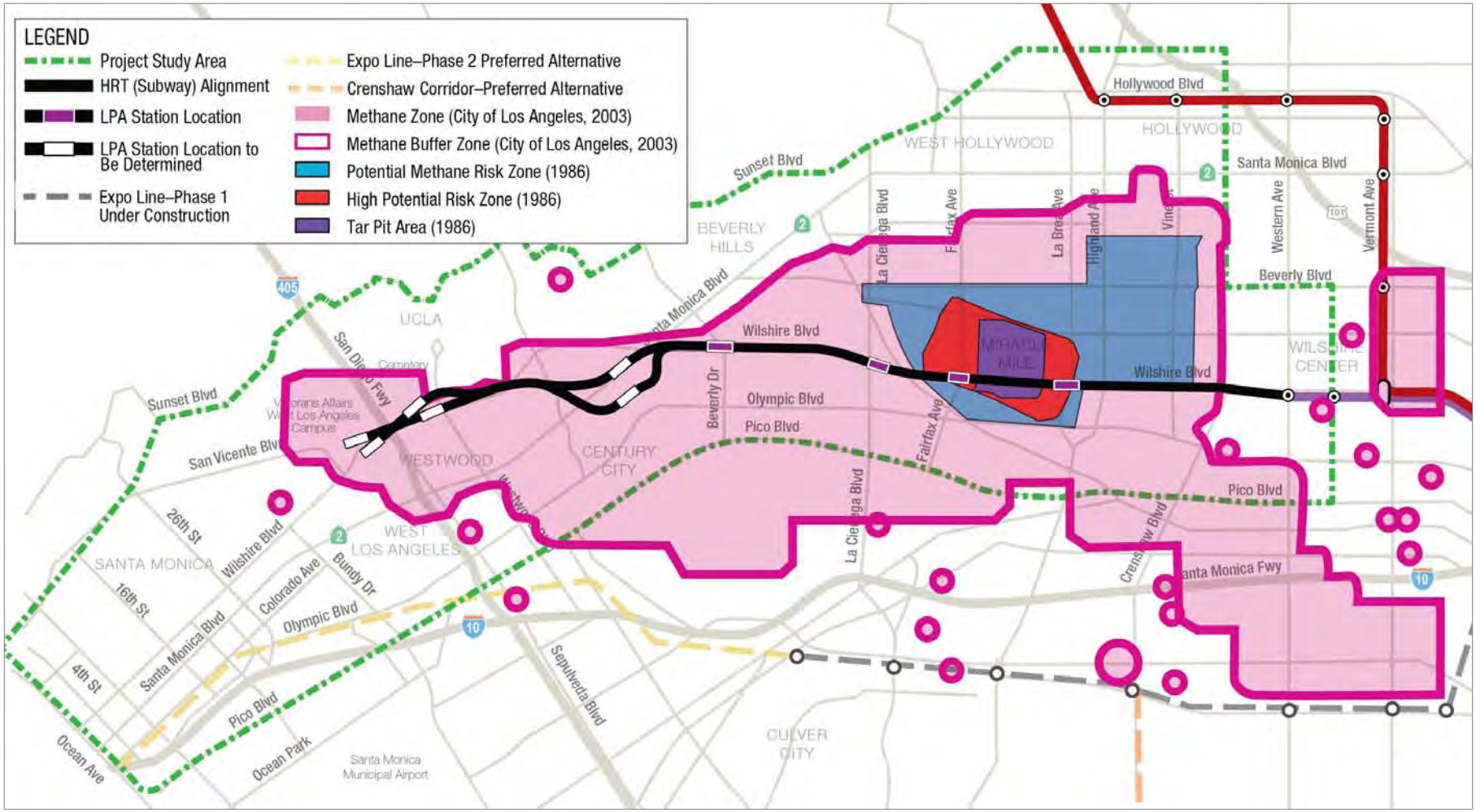


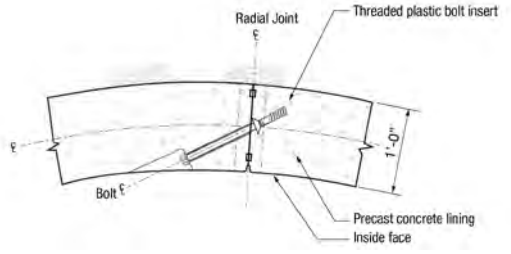
Figure 4-46. Methane Risk Zone

In some areas near the La Brea Tar Pits, methane can reach up to 90 to 100 percent by volume of the vapor phase (the explosive range is 5 to 15 percent in air). Hydrogen sulfide (H_2S) gas concentrations have been measured in the area between Burnside Avenue and Jolla Avenue typically in the range of less than 1 to about 300 parts per million (ppm) with one boring near the intersection of Wilshire Boulevard and Crescent Heights Avenue having measurements between 1,000 and 6,500 ppm over the study time frame. Gas pressures, measured in the equivalent depth of water in inches, varied from less than 1 inch to 844 inches (about 74 feet, equivalent to the water pressure in this area). For perspective, the existing Metro Red Line was constructed in areas where methane gas measurements were up to 79 percent in the Civic Center area, with pressures less than 1 inch.

According to the American Conference of Governmental Industrial Hygienists, hydrogen sulfide gas has an exposure limit or threshold limit value-time weighted average of 10 ppm for continuous exposure and 15 ppm for Threshold Limit Value—Short Term Exposure Limit (ACGIH 2001). This threshold limit value is the concentration to which it is believed that workers can be exposed continuously for a short period of time without suffering from irritation, chronic or irreversible tissue damage, or narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue ability, or materially reduce work efficiency, and provided that the daily exposure limit is not exceeded. A Short Term Exposure Limit is defined as a 15minute total weighted average exposure that should not be exceeded at any time during a workday. Methane gas, while explosive, is not highly toxic. Rather, it is considered an asphyxiant, when oxygen is displaced. A total weighted average exposure of 1,000 ppm (0.1 percent) has recently been added to American Conference of Governmental Industrial Hygienists' recommended practices. Under normal atmospheric pressure, the minimal oxygen content should be 18 percent by volume.

Radon is gas that can cause lung cancer and other health problems. Los Angeles is located in an area with indoor radon potential of between 2.0 and 4.0 pico Curies per liter of air (pCi/l). The EPA action level for radon is above 4.0 pCi/l; hence, radon is not a large concern for the Study Area.

Metro has extensively studied the characteristics of methane and hydrogen sulfide with respect to their effects on the construction and operation of its facilities, as methane and hydrogen sulfide are present in the ground surrounding the existing Red and Purple Lines. Since as far back as 1984, Metro has been developing documents and methods for reducing or eliminating hazardous conditions in its facilities under construction and in operation, some of which are as follows:



Double-gasketed tunnel segment

- In 1984, Metro developed the Alerting Report on Tunneling Liners, which included tunnel construction methods, lining methods, and ventilation requirements for the

proposed 1983 alignment of the Red Line tunnels (along Wilshire Boulevard and Fairfax Avenue).

- In 1985, Metro commissioned the development of the Congressionally Ordered Reengineering Study that established methane conditions along alternative alignments and led to the re-alignment of the then proposed Metro Red Line into its current alignment.
- Metro designed a "two-pass" tunnel lining system for the Red Line that included a high-density polyethylene water and gas barrier in tunnel construction.
- Metro undertook a study for the Mid-City area to locate and monitor gas-bearing geologic formations to determine the extent of the gas reservoirs, examine methods of treatment for pre-tunneling and tunneling timeframes, and recommend tunnel and station configurations to avoid the most gaseous areas.
- Metro implemented a double-gasketed tunnel liner that can flex enough to protect the tunnel from gas intrusion before, during, and after an earthquake.
- Metro continuously monitors for gaseous environment in its tunnels and has emergency ventilation.
- During construction, Metro's contractors strictly adhere to California's Tunnel Safety Orders (California Code of Regulations, Title 8, Tunnel Safety Orders), including additional ventilation and spark-proof equipment.

Oil Wells

A review of the State of California Division of Oil, Gas, and Geothermal Resources (DOGGR) Online Mapping System (DOMS 2010) identified the oil wells listed in Table 4-45. The table shows oil wells within 100 feet of the outer edge of the proposed tunnel or station alignments and those that may be located within the tunnel area. The locations noted in the tables are approximate since the DOMS maps are representational and are intended for general public use. Unmapped abandoned oil wells could exist in other oil field areas.

During investigations for the Final EIS/EIR, geophysical (magnetic) surveys were performed in areas where oil wells were suspected for the presence of an abandoned oil well casing. The survey identified only one magnetic anomaly close to the tunnel alignment. The anomaly is on the west edge of the Beverly Hills High School lacrosse field and is 5 to 10 feet north of the tunnel envelope. The anomaly may or may not be a well casing, so it will be further investigated and, if it is a well, it will be addressed with appropriate mitigation measures identified in Section 4.8.5. The *Westside Subway Extension Century City Area Tunneling Safety Report* (Metro 2011x) includes more information on oil well investigations.

Table 4-45. Identified Oil Wells

Phase	Well Name/API No.	Location	Plan Sheet (Appendix A)	Approximate Station	Well Status
Phase 1	Wilton Corehole/API 03706346	100 feet north of Wilshire and 50 feet west of Bronson	C-102	24+00-25+00	Uncompleted and abandoned
	Highland Corehole 1 and 2/API 03701151 and API-03720045	100 feet south of Wilshire and 100 feet east of Orange	C-105	94+00-96+00	Uncompleted and abandoned
	Chevron USA 10/API 0314970	50 feet north of Wilshire and 100 feet west of Fairfax	C107	157+00-159+00	Idle
	Chevron USA 49/API 03715144	50 feet north of Wilshire at McCarthy	C107	541+00-542+00	Abandoned
Phase 2	**Century City Constellation Boulevard Station Option**				
	Chevron USA, Rodeo 107/API: 03701069	Beverly Hills High School, 500 feet south of alignment at Constellation and 200 feet east of Century Park East	C-114	322+00-323+00	Abandoned
	Chevron USA, Wolfskill 23/API: 03701104	On alignment 150 feet east of Century Park East	C-314	327+00-329+00	Abandoned
	Chevron USA, Aladdin 21/API: 03716545 Wolfskill 24/API: 03701105 20th Century Fox 201 F/API: 03700985 Community 12 C/API: 03717552	40—200 feet north of Constellation Blvd at NE corner of Constellation Blvd and Avenue of the Stars	C-315	335+00-339+00	Abandoned
Phase 3	**Century City Santa Monica Boulevard Station Option**				
	Kansas Crude Co 2/API 03700992	30 feet east of Ensley Street and 90 feet north of alignment	C-214A	345+50-346+00	Buried idle

Figure 4-44 and Figure 4-45 show known oil fields in the study area and in more detail in the Century City area, respectively.

4.8.3 Environmental Impacts/Environmental Consequences

No Build

Under the No Build Alternative, no new infrastructure would be built within the Study Area, aside from projects currently under construction or projects funded for construction, environmentally cleared, planned to be in operation by 2035, and identified in the Metro LRTP (Metro 2009a). Projects in the No Build Alternative may be subject to the identified hazards discussed above; however, the alternative would not result in increased risk of exposure of people or property to the hazards discussed above.

Locally Preferred Alternative

The LPA could either be constructed as a single phase under the Concurrent Construction Scenario or as three consecutive phases under the Phased Construction Scenario. The opening of the LPA as a single phase or in three sequential phases will not result in substantially differing long-term risks associated with geological hazards.

Seismic Ground Shaking

America Fast Forward (30/10) Scenario (Concurrent Construction)

The LPA and the maintenance yard, as with most sites in southern California, are susceptible to strong ground shaking generated during earthquakes on nearby faults. Experience in California and worldwide shows that tunnels perform well during earthquake ground shaking, exhibiting no significant damage or collapse. Since they are embedded in the ground, they move with the ground, and thus, their motion is not magnified by the pendulum effect that occurs when an above-ground structure is shaken by an earthquake. As an example, during the Northridge Earthquake in 1994, Metro's Segment 1 Red Line tunnels received ground motions at the level of the Operating Design Earthquake without damage. Inspection was performed and the system was reopened for service the following day, with greatly increased ridership because highways were closed due to earthquake damage to bridges. Another example is the 1989 Loma Prieta earthquake that shook San Francisco, collapsing key elevated highways but leaving the Bay Area Rapid Transit tunnel system unaffected. Following an inspection of the tunnels and trackwork, the system was quickly reopened.

As previously discussed, two different levels of ground shaking hazard are considered: the Operating Design Earthquake, having a 50-percent probability of exceedance in 100 years; and the Maximum Design Earthquake, having a 4-percent probability of exceedance in 100 years (Table 4-43). This two-level approach follows that outlined in the *Recommended Load and Resistance Factor Design (LRFD) Guidelines for the Seismic Design of Highway Bridges* (MCEER/ACT 2003) published by the Applied Technology Council and the Multidisciplinary Center for Earthquake Engineering Research.

The guiding philosophy of earthquake design for the Project is to provide a high level of assurance that the overall system will continue operating safely during and after an Operating Design Earthquake and will provide a high level of assurance that public safety will be maintained during and after a Maximum Design Earthquake. It is expected that repairs will be required after the Maximum Design Earthquake.

Based on probabilistic estimates from published data on ground motion, the peak ground accelerations for the Operating and Maximum Design Earthquake along the alignment were shown in Table 4-43. During the Final Design phase, geotechnical engineers will provide further site-specific analyses, including developing specific seismic design parameters for detailed station design at each station location.

The structural elements of the LPA will be designed and constructed to resist or accommodate the appropriate site-specific estimates of ground loads and distortions imposed by the design earthquakes and conform to Metro's Design Standards for the Operating and Maximum Design Earthquakes. The concrete structures will be designed according to the Building Code Requirements for Structural Concrete by the American Concrete Institute (ACI 318).

Metro will implement Standard Operating Procedures in seismic areas to detect earthquakes and will provide back-up power, lighting, and ventilation systems to increase safety during tunnel or station evacuations in the event of loss of power due to an earthquake. For example, seismographs are located in 11 of the existing Metro

Red/Purple Line stations to detect ground motions and trigger Standard Operating Procedures (SOP #8—Earthquake) by the train operators and controllers. Operating procedures are dependent on the level of earthquake and include stopping or holding trains, gas monitoring, informing passengers, communications with Metro's Central Control, and inspecting for damage.

With this design for anticipated earthquake loads, ground shaking does not present a significant impact to the LPA, including all station, alignment, and station entrance options still under consideration.

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the risks associated with seismic ground shaking are the same as under the Concurrent Construction Scenario. The potential impacts associated with seismic ground shaking are discussed in the Concurrent Construction Scenario section above. All three phases of the LPA will be designed for anticipated earthquake loads; therefore, ground shaking does not present a significant impact to Phase 1, Phase 2, or Phase 3 of the LPA.

Surface Fault Rupture

America Fast Forward (30/10) Scenario (Concurrent Construction)

The Santa Monica fault zone runs along and parallel to Santa Monica Boulevard in West Los Angeles and crosses the LPA options in the Century City vicinity. In addition to the Santa Monica fault zone, the West Beverly Hills Lineament, considered to be the northern extension of the Newport-Inglewood fault zone crosses the LPA options in the vicinity of South Moreno Drive in the Century City area.

Subway stations, because they are habitable structures for human occupancy, may not be built on active fault zones due to regulatory codes and the practical difficulty of designing a safe and repairable structure required by Metro's design criteria. For Maximum Design Earthquake events on the Santa Monica or Newport-Inglewood fault zones, fault displacements could be on the order of 3 to 6 feet. Design of Metro's underground stations—which are complex two-story structures up to 1,000 feet long and include systems and ventilation equipment—to withstand such displacements without significant damage and potential loss of life would be impractical and without precedent. Damage levels would require a complete rebuild of the stations and associated tunnel sections, with a construction time frame of several years.

An area susceptible to surface fault rupture can range from tens to several hundred feet wide, depending on the fault characteristics. Avoidance is the recommended means of mitigating surface fault rupture hazards for facilities such as stations. Based on Metro's geologic studies undertaken during the Final EIS/EIR, the Century City Santa Monica Station option was shifted east to avoid locating the station box in the Santa Monica fault zone. However, additional investigations found that this new location places the station on the West Beverly Hills Lineament (Figure 4-42). Thus, surface fault rupture poses a substantial hazard for this station location that cannot be mitigated with the available techniques and measures.

More detailed information about the geotechnical and fault investigations is available in the *Westside Subway Extension Century City Area Fault Investigation Report* (Metro 2011w), including the detailed locations and subsurface geometries of major strands of the Santa Monica and West Beverly Hills/Newport-Inglewood fault zones. As along most major fault systems, additional secondary fault strands and zones of possible distributed near-surface deformation are also likely to occur in association with these faults. The methods of investigation used in the fault investigation study may not detect such smaller features. Thus, a buffer zone extending approximately 100 feet beyond the detected main traces of the faults was established (Figure 4-42) to include areas that may be subject to ground rupture, folding, secondary faulting, and off-fault, distributed deformation expected during an earthquake. Such features are likely to be found within the structurally complex zone of the intersection of the Santa Monica and West Beverly Hills Lineament/Newport-Inglewood fault zones near or just north of the intersection of Santa Monica Boulevard and South Moreno Drive.

The Century City Constellation Station is not located in a fault zone or a fault buffer zone, and thus fault rupture is not a hazard for this station location.

For linear facilities such as tunnels, avoidance of faults may not be possible. Thus, the preferred designs for tunnels are to cross the faults at an angle to the fault lines to limit the area of potential damage of the fault ruptures as, depending on the predicted fault off-set and area over which the movement is distributed, some distortion can be accommodated by the tunnel structure.

The approach for design of tunnels traversing active faults is documented in Metro Seismic Design Criteria and has a well-established precedent. As discussed in the *Westside Subway Extension Century City Area Tunnel Safety Report* (Metro 2011x), potential tunnel damage is also repairable. A similar philosophy is adopted for transportation infrastructure in general, such as highways, bridges, and pipelines. These structures of necessity have to cross faults, and design approaches minimize damage and allow for repair.

In some cases, such as in the rock tunnel crossing the Hollywood fault zone, the tunnels are built larger through a fault zone to accommodate future fault displacement. This is not always practical, particularly when tunnel boring machines with segmental linings are used. For potentially large anticipated tunnel deformations in fault zones, articulated joint designs have been developed as a means to satisfactorily and economically mitigate the seismic risk, providing that sufficient elasticity can be provided in the tunnel lining at the fault (Russo 2002). Other solutions include placing a stiff but crushable material behind the tunnel lining to allow movement. These types of solutions were used for other tunnels in Los Angeles crossing the Newport-Inglewood fault zone. Where fault rupture displacement may be distributed over a longer distance, more flexible tunnel lining, such as steel tunnel lining segments that can accommodate some strain, can be considered.

In the design for the Century City tunnels, the specific Maximum Design Earthquake and Operating Design Earthquake fault displacements will be calculated using a probabilistic approach during the detailed Final Design, together with further

exploration to refine the fault zone locations specific to the selected tunnel alignment. With this design, hazard from surface fault rupture will be minimized.

No known faults cross the maintenance yard; therefore, hazard from surface fault rupture does not pose a substantial hazard in this area.

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the potential for impacts related to surface fault ruptures is the same as under the Concurrent Construction Scenario. The only difference between the two scenarios is the timing of potential for impacts related to surface fault ruptures to occur. Under the Phased Construction Scenario, the potential for impacts related to surface fault ruptures along Phase 2 and Phase 3 will occur later than under the Concurrent Construction Scenario due to an extended construction timeline. The timing for potential impacts related to surface fault ruptures to occur along Phase 1 of the LPA will be earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

Phase 1 to Wilshire/La Cienega

No known active fault zones cross the Phase 1 alignment or the Division 20 maintenance yard. Therefore, surface fault rupture does not pose a substantial hazard for Phase 1 of the LPA.

Phase 2 to Century City

The West Beverly Hills Lineament, considered to be the northern extension of the Newport-Inglewood fault zone, crosses Phase 2 of the LPA in the Century City vicinity. The precise location of where the fault zone crosses the LPA depends on the location of the Century City Station. The Century City Santa Monica Station option is located on the West Beverly Hills Lineament/Newport-Inglewood fault zone at the intersection of Santa Monica Boulevard at about South Moreno Drive. With the Century City Constellation Station option, the tunnel in between the Wilshire/Rodeo Station and this station option crosses the West Beverly Hills Lineament/Newport-Inglewood fault zone under the Beverly Hills High School property. The hazards resulting from construction of the LPA in the vicinity of these known faults are discussed in the Concurrent Construction Scenario above.

Phase 3 to Westwood/VA Hospital

The Santa Monica fault zone crosses Phase 3 of the LPA in the Century City vicinity. The precise location of where the Santa Monica fault zone crosses the LPA depends on the location of the Century City Station. The hazards resulting from construction of the LPA in the vicinity of this known fault are discussed in the Concurrent Construction Scenario above.

Seismic Settlement

America Fast Forward (30/10) Scenario (Concurrent Construction)

Differential seismic settlement is most likely to occur at transitions between higher density and lower density materials, such as between more recently deposited alluvial soils in an old stream bed and the adjacent denser soils at the banks of the old stream. Geotechnical investigations for the LPA have identified that the soils beneath the level of

tunnels and station boxes are not prone to seismic densification and hence not susceptible to seismic settlement. However, some areas beneath shallow station entrance structures or other shallow ancillary structures could be prone to seismic settlement; the Wilshire/La Cienega, Westwood/UCLA, and Westwood/VA Hospital Stations have some portions susceptible to seismic settlement.

At those locations, a seismic settlement evaluation will be used to select either structural design (for seismic settlements of less than about 1 inch) or ground improvement (such as deep soil mixing) or deep foundations (such as piles).With the use of the selected techniques, the potential settlement hazard will be minimized.

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the potential for impacts related to seismic settlement is the same as under the Concurrent Construction Scenario. The only difference between the two scenarios is the timing of potential for impacts related to seismic settlement to occur. Under the Phased Construction Scenario, the potential for impacts related to seismic settlement along Phase 2 and Phase 3 will occur later than under the Concurrent Construction Scenario due to an extended construction timeline. Along Phase 1 of the LPA these impacts have a potential to occur earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

The potential impacts associated with seismic ground shaking are discussed in the Concurrent Construction Scenario section above. Of the areas susceptible to seismic settlement, the Wilshire/La Cienega Station is located along the Phase 1 alignment and the Westwood/UCLA and Westwood/VA Hospital Stations are located along the Phase 3 alignment.

Liquefaction and Lateral Spreading

America Fast Forward (30/10) Scenario (Concurrent Construction)

Some portions of the LPA are within areas designated as potentially liquefiable. Based on the geotechnical investigations for the LPA, some of the soils in those areas are potentially liquefiable in the event of a moderate or large earthquake. However, soils beneath the level of tunnels and station boxes are not prone to liquefaction or the associated lateral spreading. Nevertheless, some areas beneath shallow station entrance structures or other shallow ancillary structures could be prone to liquefaction; the Wilshire/La Cienega, Westwood/UCLA, and Westwood VA Hospital Stations have some portions susceptible to liquefaction.

At those locations, liquefaction evaluations will be performed to calculate estimates of the magnitude of the potential liquefaction. Evaluations performed indicate that lateral spreading is not anticipated in the vicinity of the LPA, but other consequences of liquefaction could be experienced for those shallow structures. Based on the magnitude of evaluated liquefaction, either structural design or ground improvement techniques (such as deep soil mixing) or deep foundations (such as piles) to minimize these hazards will be selected. The State of California has issued Guidelines for Evaluating and Mitigating Seismic Hazard in California (CGS 1997). Site-specific design will be selected based upon the state recommendations and design criteria set forth in the Metro

Seismic Design Criteria. Liquefaction is not considered a hazard at the maintenance yard expansion site.

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the potential for impacts related to liquefaction and lateral spreading is the same as under the Concurrent Construction Scenario. The only difference between the two scenarios is the timing of potential for impacts related to liquefaction and lateral spreading to occur. Under the Phased Construction Scenario, the potential for these impacts along Phase 2 and Phase 3 to occur is later than under the Concurrent Construction Scenario due to an extended construction timeline. Along Phase 1 of the LPA the potential for these impacts to occur is earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

The potential impacts associated with liquefaction and lateral spreading are discussed in the Concurrent Construction Scenario section above. Of the areas susceptible to liquefaction and lateral spreading, the Wilshire/La Cienega Station is located along the Phase 1 alignment and the Westwood/UCLA and Westwood/VA Hospital Stations are located along the Phase 3 alignment. Under the Phased Construction Scenario, the same mitigation measures will be implemented and the same regulations will be followed as described for the Concurrent Construction Scenario.

Unsuitable Soils

America Fast Forward (30/10) Scenario (Concurrent Construction)

Where corrosive soils are identified, appropriate protection measures such as use of corrosion resistant cements will be incorporated into the design. This is a standard method for construction and therefore unsuitable soils are not considered a significant impact for the Project. In some cases, excavated soil may be re-used for backfill over stations and entrances. Backfill soil must meet construction specifications for grain size distribution and expansive properties, so as the excavated soils are considered for re-use, these soils will be tested during construction to ensure that they meet the required specifications.

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the potential for impacts related to unsuitable soils is the same as under the Concurrent Construction Scenario. The only difference between the two scenarios is the timing of potential for impacts related to unsuitable soils to occur. Under the Phased Construction Scenario, the potential for these impacts to occur along Phase 2 and Phase 3 is later than under the Concurrent Construction Scenario due to an extended construction timeline. Along Phase 1 of the LPA the potential for these impacts to occur is earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

The potential impacts associated with unsuitable soils are discussed in the Concurrent Construction Scenario section above. Unsuitable soils are not considered a significant impact for the Project under the Phased Construction Scenario.

Subsidence

America Fast Forward (30/10) Scenario (Concurrent Construction)

No current substantial subsidence problems related to petroleum or groundwater extraction have been identified in the vicinity of the LPA alignment options. Therefore, the subsidence related to extraction of petroleum and groundwater is not considered a hazard to the LPA. However, the potential exists for ground subsidence related to construction activities such as tunneling and dewatering at station areas along the full length of the proposed alignment and options. Therefore, subsidence induced by construction dewatering poses a potentially adverse impact. Impacts due to subsidence and techniques and measures to minimize this potential impact are discussed in Section 4.15. Subsidence is not considered an impact during operation of the LPA, including all station, alignment, and station entrance options still under consideration.

No current substantial subsidence problems related to oil or groundwater pumping have been identified in the vicinity of the maintenance yard. Therefore, the subsidence related to extraction of petroleum and groundwater is not considered a substantial hazard at the yard.

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the potential for impacts related to subsidence is the same as under the Concurrent Construction Scenario. The only difference between the two scenarios is the timing of potential for impacts related to subsidence to occur. Under the Phased Construction Scenario, the potential for these impacts along Phase 2 and Phase 3 to occur is later than under the Concurrent Construction Scenario due to an extended construction timeline. The timing for the potential of these impacts to occur along Phase 1 of the LPA is earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

The potential impacts associated with subsidence are discussed in the Concurrent Construction Scenario section above. Subsidence is not considered a significant impact for the Project under the Phased Construction Scenario.

Tar Sands

America Fast Forward (30/10) Scenario (Concurrent Construction)

Tar sands (also referred to as oil sands) are a combination of clay, sand, water, and **bitumen**, a heavy black viscous oil. Tar sands cannot be generically classified as either hazardous or non-hazardous materials for waste classification purposes. However, most petroleum-hydrocarbon impacted soils (which would include tar sands) are typically classified, transported and disposed of as a non-hazardous waste. Depending on the results of analytical tests, excavated soils from tar sands will be disposed of or recycled in accordance with all applicable prevailing guidelines of local, state, and federal regulations. In order to identify whether a waste material (e.g., excavated tar sand soils) would require disposal as a RCRA (federal) hazardous waste, a non-RCRA (California) hazardous waste or a non-hazardous waste, analyses will be conducted on samples that are representative of the excavated material. The samples are typically analyzed for total petroleum hydrocarbons, volatile organic compounds, metals and aquatic toxicity. The test results are then compared to federal and state waste criteria for identifying the

classification of the waste material. Refer to Section 4.9 for additional discussion of regulations for hazardous materials.

Although a waste material (such as excavated tar sand material) may be classified as non-hazardous based on the test results, this does not mean that it can be reused on a construction project and these types of soils will typically require special handling, transportation, and disposal.

Excavation in the tar sands has been conducted for deep basements and underground parking garages in the Wilshire Boulevard and Fairfax Avenue area. The drummed soils generated from Metro's recent studies in the area near the La Brea Tar Pits that have encountered tar sands have been analyzed for total petroleum hydrocarbons (TPH), Title 22 Metals, a comprehensive list of volatile organic compounds and aquatic toxicity (bioassay). To date, the laboratory analyses have indicated the tar sands to be classified as non-hazardous soils. Therefore, tar sands are not considered as a concern with respect to environmental transporting and disposal requirements. The tar sands from exploratory borings have been sent to the Soil Safe (formerly TPST) facility in Adelanto, California for thermal treatment and reuse. Larger quantities of soil will likely require transport to a facility that accepts hydrocarbon-impacted soils. Investigations into the use of tar sand materials, such as for paving materials, is on-going, and will continue further during subsequent design phases.

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the potential for impacts related to tar sands is the same as under the Concurrent Construction Scenario. The only difference between the two scenarios is the timing of potential for impacts related to tar sands to occur. Under the Phased Construction Scenario, the potential for impacts related to tar sands to occur along Phase 2 and Phase 3 will be later than under the Concurrent Construction Scenario due to an extended construction timeline. The timing for these impacts to occur along Phase 1 of the LPA will be earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

The analysis of impacts associated with tar sands is discussed in the Concurrent Construction Scenario section above. The tar sands encountered in the vicinity of the La Brea Tar Pits are located along Phase 1 of the alignment. Under the Phased Construction Scenario, the same mitigation measures will be implemented and the same regulations will be followed for disposal of tar sands as described for the Concurrent Construction Scenario. Tar sands are not considered a significant hazard for the Project under the Phased Construction Scenario.

Hazardous Subsurface Gas and Oil Fields

America Fast Forward (30/10) Scenario (Concurrent Construction)

The gassy conditions present in some areas, particularly in the vicinity of Wilshire Boulevard and Fairfax Avenue, are higher in gas concentrations and pressures than those encountered previously during design and construction of underground structures for the Metro Red Line and Gold Line Eastside Extension. As stated above, methane and hydrogen sulfide are considered hazardous because of their explosive properties. Hydrogen sulfide is also highly toxic when inhaled—at levels much lower than its

explosive limits. If structures are not designed to prevent gas intrusion, these gases can seep into tunnels and other excavations from surrounding soils and result in hazardous conditions.

Methane and hydrogen sulfide are present in concentrations higher than those encountered during Metro Red Line construction for about 1.1 mile along Wilshire Boulevard, from about South Burnside Avenue on the east end to about South La Jolla Avenue on the west. The entire alignment passes through an area characterized by oil and gas fields; thus the possibility of encountering gaseous conditions cannot be completely eliminated for any portion of the alignment. Therefore, Metro has undertaken special studies to develop comprehensive recommendations for analysis and testing during design phases.

Tunnels and stations will be designed to provide a redundant protection system against gas intrusion hazard, such as those described in the City of Los Angeles Municipal Code, Chapter IX, Building Regulations, Article 1, Division 71, Methane Seepage Regulations. In compliance with these regulations, specific requirements are determined according to the actual methane levels and pressures detected on a site, and the identified specific requirements will be incorporated into the design and construction. Therefore, hazardous subsurface gasses impacts will be minimized.

Most gases, if present, are purged from the tunnels simply by the action of trains running through the tunnels. During non-revenue operations, air velocity must be maintained at a minimum of 100 feet per minute. This air velocity is the minimum that the ventilation system must achieve to direct hazardous gases toward the nearest point of extraction and prevent gases from accumulating during the hours when the trains are not operating. In addition, gas and waterproofing systems considered in preliminary and final design include the following:

- Specially designed precast concrete liners used for the primary tunnel lining and barrier designed with the possibility of adding of a secondary liner as needed if leakage occurs at some future time.
- Lining to include thicker segments than what has been provided to date so that wider gaskets can be used to increase the performance of the gasket seals.
- Reduced permeability tunnel segment concrete—the segments may include steel fibers or other types of fiber reinforcement for denser concrete as well as coatings.
- Double-gasket design—the double-gasket system provides a second seal for a more redundant system. This also facilitates post-installation repair of leaks (if needed) by grouting the areas between the gaskets.
- Segment Insert Materials—use of non-corrosive plastics, for example plastic dowels, at segment circumferential joints.
- Rapid repair methods such as pre-installed grout tubes within water-proofing systems.
- Other methods for gas and waterproofing will be added for evaluation as they are identified.

Additional measures that will be incorporated into the design to further minimize impacts are described in Section 4.8.5. With incorporation of these techniques and mitigation measures the hazards associated with hazardous subsurface gasses will be minimized.

The expanded Division 20 yard is adjacent to the Union Station Oil Field where the potential exists that methane and hydrogen sulfide are present in this area. However, it is not anticipated that the maintenance yard will require construction of subterranean structures other than foundations. Therefore, hazardous subsurface gasses are not considered to pose a hazard to the maintenance yard.

Abandoned oil wells have been identified near or within the alignment options. The potential exists for encountering wells during construction if the tunnel is not aligned to avoid these wells or the wells are not identified. Based on the existing information, design of the LPA, including all station, alignment, and station entrance options still under consideration, has avoided oil wells where these are definitely known and, during final design, additional studies and testing will be performed to further ensure all oil wells are identified and re-abandoned or removed according to approved California State Department of Oil, Gas, and Geothermal Resources procedures prior to tunneling. Testing will include magnetic scanning to locate metal well casings within the tunnel alignment. With these safeguards, the presence of existing oil wells is not considered a hazard for design or operation of the LPA, including all station, alignment, and station entrance options still under consideration. The opening of the LPA as a single phase or in three sequential phases will not result in different impacts related to oil wells. Section 4.15 provides additional information on oil well abandonment, as oil wells, if encountered, would be removed prior to or during construction.

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the potential for impacts related to hazardous subsurface gas and oil fields is the same as under the Concurrent Construction Scenario. The only difference between the two scenarios is the timing of potential for impacts related to hazardous subsurface gas and oil fields to occur. Under the Phased Construction Scenario, the potential for these impacts along Phase 2 and Phase 3 to occur is later than under the Concurrent Construction Scenario due to an extended construction timeline. Along Phase 1 of the LPA the potential for these impacts to occur is earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

The potential impacts associated with hazardous subsurface gas and oil fields are discussed in the Concurrent Construction Scenario section above. The gassy conditions in the vicinity of Wilshire Boulevard and Fairfax Avenue are located along Phase 1 of the alignment. Under the Phased Construction Scenario, the same gas and waterproofing systems will be implemented and the same regulations will be followed as under the Concurrent Construction Scenario. With implementation of these measures, hazardous subsurface gas and oil fields are not considered a significant hazard for the Project under the Phased Construction Scenario.

4.8.4 Summary of Impacts

The tunnel alignment will cross the Santa Monica fault zone west of the Century City Station (for both Century City Constellation and Century City Santa Monica station options). In addition to the Santa Monica fault zone, the tunnel alignment and station will cross the West Beverly Hills Lineament/Newport-Inglewood fault zone east of the Century City Station (for both station options).The Century City Santa Monica Station would be located on the West Beverly Hills Lineament/Newport-Inglewood fault zone at the intersection of Santa Monica Boulevard at about South Moreno Drive. Thus, surface fault rupture poses a substantial hazard for this station location that cannot be mitigated with the available techniques and measures.

Alternatively, the tunnel between the Wilshire/Rodeo and Century City Constellation Stations would cross the West Beverly Hills Lineament/Newport-Inglewood fault zone under the Beverly Hills High School property in the vicinity of the lacrosse field. If the LPA is constructed under the Phased Construction Scenario, Phase 2 will cross the West Beverly Hills Lineament/Newport-Inglewood fault zone in the Century City vicinity. Phase 3 will also cross the Santa Monica fault zone in the Century City vicinity.

Due to the presence of shallow groundwater and young surficial alluvial deposits, a potential exists for liquefaction in the upper soil layers at the Wilshire/La Cienega, Westwood/UCLA, and Westwood/VA Hospital Stations.

Hazardous subsurface gases (methane and hydrogen sulfide) pose a hazard during construction and operation. Impacts due to these gassy conditions and techniques and measures to minimize this potential impact during construction are discussed in Section 4.15.

The opening of the LPA as a single phase or in three sequential phases will not result in different impacts related to geological hazards during operation of the LPA, including all station, alignment, and station entrance options still under consideration.

4.8.5 Mitigation Measures

Construction and design will be performed in accordance with Metro's Design Criteria, the latest federal and state seismic and environmental requirements, and state and local building codes. By compliance with these requirements, potential impacts from geologic hazards will be minimized. The measures listed in Table 4-46 are included to further avoid and minimize impacts.

Table 4-46: Summary of Geologic Hazard Impacts and Mitigation Measures

Geologic Hazard Category	Area Affected	Mitigation	After Mitigation	
			NEPA Finding	CEQA Determination
Seismic ground shaking	All of Study Area	*GEO-1 Seismic Shaking:* Metro design criteria require probabilistic seismic hazard analyses (PSHA) to estimate earthquake loads on structures. These analyses take into account the combined effects of all nearby faults to estimate ground shaking. During Final Design, site-specific PSHAs will be used as the basis for evaluating the ground motion levels along the LPA. The structural elements of the LPA will be designed and constructed to resist or accommodate appropriate site-specific estimates of ground loads and distortions imposed by the design earthquakes and conform to Metro's *Design Standards for the Operating and Maximum Design Earthquakes*. The concrete structures are designed according to the *Building Code Requirements for Structural Concrete* (ACI 318) by the American Concrete Institute.	Minimal impact	Impacts reduced to less than significant with engineered design and construction
Fault rupture—tunnel crossing	Crossing of Santa Monica and West Beverly Hills Lineament/ Newport-Inglewood fault zones in Beverly Hills and Century City areas	*GEO-2 Fault Crossing Tunnel, Fault Rupture, Tunnel Crossing:* LPA—Century City Constellation option Design will allow for the tunnels to cross the faults nearly perpendicular to limit the area of potential damage and will use Metro's two-level approach to assess fault offset and the associated structural design required to accommodate the offset. During Final Design, fault crossings will be designed for the ground conditions at the crossing location and incorporate the methods used to excavate and support the tunnel. Metro design criteria require use of a probabilistic approach to determine the Maximum Design Earthquake and Operating Design Earthquake. Design must include the following: ▪ Prevent collapse of the tunnel to ensure tunnel safety ▪ Maintain structural continuity of tunnel ring ▪ Prevent flow of water and soil ▪ Establish the tunnel size to maintain tunnel clearances and provide a guideway for derailed trains to decelerate without impact Several preliminary design approaches or combinations have been considered and will be further developed in Final Design: ▪ Steel tunnel rings with compressible material between the ring and soil to accommodate movement of the fault ▪ Flexible steel linings ▪ Articulated joints between tunnel segments for added flexibility ▪ Oversized tunnel to allow additional movement and, to some extent, more rapid repair after a seismic event. This could also be accomplished using cut and cover methods.	Minimal impact	Impacts reduced to less than significant with engineered design

Table 4-46: Summary of Geologic Hazard Impacts and Mitigation Measures (continued)

			After Mitigation	
Geologic Hazard Category	**Area Affected**	**Mitigation**	**NEPA Finding**	**CEQA Determination**
Fault rupture—station location	Century City-Santa Monica Option, Station area	Fault Rupture at Station Location (Century City Santa Monica option). No *feasible mitigation*. Surface fault rupture poses a substantial hazard for this station location that cannot be mitigated.	Major impact	Significant unavoidable impact
Operational procedures during earthquake	All areas	*GEO 3—Operational Procedures during Earthquake:* In addition to design measures, as Metro has implemented on the existing Red Line, it will implement standard operating procedures (SOP) in seismic areas to detect earthquakes and will provide back-up power, lighting, and ventilation systems to increase safety during tunnel or station evacuations in the event of loss of power due to an earthquake. For example, seismographs are located in 11 of the existing Metro Red/Purple Line stations to detect ground motions and trigger SOPs (SOP #8—Earthquake) by the train operators and controllers. Operating procedures are dependent on the level of earthquake and include stopping or holding trains, gas monitoring, informing passengers, communications with Metro's Central Control, and inspecting for damage.	Minimal impact	Impacts reduced to less than significant with engineered design and adherence to Metro's operating procedures
Liquefaction and seismic settlement	Wilshire/La Cienega, Westwood/UCLA and Westwood/VA Station areas	*GEO 4—Liquefaction and Seismic Settlement:* At liquefaction or seismic settlement prone areas, evaluations by geotechnical engineers will be performed to provide estimates of the magnitude of the anticipated liquefaction or settlement. Based on the magnitude of evaluated liquefaction, either structural design, or ground improvement (such as deep soil mixing) or deep foundations to non-liquefiable soil (such as drilled piles) measures will be selected. Site-specific design will be selected based on State of California guidelines and design criteria set forth in the *Metro Seismic Design Criteria*.	Minimal impact	Impacts reduced to less than significant with engineered design

Table 4-46: Summary of Geologic Hazard Impacts and Mitigation Measures (continued)

			After Mitigation	
Geologic Hazard Category	**Area Affected**	**Mitigation**	**NEPA Finding**	**CEQA Determination**
Hazardous subsurface gas operations	All areas, but higher risk methane zone near Wilshire/Fairfax Station	*GEO 5—Hazardous Subsurface Gas Operations:* As with the existing Red and Purple Lines and the Metro Gold Line Eastside Extension, Metro will install gas monitoring and detection systems with alarms, as well as ventilation equipment to dissipate gas to safe levels according to Metro's current design criteria and Cal/OSHA standards for a safe work environment. Measures will include, but are not limited to, the following for both tunnel and station operation: ▪ High volume ventilation systems with back-up power sources ▪ Gas detection systems with alarms ▪ Emergency ventilation triggered by the gas detection systems ▪ Automatic equipment shut-off ▪ Maintenance and operations personnel training ▪ Gas detection instrumentation is set to send alarms to activate ventilation systems and evacuate the structures as follows: methane gas—minor alarm at 10 percent of the lower explosive limit (LEL) (activate ventilation) and major alarms at 20 percent of LEL (evacuation of area) ▪ Hydrogen sulfide—Minor alarm at 8 ppm and major alarm at 10 ppm.	Minimal impact	Impacts reduced to less than significant with engineered design and adherence to Metro's operating procedures

Table 4-46: Summary of Geologic Hazard Impacts and Mitigation Measures (continued)

			After Mitigation	
Geologic Hazard Category	**Area Affected**	**Mitigation**	**NEPA Finding**	**CEQA Determination**
Hazardous subsurface gas structural design	All areas, but higher risk methane zone near Wilshire/ Fairfax Station	*GEO 6—Hazardous Subsurface Gas Structural Design:* Tunnels and stations will be designed to provide a redundant protection system against gas intrusion hazard. The primary protection from hazardous gases during operations is provided by the physical barriers (tunnel and station liner membranes) that keep gas out of tunnels and stations. As with the existing Metro Red and Purple Lines and the Metro Gold Line Eastside Extension, tunnels and stations will be designed to exclude gas to below alarm levels (GEO-5) and include gas monitoring and detection systems with alarms, as well as ventilation equipment to dissipate gas. ▪ At stations in elevated gassy ground (e.g., Wilshire/Fairfax), construction will be accomplished using slurry walls—or similar methods such as continuous drilled piles—to provide a reduction of gas inflow both during and after construction than would occur with conventional soldier piles and lagging. ▪ Other station design concepts to reduce gas and water leakage are the use of additional barriers; compartmentalized barriers to facilitate leak sealing; and flexible sealants, such as poly-rubber gels, along with high-density polyethylene-type materials used on Metro's underground stations. ▪ Consideration of secondary station walls to provide additional barriers or an active system (low or high pressure barrier) will also be studied further to determine if they will be incorporated into the LPA. ▪ The evaluations for station and tunnel construction materials will include laboratory testing programs such as those conducted for the Metro Gold Line Eastside Extension during development of the double gasket system and material testing for long-term exposure to the ground conditions for materials such as rubber gaskets used for tunnel segment linings. Testing programs will examine: • Segment leakage—gasket seal under pressure before, during, and after seismic movements. This will include various gasket materials and profiles (height and width). • Gasket material properties—effective life and resistance to deterioration when subjected to man-made and natural contaminants, including methane, asphaltic materials, and hydrogen sulfide. • Alternative products to high-density polyethylene products such as poly-rubber gels, now in use in ground containing methane in other cities. Methods for field testing high-density polyethylene joints. These are now being used for landfill liners and water tunnels under internal water pressure.	Minimal impact	Impacts reduced to less than significant with engineered design

Table 4-46: Summary of Geologic Hazard Impacts and Mitigation Measures (continued)

			After Mitigation	
Geologic Hazard Category	Area Affected	Mitigation	NEPA Finding	CEQA Determination
Tar sands	Wilshire/Fairfax area	Refer to Section 4.15	Refer to Section 4.15	Refer to Section 4.15
Oil wells	Century City, Wilshire/Fairfax	Refer to Section 4.15	Refer to Section 4.15	Refer to Section 4.15
All categories	All areas with focus on higher risk areas near Wilshire/ Fairfax Station and Century City Station	*GEO 7—Tunnel Advisory Panel Design Review:* The Metro Tunnel Advisory Panel (TAP) will review designs with respect to geologic hazards in areas of identified higher risk. These include the Century City area (seismic risk) and the Fairfax area (gassy ground risk). The TAP will be supplemented, as necessary, by qualified experts in seismic design, gas intrusion, and ground contaminant effects on underground structures.		

If the LPA is constructed under the Phased Construction Scenario, Mitigations GEO-1, GEO-3, GEO-4, GEO-5, GEO-6, and GEO-7, as described in Table 4-46, will be required for all three phases of the LPA. GEO-2 will be required as part of Phase 2 and Phase 3 of the LPA

4.8.6 California Environmental Quality Act Determination

The CEQA determination compares the effects of the LPA under both the Concurrent Construction Scenario and the Phased Construction Scenario with the existing conditions described in the affected environment/existing conditions section. The analysis considers if the LPA will result in the following:

- 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 will become unstable as a result of the LPA 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.

In addition to CEQA criteria, Metro considered exposure to toxic gases, including methane and hydrogen sulfide.

The opening of the LPA as a single phase under the Concurrent Construction Scenario or in three sequential phases under the Phased Construction Scenario will not result in different geologic hazards impacts during operation of the LPA, as discussed in Section 4.8.3.

As discussed, the LPA is in the area of geologic hazards as it traverses the areas of heightened hazardous underground gas concentrations in the area surrounding the La Brea Tar Pits, the active Santa Monica fault zone and West Beverly Hills Lineament in the Beverly Hills and Century City areas, as well as some potential liquefaction zones near La Cienega, Westwood, and the Veterans Administration Campus.

If the LPA is constructed under the Phased Construction Scenario, Phase 2 will cross the West Beverly Hills Lineament/Newport-Inglewood fault zone in the Century City vicinity. Phase 3 will also cross the Santa Monica fault zone in the Century City vicinity. The results of the geotechnical investigation and evaluation of known and potentially active faults, ground motion parameters and liquefaction and other settlement potential are contained in the *Westside Subway Extension Geotechnical and Environmental Report* (Metro 2011ad) and the *Westside Subway Extension Century City Area Fault Investigation Report* (Metro 2011w).

Metro will ensure that the design and construction of the LPA, including all station, alignment, and station entrance options still under consideration under the Concurrent Construction Scenario or the Phased Construction Scenario, are in accordance with

current laws and regulations, and implement identified design techniques, mitigation measures, and recommendations contained in the geotechnical reports to protect public and property from the effects of seismic shaking and ground rupture during an earthquake, liquefaction, and exposure to hazardous gas and geologic hazards identified in the Existing Conditions section. Construction and design will be performed in accordance with Metro's design criteria, the most current federal and state seismic and environmental requirements, and state and local building codes.

The exception to this is the Century City Santa Monica Station option, which is located within the active West Beverly Hills Lineament/Newport-Inglewood fault zone, which would be a significant unavoidable impact. While the fault's location is not mapped as an Alquist-Priolo Earthquake Fault Zone, the state's intent is to prevent the construction of habitable structures on the surface traces of active earthquake faults. Designing a station to withstand Maximum Design Earthquake displacements without significant damage and potential loss of life is impractical and without precedent. Damage levels would require a complete rebuild of the stations and associated tunnel sections, with a construction time frame of several years. The substantial geologic hazards associated with this location result in a significant unavoidable impact.

For all other portions of the LPA, incorporation of the design requirements and geologic recommendations and mitigation measures will reduce the impacts related to geologic hazards during the operational phases of the LPA to a less than significant level.

4.9 Hazardous Waste and Materials

This section has been updated from the Draft EIS/EIR to focus on the analysis of the effects of the LPA on hazardous waste and materials. The analysis results have been updated from the Draft EIS/EIR to reflect additional research and field and associated laboratory testing of soil and groundwater samples. The LPA could either be constructed as a single phase under the America Fast Forward (30/10) Scenario (Concurrent Construction) or as three consecutive phases under the Metro Long Range Transportation Plan Scenario (Phased Construction). The opening of the LPA as a single phase or in three sequential phases does not substantially change the analysis of hazardous waste and materials that was presented in the Draft EIS/EIR. The analysis of all the Build and TSM Alternatives in the Draft EIS/EIR is incorporated in this document by reference. Information in this section is summarized from the *Westside Subway Extension Geotechnical and Hazardous Materials Technical Report* (Metro 2010i) and the *Preliminary Geotechnical and Environmental Report* (Metro 2011ad), where additional detailed information is provided.

4.9.1 Regulatory Setting

This section provides the federal, state, and local regulations that are applicable to the hazardous materials concerns of the LPA and its Study Area. The LPA will extend through the incorporated cities of Los Angeles and Beverly Hills and unincorporated portions of Los Angeles County. The regulatory settings for the LPA are the same whether the LPA is constructed under the Concurrent Construction Scenario or the Phased Construction Scenario. Under the Phased Construction Scenario, Phase 1 and

Phase 2 will extend through the cities of Los Angeles and Beverly Hills, and Phase 3 will extend through the City of Los Angeles and unincorporated portions of Los Angeles County.

Federal

In addition to NEPA (USC 1969), the following federal regulations are applicable to the LPA.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (CFR 1980), otherwise known as the "Superfund Act," provides a federal fund to identify, characterize, and remediate hazardous material sites. Through the Superfund Act, the EPA was granted the authority to identify and obtain the cooperation of parties responsible for hazardous material incidents and conditions.

U.S. Environmental Protection Agency All Appropriate Inquiry Rule

In November 2006, EPA adopted a final rule that established specific requirements for conducting all appropriate inquiries into previous site ownership, uses, and environmental conditions for qualifying for landowner liability protections under the Superfund Act. This rule recognizes the standard discussed below as a means to assess and indicate site hazardous material conditions.

Federal Resource Conservation and Recovery Act of 1976

The Resource Conservation and Recovery Act (RCRA) (CFR 1976) gives EPA the authority to control hazardous waste from "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous solid wastes. The 1986 amendments to RCRA enabled EPA to address environmental problems that could result from underground tanks storing petroleum and other hazardous substances.

The 1984 *Federal Hazardous and Solid Waste Amendments* to the RCRA focus on waste minimization and phasing out land disposal of hazardous waste as well as corrective action for releases. Some of the other mandates of this law include increased enforcement authority for EPA, more stringent hazardous waste management standards, and a comprehensive underground storage tank program.

Ocupational Safety and Health Administration Regulations

Occupational Safety and Health Standards (CFR 1971a) applies to general industry operations and *Safety and Health Regulations for Construction* (CFR 1971b) applies to construction operations.

The Clean Water Act of 1977

Refer to Section 4.11.

ASTM International E-1527-05

ASTM E-1527-05 (ASTM 2005) is not a federal regulation but a professional society standard for hazardous material site assessment that has become the national standard. It is recognized by the EPA as a means to assess and indicate a site's hazardous material conditions.

State

California Environmental Quality Act of 1970

CEQA (PRC 2009) establishes a means to maintain and restore environmental quality for the public welfare. Under CEQA, the focus of the environmental analysis is on the physical change resulting from a project. However, the analysis of such changes may be traced back to non-physical changes, such as a revision in the use of an area that would cause physical changes.

California Health and Safety Code

Sections 25316 and 25317 of the California Health and Safety Code identify hazardous material, substances, and wastes that require removal, including petroleum and petroleum byproducts.

California Regional Water Quality Board

The California Regional Water Quality Board provides listings of leaking underground storage tanks (LUST).

California Occupational Safety and Health Administration

Cal/OSHA regulations apply to hazardous waste operations and emergency responses (8 CCR 5192 et seq.).

State Water Resources Control Board General Permits

Refer to Section 4.11.

Local

Waste Discharge Requirements

Refer to Section 4.11.

Municipal Regulatory Approach

The incorporated Cities of Los Angeles, Beverly Hills, West Hollywood, and Santa Monica, as well as Los Angeles County, have departments that administer and oversee hazardous material concerns. Each of these entities has a general plan and zoning codes to address hazardous material concerns; they are most often administered through the County Fire Department and city emergency services.

4.9.2 Affected Environment/Existing Conditions

The alignments and maintenance yard are located within urbanized areas of Los Angeles and Beverly Hills. The urban areas around the alignments are characterized by paved streets, commercial office buildings, retail businesses, medical office buildings, museum property, federal property, and residential homes and apartments.

The maintenance yard is located within an industrial area that includes parking lots, commercial buildings, existing railroad yards, or railroad right-of-way. The proposed maintenance yard site is an active rail yard. Metro stores and maintains its Red Line/Purple Line vehicle fleet at the existing Division 20 Maintenance Facility at the site bounded by 1st Avenue on the north, the Los Angeles River on the east, 4th Street on the south, and Santa Fe Avenue on the west.

The affected environment and existing conditions for the LPA are the same whether the LPA is constructed under the Concurrent Construction Scenario or the Phased Construction Scenario. Under the Phased Construction Scenario, the Division 20 Vehicle Storage and Maintenance Facility will be expanded under Phase 1.

Study Area Hazardous Materials Conditions

Hazardous materials may be defined as solids, liquids, or gases that can harm humans, animals, property, or the environment. Often within urban environments, the more prevalent hazardous materials include petroleum products from gasoline stations and automotive service areas, cleaning solvents from dry cleaning operations, and various other hazardous materials at manufacturing and storage properties. Methane and hydrogen sulfide gas that may be naturally present in the soil are considered geologic hazards and are discussed in Section 4.8.

The activities undertaken to identify hazardous material conditions in the Study Area include reviewing historic topographic maps, aerial photos, fire insurance maps, and city directories; searches of government environmental databases; and site reconnaissance. A records search was conducted for hazardous wastes and materials within a 500-foot radius of the alignments and station areas, to assess whether activities on or near the alignments have the potential to create recognized environmental conditions onsite. According to the ASTM standard, a recognized environmental condition is identified as "…the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release…into the ground, ground water or surface water of the property."

For the maintenance yard, the search was limited to a 200-foot radius because the yard will be affected by conditions primarily at the surface, and removal of soil in this area will be minimal in comparison to the subway structures. No dewatering is anticipated in this area due to the depth of groundwater. The complete list of databases reviewed is provided in the *Westside Subway Extension Geotechnical and Hazardous Materials Technical Report* (Metro 2010i). The results of the records search are discussed below.

Hazardous Material Properties Found in Topographic Maps, Fire Insurance Maps, Aerial Photographs, and City Directories

Review of Sanborn Maps, historic topographic maps, fire insurance maps, aerial photographs, and city directories was conducted to identify the former presence of properties of potential hazardous material concern. The historical review results in two histories based on the information reviewed: a history of the past use of the site and a history of the past use of the adjacent/nearby properties. The earliest historical references typically consulted date from 1940 or from the first developed use of the site or nearby properties.

The station locations are all located in urbanized areas of Los Angeles County. In many cases, the station locations and adjacent properties have been developed since the early 1900s. The historical use on adjacent properties to each of the stations has ranged from residential, retail, commercial, and light industrial. Additionally, a majority of the

stations are adjacent to properties that are or were occupied by businesses commonly associated with soil and groundwater contamination (namely, automotive service stations, dry cleaners, and light industrial operations).

Hazardous Material Properties Cited in Environmental Regulatory Databases

A review of government environmental regulatory databases is the most effective method of determining if properties within a study area have documented hazardous material concerns and what the state of such concerns may be. Table 4-47 includes a record of the results of the review of federal, state, and local environmental regulatory databases.

A number of sites identified within the alignment as "closed" or "no further action" cases are listed as having less than significant impact based on the closed or no further action status. These sites were evaluated and considered to have less than significant impact based on the regulatory database information, the type of contamination, and proximity to the alignment. Table 4-47 lists those properties with a high potential for hazardous material impacts in the Study Area, including the following types of properties:

- Properties where documented releases have occurred and additional assessment is required or remediation is ongoing
- Properties with residual contamination after regulatory agency closure
- Properties where additional information is needed because limited data are available in readily accessible environmental agency databases

Section 4.8 provides a discussion of naturally occurring hazardous gasses (methane and hydrogen sulfide) as well as naturally occurring bituminous soils (also referred to as "tar sands").

Reconnaissance

Reconnaissance of properties within, adjacent to, and surrounding the LPA site was performed from public rights-of-way and other publically accessible areas. Concerns that may be observed in a reconnaissance include evidence of older transformers; drums and chemical containers; pits, ponds, and septic areas; evidence of pesticide use; stressed vegetation; and monitoring wells. Certain businesses or occupations, such as dry-cleaning operations, may typically use hazardous substances or generate hazardous waste. Other signs of potential environmental concerns include underground storage tanks (UST), unusual odors, pools of liquids, drums, unidentified containers, illegal dumping sites, items that may contain polychlorinated biphenyls (PCB), stains or corrosion, and drains or sumps.

Table 4-47. Properties with High Potential for Hazardous Material Impacts in the Study Area as Indicated in Environmental Regulatory Databases

Phase	Property	Hazardous Material Concern	Hazardous Material Exploration Number[1]
Properties along the LPA			
Phase 1	3807 Wilshire Boulevard	Groundwater was affected by volatile organic compounds at this property with no apparent regulatory closure.	E-101
	4180 Wilshire Boulevard	A gasoline release occurred in 1982, and gasoline was found floating on top of the groundwater at this property. The environmental regulatory listing shows that this property is currently undergoing remediation.	E-105
	5034 Wilshire Boulevard	A release of perchloroethylene affected groundwater at this property, and the property is shown as currently undergoing remediation.	E-106 E-107
	5020 Wilshire Boulevard	A release of "other solvent or non-petroleum product" affected groundwater at this property, and the environment regulatory listing shows this property is currently undergoing assessment. The site does not appear on the Department of Toxic Substances Control (DTSC) or Regional Water Quality Control Board (RWQCB) websites (Envirostor and Geotracker).	E-107
	5151 Wilshire Boulevard	This property has an environmental regulatory listing as having a leaking underground storage tank, but does not indicate the date or the material released. The property showed as being "open-assessment and interim remedial action" as of January 13, 2009.	E-108
	5220 Wilshire Boulevard	This property has an environmental regulatory listing as "open-site assessment" as of November 2008, with potential media affected and contaminants of concern not being reported and additional information not available. As of January 2011, a work plan was approved for groundwater monitoring.	E-109 E-110
	5779 W. Wilshire Boulevard	This property was reported by the Los Angeles Fire Department in the environmental regulatory databases to have methane gas flowing at a rate of approximately 4 liters per minute near Curson Avenue and had reportedly been doing so for years.	E-113
	8567 Wilshire Boulevard	A gasoline release affected groundwater at this property in 1990. Although the property was granted regulatory closure in January 2010, residual benzene remains in groundwater.	E-123
Phase 2	9988 Wilshire Boulevard	A gasoline release affected groundwater at this property in 1998, and elevated levels of tertiary butyl alcohol are reported as being present in groundwater. The environmental regulatory listing shows the property as being under "open-site assessment." The RWQCB issued a corrective action letter on March 29, 2011. No apparent regulatory closure indicated.	
Phase 3	10301 Santa Monica Boulevard	The environmental regulatory listing for this property indicates that it is under "open-site assessment" as of July 18, 2002, with the potential media affected and contaminants of concern not reported. Other environmental databases indicate that this property has ongoing assessment activities and groundwater monitoring is under way. As of March 3, 2011, a request for site closure has been made to the RWQCB.	E-131

Table 4-47. Properties with High Potential for Hazardous Material Impacts in the Study Area as Indicated in Environmental Regulatory Databases (continued)

Phase	Property	Hazardous Material Concern	Hazardous Material Exploration Number[1]
Expanded Division 20 Yard and Turnback Facility			
Phase 1	590 S. Santa Fe Avenue	This property was used historically for the manufacture of paints and inks using solvents. Numerous underground storage tanks were operated on-site. Soil and groundwater were affected by contaminants such as benzene, ethylbenzene, dichloroethane, and other chemicals. Environmental regulatory databases indicate that this property is an active voluntary cleanup site, but there is no indication that remedial action has occurred. The proposed Turnback Facility is located within the Division 20 Maintenance Yard. Because of this, the citations above for the Expanded Division 20 Yard cover sites that could impact the proposed Turnback Facility location. No additional properties were identified in the environmental regulatory database searches that indicate a high potential for hazardous material related concern to the Turnback Facility location.	

Sources: Geotechnical and Hazardous Material Technical Report (Metro 2010i), Tables 3.4.1 through 3.4.9

[1]Hazardous Material Exploration Number refers to boring drilled near location to obtain samples for testing of soil and ground water (refer to Subsurface Investigation section below).

No dry cleaning activities were observed on the sites but several were observed adjacent to many of the sites. Evidence of stored hazardous substances or petroleum products was not observed on the sites during the reconnaissance. Additionally, obvious evidence of surficial spills or leaks migrating from properties onto the LPA sites was not noted. Motor oil staining from vehicles was noted on the asphalt/concrete surface of each site. Although asbestos and lead-based paints are typically concerns to be observed, they are largely building-specific. The reconnaissance revealed no concerns with respect to most of the above-listed issues, with the exception of some gasoline stations with USTs and adjacent dry-cleaning operations, nearly all of which are shown on Figure 4-47 and Figure 4-48 and listed in Table 4-47, which indicates the phases for each location if the LPA is constructed under the Phased Construction Scenario.

Subsurface Investigation

Based on the findings of the initial hazardous materials investigation (document reviews and site reconnaissance), subsequent field sampling activities were conducted between June 21 and September 22, 2011, that consisted of collecting soil and groundwater samples at 31 boring locations along the Study Area. The drilling subcontractors used direct-push and hollow-stem auger sampling methodologies to collect soil and groundwater samples from discreet depths at each boring location.

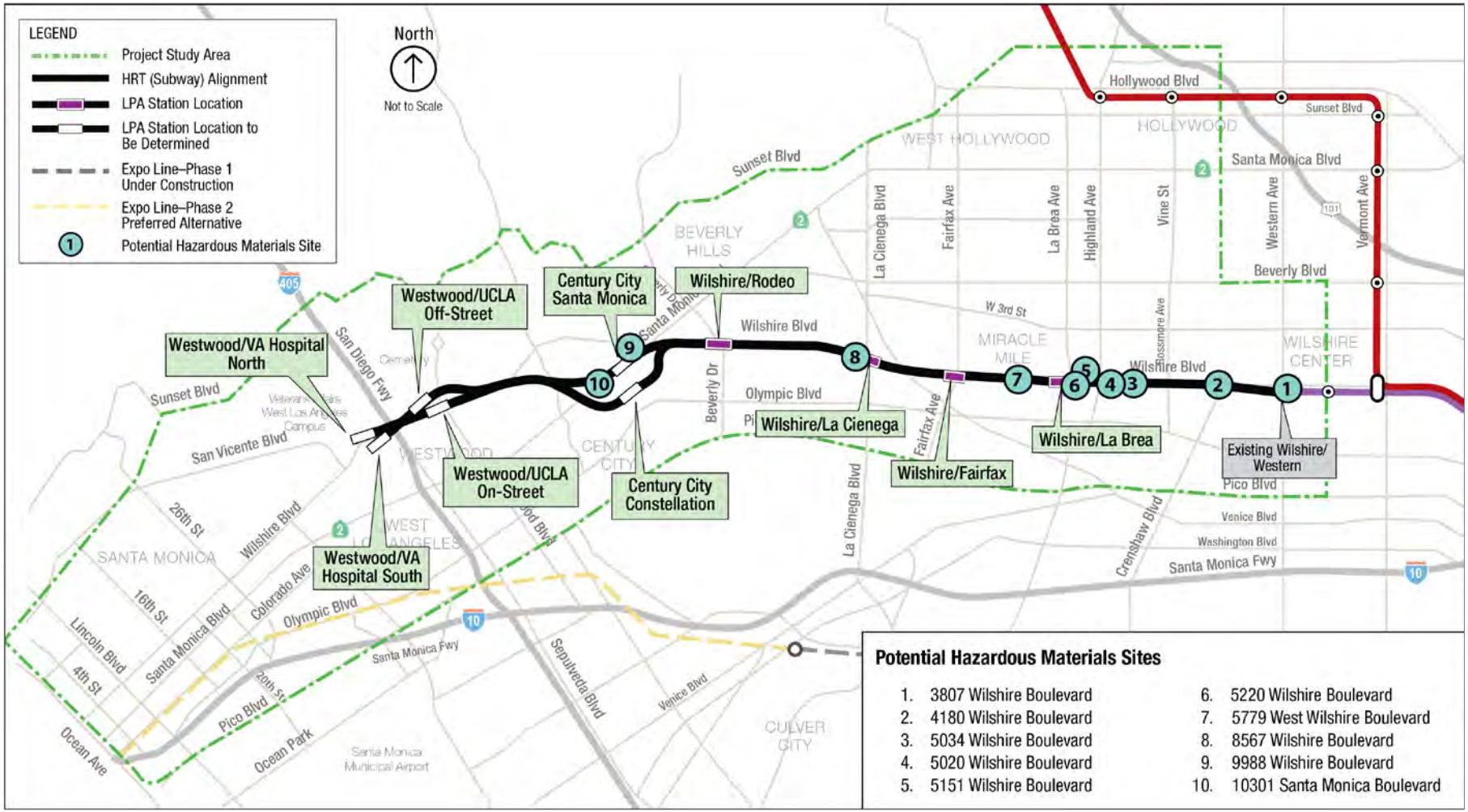


Figure 4-47. Potential Hazardous Materials Sites near the Locally Preferred Alternative

Figure 4-48. Potential Hazardous Materials Sites near Division 20 Vehicle Storage and Maintenance Facility

Selected soil and groundwater samples were analyzed for petroleum hydrocarbons, volatile organic compounds (VOC), semi-volatile organic compounds, and metals. The samples were analyzed at depths of potential excavation (tunnel depths for tunnel portions of the alignment and the full station depth for station locations). A review of the field findings and analytical laboratory results shows that suspect constituents of concern (excluding metals) were detected in approximately two-thirds of the borings advanced during this investigation. The constituents identified were related to releases of fuel compounds or chlorinated solvents or naturally occurring petroleum compounds. Based on the constituent concentrations detected in the samples that were analyzed, excavated soils will be transported and disposed of as a non-hazardous waste. Between approximately 10 and 12 metals out of the 17 different metals in the Title 22 analytical suite were detected in each of the soil samples submitted for analysis. However, the reported metal concentrations were not elevated and are likely representative of typical background concentrations for soils in the area of the respective boring from which the sample was collected.

No elevated constituent concentrations were documented in the soil samples submitted for analysis except for heavier-range petroleum hydrocarbons for borings that were located in the Study Area generally between La Brea and Fairfax Avenues. (In general, "elevated" refers to levels where additional investigation and/or remediation might be required by a regulatory agency.) In general, the groundwater samples that were submitted for analysis did not contain elevated concentrations of fuel and volatile constituents.

Impacted soils and groundwater were documented in samples collected from the environmental boring locations, as summarized in Table 4-48, which indicates the phases for each location if the LPA is constructed under the Phased Construction Scenario.

Table 4-48. Summary of Environmental Borings

Phase	Boring No.	Location	Media Affected	Constituents Detected	
Phase 1	E-102	Wilshire/St. Andrews	Groundwater	MTBE Cis-1,2 Dichloroethene	TCE TPH-G
	E-103	Wilshire/St. Andrews	Soil	Benzene	
	E-106	Wilshire/between Highland and Citrus	Groundwater	1,1-Dichloroethane 1,1-Dichloroethene Cis-1,2 Dichloroethene	TCE Toluene TPH-D TPH-O
	E-107	Wilshire/Citrus	Groundwater	1,1-Dichloroethene n-Propylbenzene TCE	Toluene TPH-D TPH-O
	E-109	Wilshire/La Brea	Groundwater	1,1-Dichloroethene Cis-1,2 Dichloroethene	MTBE TCE
	E-110	Wilshire/Manhattan	Soil Groundwater	MTBE Cis-1,2 Dichloroethene	TPH-D TPH-O
	E-111	Wilshire/Detroit	Soil Groundwater	MTBE Cis-1,2 Dichloroethene TCE	
	E-112	Wilshire/between Burnside and Ridgeley	Soil	TPH-G TPH-D	TPH-O
	E-113	Wilshire/Stanley	Soil	TPH-G TPH-D	TPH-O
	E-114	Wilshire/between Spaulding and Ogden	Soil	TPH-G TPH-D	TPH-O Xylenes
	E-115	Wilshire/Fairfax	Soil	TPH-G TPH-D	TPH-O
	E-116	Wilshire/Hayworth	Soil	TPH-G TPH-D	TPH-O
	E-117	Wilshire approximately 300 feet West of Hayworth	Soil	TPH-G TPH-D	TPH-O Xylenes
	E-118	Wilshire/McCarthy Vista-Crescent Heights	Soil	TPH-G TPH-D TPH-O Benzene Trimethylbenzene	Ethylbenzene n-Propylbenzene Naphthalene Xylenes Toluene
	E-120	Wilshire/San Vicente	Groundwater	Cis-1,2 Dichloroethene	
Phase 2	E-124	Wilshire/Carson	Groundwater	1,1-Dichloroethene TPH-D	tCE
	E-126	Wilshire/Reeves	Groundwater	Chloroform	
	E-127	Wilshire/Santa Monica	Groundwater	Chloroform	TPH-D TPH-O
	E-132	Constellation/Avenue of the Stars	Soil	TPH-D	TPH-O
	E-133	Constellation/Avenue of the Stars	Groundwater	TPH-D	TPH-O
	E-134	Constellation/Avenue of the Stars	Groundwater	Cis-1,2 Dichloroethene	Chloromethane

MTBE = methyl tert butyl ether
TPH-G = total petroleum hydrocarbons (gasoline range)
TPH-D = total petroleum hydrocarbons (diesel range)
TPH-O = total petroleum hydrocarbons (oil range)
TCE = trichloroethylene

4.9.3 Environmental Impacts/Environmental Consequences

No Build

Under the No Build Alternative, no new infrastructure would be built within the Study Area, aside from projects currently under construction or projects funded for construction, environmentally cleared, planned to be in operation by 2035, and identified in the Metro LRTP (Metro 2009a). The No Build Alternative would not result in the potential for risk of long-term hazardous material exposure.

Locally Preferred Alternative

The LPA could either be constructed as a single phase under the Concurrent Construction Scenario or as three consecutive phases under the Phased Construction Scenario. The opening of the LPA as a single phase or in three sequential phases will not result in substantially differing risk of long-term hazardous materials exposure.

America Fast Forward (30/10) Scenario (Concurrent Construction)

Under the Concurrent Construction Scenario, the LPA will be operational in its entirety to Westwood/VA Hospital in 2022. As shown in Table 4-47, several gas stations, dry cleaners, and other facilities with a history of hazardous materials incidences occur within the Study Area. The alignment of the LPA is in close proximity to areas where USTs, VOCs, and oil exploration sites occur. Oil exploration and natural oil seeps occur along Wilshire Boulevard between La Brea and La Cienega Boulevards and within Century City. All of these areas have the potential for contaminated soils and groundwater.

In most cases, the tunnel is expected to be under the lowest point of contaminated soils; there will be no- or low-potential impact. Where stations are located in areas of soil contamination, construction methods will be impacted. The excavated soils generated during the construction activities will be handled in accordance with applicable regulations, as described in Section 4.15. Also, if contaminants were in groundwater, the LPA has a high likelihood of encountering these contaminants due to shallow water tables. Dewatering could be necessary during operation of the LPA station cut and cover structures and cross passages. Water intrusion in the tunnels and stations will be pumped out and treated in accordance with applicable permits prior to discharge or disposal. Operation of facilities will be conducted in accordance with all federal and state regulatory requirements that are intended to prevent or manage hazards. Therefore, operation of the LPA, including station, alignment, and station entrance options still under consideration, will not result in any adverse effects related to hazardous materials.

Section 4.15 describes impacts and mitigations for construction when hazardous materials are present. Although asbestos and lead-based paints are typically concerns to be observed, they are largely building-specific and will not have a major bearing on project implementation because the LPA is largely subterranean. Asbestos and lead-based paints may be encountered in buildings to be demolished for the staging and station access sites (see Section 4.15).

Features included in the maintenance yard site will require storing hazardous materials/waste on-site and consist of a storage yard for the heavy rail transit vehicles, a mainte-

nance area, a car wash building, and other support for the yard and shop. Operations and maintenance will require routine transport, use, or disposal of hazardous materials. These materials typically include fuel, oil, solvents, cleansers, and other materials, which are not considered acutely hazardous.

The potential exists 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 materials impacts are anticipated.

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the potential for impacts related to hazardous materials is the same as under the Concurrent Construction Scenario. The only difference between the two scenarios is the timing of potential for impacts related to hazardous materials. Under the Phased Construction Scenario, the potential for impacts related to hazardous materials along Phase 2 and Phase 3 will occur later than under the Concurrent Construction Scenario due to an extended construction timeline. The timing for potential impacts related to hazardous materials along Phase 1 of the LPA will occur earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

Phase 1 to La Cienega

Under Phase 1, the LPA will operate to the Wilshire/La Cienega Station. As shown in Table 4-47, several gas stations, dry cleaners, and other facilities with a history of hazardous materials incidences are located along the Phase 1 alignment. The Phase 1 alignment is in close proximity to areas where USTs, VOCs, and oil exploration sites occur. Oil exploration and natural tar seeps occur along Wilshire Boulevard between La Brea and La Cienega Boulevards. All of these areas have the potential for contaminated soils and groundwater.

As discussed under the Concurrent Construction Scenario, the tunnel is expected to be under the lowest point of contaminated soils; there will be no- or low-potential impact. Where stations are located in areas of soil contamination, construction methods will be implemented to minimize risk, as described in Section 4.15. In addition, if contaminants were in groundwater, the LPA has a high likelihood of encountering these contaminants due to shallow water tables. Dewatering could be necessary during operation of Phase 1 station cut-and-cover structures and cross passages. Water intrusion in the tunnels and stations will be pumped out and treated in accordance with applicable permits prior to discharge or disposal. Operation of facilities will be conducted in accordance with all federal and state regulatory requirements that are intended to prevent or manage hazards. Therefore, operation of Phase 1 will not result in any adverse effects related to hazardous materials.

Section 4.15 describes impacts and mitigations for construction when hazardous materials are present for Phase 1.

The Division 20 Vehicle Storage and Maintenance Facility will be expanded as part of Phase 1. The potential for impacts related to hazardous materials at this location are discussed under the Concurrent Construction Scenario. No long-term hazardous materials impacts associated with expansion of the Division 20 Vehicle Storage and Maintenance Facility are anticipated.

Phase 2 to Century City

Under Phase 2, the LPA will operate to the Century City Station (either Santa Monica or Constellation). As shown in Table 4-47, several gas stations, dry cleaners, and other facilities with a history of hazardous materials incidences occur along the Phase 2 alignment. The Phase 2 alignment is in close proximity to areas where USTs, VOCs, and oil exploration sites occur. Oil exploration occurs within Century City. All of these areas have the potential for contaminated soils and groundwater.

As discussed under the Concurrent Construction Scenario, the tunnel is expected to be under the lowest point of contaminated soils; there will be no- or low-potential impact. Where stations are located in areas of soil contamination, construction methods will be implemented to minimize risk, as described in Section 4.15. In addition, if contaminants were in groundwater, the LPA has a high likelihood of encountering these contaminants due to shallow water tables. Dewatering could be necessary during operation of Phase 2 station cut-and-cover structures and cross passages. Water intrusion in the tunnels and stations will be pumped out and treated in accordance with applicable permits prior to discharge or disposal. Operation of facilities will be conducted in accordance with all federal and state regulatory requirements that are intended to prevent or manage hazards. Therefore, operation of Phase 2 will not result in any adverse effects related to hazardous materials.

Section 4.15 describes impacts and mitigations for construction when hazardous materials are present for Phase 2.

Phase 3 to Westwood/VA Hospital

Under Phase 3, the LPA will be opened in its entirety to the Westwood/VA Hospital Station. As shown in Table 4-47, there is one known facility with a history of hazardous materials incidence along the Phase 3 alignment. The Phase 3 alignment is in close proximity to areas where USTs, VOCs, and oil exploration sites occur. Oil exploration and natural oil seeps occur within Century City. All of these areas have the potential for contaminated soils and groundwater.

As discussed under the Concurrent Construction Scenario, the tunnel is expected to be under the lowest point of contaminated soils; there will be no- or low-potential impact. Where stations are located in areas of soil contamination, construction methods will be implemented to minimize risk, as described in Section 4.15. In addition, if contaminants were in groundwater, the LPA has a high likelihood of encountering these contaminants due to shallow water tables. Dewatering could be necessary during operation of Phase 3 station cut-and-cover structures and cross passages. Water intrusion in the tunnels and stations will be pumped out and treated in accordance with applicable permits prior to discharge or disposal. Operation of facilities will be conducted in accordance with all federal and state regulatory requirements that are

intended to prevent or manage hazards. Therefore, operation of Phase 3 will not result in any adverse effects related to hazardous materials.

Section 4.15 describes impacts and mitigations for construction when hazardous materials are present for Phase 3.

4.9.4 Mitigation Measures

The No Build Alternative is not expected to result in impacts related to hazardous materials.

In addition to the mitigation measures outlined for geologic hazards, measures to further ensure that any impacts are avoided or minimized for the LPA include the following.

- **HAZ-1—Disposal of Ground Water**

  Disposal of groundwater from underground structures will comply with the City of Los Angeles Industrial Wastewater Permit if there is any contaminated groundwater leakage into the final structure.

- **HAZ-2—Emergency Response Procedure**

  In the unlikely event of a major hazardous materials release close to or in the vicinity of the LPA, Metro will develop emergency response procedures in conformance with federal, state, and local regulations.

If the LPA is constructed under the Phased Construction Scenario, both HAZ-1 and HAZ-2 will be required for all three phases. For discussion of impacts during construction and mitigation measures, refer to Section 4.15.

4.9.5 California Environmental Quality Act Determination

The CEQA determination compares the effects of the LPA, including station, alignment, and station entrance options under both the Concurrent Construction Scenario and the Phased Construction Scenario, with the existing conditions described in the affected environment/existing conditions section. The evaluation of the potential for hazardous materials impacts of the LPA, under both the Concurrent Construction Scenario and the Phased Construction Scenario, are discussed above. Categories of hazardous material impacts are set forth by the California Public Resources Code (PRC) and CEQA guidelines. For the purposes of this analysis, an impact was considered to be significant if it results in any of the following:

- Creates a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials
- Creates 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
- Is located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 (CGC 1992) and, as a result, creates a significant hazard to the public or the environment.
- Emits hazardous emissions or handles hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school

- Results in a safety hazard for people residing or working in the Project area (applies to 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)
- For a project within the vicinity of a private airstrip, results in a safety hazard for people residing or working in the project area
- Impairs implementation of or physically interferes with an adopted emergency response plan or emergency evacuation plan
- Exposes people or structures to a significant risk of loss, injury, or death involving wild-land fires, including where wild lands are adjacent to urbanized areas or where residences are intermixed with wild lands.

Operations and maintenance will require routine transport, use, or disposal of hazardous materials. These materials will typically include fuel, oil, solvents, cleansers, and other materials, which are not considered acutely hazardous. Operation of the LPA, including station, alignment, and station entrance options under either the Concurrent Construction Scenario or the Phased Construction Scenario, is not anticipated to result in exposure to acutely hazardous materials. The LPA is not located within 2 miles of an airport or airstrip and will not result in a safety hazard for people working in the area.

Removal of soil and groundwater during construction of the LPA (refer to Section 4.15) will be limited to the station, crossover, and access shaft areas. While there are schools within the one-quarter-mile distance from these access points, the impact on schools is not expected as transported soil will be in covered trucks to prevent loss of materials in the surrounding area. Materials stockpiled at the worksites will be sprayed with water or an SCAQMD-approved vapor suppressant and covered with plastic to prevent exposure to the soil.

Operation of the LPA, including station, alignment, and station entrance options under either the Concurrent Construction Scenario or the Phased Construction Scenario, will not impair implementation of or physically interfere with adopted emergency response or evacuation plans. The LPA will not expose people or structures to a significant risk of loss, injury, or death involving wild-land fires since the LPA is in an urban area. The LPA, including station, alignment, and station entrance options under either the Concurrent Construction Scenario or the Phased Construction Scenario, will be implemented in accordance with all federal and state requirements. Therefore, a less-than-significant impact is anticipated for exposure to hazardous materials.

Impacts from hazardous materials associated with facilities along the alignment and maintenance yard will be less than significant with the implementation of HAZ-1 and HAZ-2 under either the Concurrent Construction Scenario or the Phased Construction Scenario.

The opening of the LPA as a single phase under the Concurrent Construction Scenario or in three sequential phases under the Phased Construction Scenario will not result in differing hazardous materials impacts during operation of the LPA, as discussed in Section 4.9.3. The only difference between the two scenarios is the timing of potential for operational hazardous materials impacts. Under the Phased Construction Scenario, the potential for hazardous materials impacts along Phase 2 and Phase 3 will occur later than under the Concurrent Construction Scenario due to an extended construction

timeline. The timing for potential hazardous materials impacts along Phase 1 of the LPA will occur earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

4.10 Ecosystems/Biological Resources

This section has been updated from the Draft EIS/EIR to focus on the analysis of the effects of the LPA on ecosystems and biological resources. The LPA could either be constructed as a single phase under the America Fast Forward (30/10) Scenario (Concurrent Construction) or as three consecutive phases under the Metro Long Range Transportation Plan Scenario (Phased Construction). The opening of the LPA as a single phase or in three sequential phases does not substantially change the ecosystems/biological resources analysis that was presented in the Draft EIS/EIR. The analysis results have not changed from the Draft EIS/EIR. The analysis of all the Build and TSM Alternatives in the Draft EIS/EIR is incorporated into this document by reference. Information in this section is summarized from the *Westside Subway Extension Ecosystems/Biological Resources Technical Report* (Metro 2010h), where additional detailed information and species lists are provided.

4.10.1 Regulatory Setting

This section discusses federal, state, and local regulations that are applicable to ecological and biological resource concerns of the LPA and the Study Area. The regulatory settings for the LPA are the same whether the LPA is constructed under the Concurrent Construction Scenario or the Phased Construction Scenario. Under the Phased Construction Scenario, Phase 1 and Phase 2 will extend through the cities of Los Angeles and Beverly Hills, and Phase 3 will extend through the City of Los Angeles and unincorporated portions of Los Angeles County.

Federal

Endangered Species Act

The Endangered Species Act (ESA) (USC 1995) conserves endangered and threatened species and the ecosystems they depend upon. Section 7 requires federal agencies to aid in conserving listed species and to ensure that activities of federal agencies will not jeopardize the continued existence of listed species or adversely modify designated critical habitat. The U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration Fisheries Service administer the ESA.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (USC 1918) decrees that all migratory birds and their parts (including eggs, nests, and feathers) are fully protected. Taking, killing, or possessing migratory birds is unlawful. Projects that affect birds protected under the Migratory Bird Treaty Act will require a take permit from the USFWS.

State

California Endangered Species Act

The California Department of Fish and Game (CDFG) is responsible for administering the California Endangered Species Act (CESA). For projects that affect state- and federal-

listed species, compliance with the ESA will satisfy the CESA if the CDFG determines that the federal incidental take authorization is "consistent" with the CESA. Projects that result in a take of a state-only-listed species require a take permit under the CESA.

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

Sections 3500–3705 regulate the taking of migratory birds and their nests. These codes prohibit taking nesting birds, their nests, eggs, or any portion thereof during the nesting season, typically from March 1 through August 30.

Local

The following is a description of local applicable regulations:

- **Los Angeles County General Plan Conservation and Open Space Element** identifies Significant Ecological Areas and sets forth the goal of conserving these areas.
- **City of Los Angeles General Plan Conservation Element** sets forth objectives and policies for protecting biological resources, including endangered species and habitats.
- **City of Los Angeles Native Tree Protection Ordinance No. 177,404** protects native tree habitat. Removing protected trees requires a Board of Public Works permit, and any act that may cause the failure or death of a protected tree requires a City Urban Forestry Division inspection.
- **City of Beverly Hills General Plan** protects biological and ecological resources with natural and open space protection, urban forest management, and retention of trees of significance.
- **City of Beverly Hills Municipal Code** requires a tree removal permit for a protected tree. Native trees that are removed must be replaced. Section 10-3-2905 requires protection of native trees during construction with fencing or other measures.

4.10.2 Affected Environment/Exisiting Conditions

The Study Area for ecosystems/biological resources is defined as the specific area that has the potential to be affected by the LPA. For the LPA, the Study Area is the area within one-quarter mile of the LPA alignment, station, and maintenance site. The affected environment and existing conditions for the LPA are the same whether the LPA is constructed under the Concurrent Construction Scenario or the Phased Construction Scenario. The California Natural Diversity Database (CNDDB) was searched to identify sensitive plants and animals with the potential to occur in the Study Area. A visual review of parks and other public open spaces to identify ecosystems and biological resources was also conducted. A visual review consists of observation and photographic documentation of parks and open space areas as well as mature trees and wildlife, including birds, observed within the Study Area. General field reconnaissance work was conducted to identify habitat features within the project area. Habitat was generally assessed as to its quality and suitability for wildlife species, including threatened and endangered species.

As shown in Table 4-49, 41 federal- and state-listed threatened, endangered, species of concern, and candidate plant or wildlife species were reported by CNDDB and California Native Plant Society (CNPS) as occurring within the 7.5-minute U.S. Geological Survey topographic quadrangles comprising the Study Area. However, none of these special status species were observed in the Study Area, including in the vicinity of proposed station areas, within station construction footprints, or in the vicinity of the maintenance and operations facility sites. In addition, no suitable habitat for any of these special status species was observed in the Study Area. The Study Area is within a densely developed and urbanized area with limited ecosystems/biological resources.

Land cover in the Study Area is predominantly urban development with irrigated and maintained landscaping and some mature trees. Some migratory bird species may use these trees during migration. Native trees, including southern coast live oak riparian forest, California walnut woodland, and southern sycamore alder riparian and walnut forest, have the potential to occur in the Study Area. No sensitive vegetation communities were observed.

The Study Area is composed of and surrounded by residential, commercial, and industrial uses and heavily travelled arterials. There are no habitat conservation plans and no significant ecological areas in the Study Area. As such, the Study Area does not link significant wildlife habitat and does not contain wildlife corridors that would support movement of wildlife species other than birds. Due to their mobility, some sensitive bird species may use existing mature trees during migration but would not be supported as residents within this urbanized setting.

Two locations along Wilshire Boulevard have open space that supports mature trees and other vegetation. One location is Hancock Park, where most of the vegetation is non-native, although some native trees, including sycamores, are present. The other location with open space is the Los Angeles Country Club, where the golf course contains mature, primarily non-native, vegetation that supports bird and wildlife habitat. Furthermore, California sycamore trees were observed in the Wilshire/La Brea Station area. However, human use limits native wildlife use and prohibits nesting of special-status bird species. If the LPA is constructed under the Phased Construction Scenario, all of these locations are located along Phase 1.

Division 20, the site of the existing maintenance and storage facility and proposed expansion, is almost entirely paved, and the existing vegetation is non-native vegetation.

No wetland areas are in the Study Area. However, the Los Angeles River is located in the vicinity of the Division 20 Rail Yard. The river is a concrete-lined channel and is considered “waters of the United States” and subject to U.S. Army Corps of Engineers (USACE) regulations (see Section 4.11). No fish are expected to be present. If the LPA is constructed, the expansion of the Division 20 Vehicle Storage and Maintenance Facility will occur under the Concurrent Construction Scenario and occur as part of Phase 1 of the Phased Construction Scenario.

Table 4-49. Special Status Wildlife and Plant Species Potentially in the Study Area

	Common Name	Scientific Name	Status
Birds	Burrowing Owl	*Athene cunicularia*	SC
	Southwestern Willow Flycatcher	*Empidonax traillii extimus*	FE, CE
	Coastal California Gnatcatcher	*Polioptila californica californica*	FT, SC
Mammals	Pallid Bat	*Antrozous pallidus*	SC[1]
	Western Mastiff Bat	*Eumops perotis californicus*	SC[1]
	Silver-haired Bat	*Lasionycteris noctivagans*	None
	Hoary Bat	*Lasiurus cinereus*	None
	Big Free-tailed Bat	*Nyctinomops macrotis*	SC
	South Coast Marsh Vole	*Microtus californicus stephensi*	SC
	American Badger	*Taxidea taxus*	SC
Reptiles	Coast (San Diego) Horned Lizard	*Phrynosoma coronatum (blainvillii* population*)*	SC
	Coastal Whiptail	*Aspidoscelis tigris stejnegeri*	None
Invertebrates	Busck's Gallmoth	*Carolella busckana*	None
	Sandy Beach Tiger Beetle	*Cicindela hirticollis gravida*	None
	Globose Dune Beetle	*Coelus globosus*	None
	Monarch Butterfly	*Danaus plexippus*	None
	Gertsch's SocalChemmis Spider	*Socalchemmis gertschi*	None
Plants	Marsh Sandwort	*Arenaria paludicola*	FE, CE, PEC
	Braunton's Milk-vetch	*Astragalus brauntonii*	FE, PEC
	Ventura Marsh Milk-vetch	*Astragalus pycnostachyus* var. *lanosissimus*	FE, CE, PEC
	Coastal Dunes Milk-vetch	*Astragalus tener* var. *titi*	FE, CE, PEC
	Parish's Brittlescale	*Atriplex parishii*	PEC
	Davidson's Saltscale	*Atriplex serenana* var. *davidsonii*	FEC
	Round-leaved Filaree	*California macrophylla*	PEC
	Plummer's Mariposa-lily	*Calochortus plummerae*	FEC
	Santa Barbara Morning-glory	*Calystegia sepium* ssp. *binghamiae*	PEC
	Southern Tarplant	*Centromadia parryi* ssp. *australis*	SEC
	Salt Marsh Bird's-beak	*Cordylanthus maritimus* ssp. *maritimus*	FE, CE, FEC
	Beach Spectaclepod	*Dithyrea maritima*	CT, SEC
	Many-stemmed Dudleya	*Dudleya multicaulis*	FEC
	Los Angeles Sunflower	*Helianthus nuttallii* ssp. *parishii*	PEC
	Mesa Horkelia	*Horkelia cuneata* ssp. *puberula*	SEC
	Orcutt's Linanthus	*Linanthus orcuttii*	NVEC
	Mud Nama	*Nama stenocarpum*	RTECCE
	Gambel's Water Cress	*Nasturtium gambelii*	FE, CT, SEC
	Prostrate Vernal Pool Navarretia	*Navarretia prostrata*	SEC
	White Rabbit-tobacco	*Pseudognaphalium leucocephalum*	RTECCE
	Parish's Gooseberry	*Ribes divaricatum* var. *parishii*	PEC
	Salt Spring Checkerbloom	*Sidalcea neomexicana*	RTECCE
	San Bernardino Aster	*Symphyotrichum defoliatum*	FEC
	Greata's Aster	*Symphyotrichum greatae*	NVEC

Source: California Natural Diversity Database (CDFG 2009)

CE = California Endangered (CDFG)
CT = California Threatened (CDFG)
FE = Federally Endangered (USFWS)
FEC = Fairly Endangered in California (CNPS)
FT = Federally Threatened (USFWS)
NVEC = Not Very Endangered in California (CNPS)
PEC = Presumed Extinct in California (CNPS)
RTECCE = Rare, Threatened or Endangered in California but More Common Elsewhere (CNPS)
SC = Species of Concern in California (CDFG)
SEC = Seriously Endangered in California (CNPS)

4.10.3 Environmental Impacts/Environmental Consequences

No Build Alternative

No impacts to ecosystems/biological resources would occur with the No Build Alternative.

Locally Preferred Alternative

The LPA could either be constructed as a single phase under the Concurrent Construction Scenario, or as three consecutive phases under the Phased Construction Scenario. The opening of the LPA as a single phase or in three sequential phases will not result in substantially different impacts on ecosystems or biological resources during operation of the LPA.

America Fast Forward (30/10) Scenario (Concurrent Construction)

The LPA is located in a densely developed urban land area. Some removal or pruning of California sycamore trees may occur at the Wilshire/La Brea Station area. As these trees are protected under native tree protection ordinance or municipal code, a tree removal permit will be required. Removal and replacement of these trees, if necessary, would be conducted in compliance with applicable regulations and tree protection ordinances of the City of Los Angeles. The tree removal permit may require replanting of native trees within the project area or at another location within the City of Los Angeles to mitigate for the removal of these trees. Replacement of protected trees could be required at a 2:1 ratio and other trees at a 1:1 ratio. Although the ordinance does not require a permit for the pruning of protected trees, the City of Los Angeles recommends consultation with a certified arborist to ensure that the pruning of protected trees is performed carefully.

During operation, no direct or indirect impacts to ecosystems/biological resources will occur under the LPA, including station, alignment, and station entrance options.

Metro Long Range Transportation Plan Scenario (Phased Construction)

Under the Phased Construction Scenario, the potential impacts related to ecosystems and biological resources are the same as under the Concurrent Construction Scenario. The only difference between the two scenarios is the timing of potential impacts related to ecosystems and biological resources. Under the Phased Construction Scenario, the potential for impacts on ecosystems and biological resources along Phase 2 and Phase 3 will occur later than under the Concurrent Construction Scenario due to an extended construction timeline. The timing for potential impacts on ecosystems and biological resources along Phase 1 of the LPA will occur earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.

The analysis of potential impacts to ecosystems and biological resources are discussed in the Concurrent Construction Scenario section above. Any removal or pruning of California sycamore at the Wilshire/La Brea Station area will occur as part of Phase 1 and will be in compliance with applicable regulations and tree protection ordinances of the City of Los Angeles as described above. During operation, no direct or indirect impacts to ecosystems or biological resources will occur under the LPA, including station, alignment, and station entrance options.

4.10.4 Mitigation Measures

The LPA, including station, alignment, and station entrance options under both the Concurrent Construction Scenario and the Phased Construction Scenario, will not result in impacts to ecosystems/biological resources during operation of the system; therefore, no mitigation measures will be required. For a more detailed discussion of impacts during construction and mitigation measures, refer to Section 4.15.

4.10.5 California Environmental Quality Act Determination

The CEQA determination compares the effects of the LPA under both the Concurrent Construction Scenario and the Phased Construction Scenario, with the existing conditions described in the affected environment/existing conditions section. The CEQA (PRC 2009) thresholds with regard to biological resources are identified in Section C of the *L.A. CEQA Thresholds Guide* (LA 2006). Based on Section C of the Guide, a project would have a significant impact on ecosystems/biological resources if it would result in the following:

- Loss of individuals, or the reduction of existing habitat, of a state- or federally listed endangered, threatened, rare, protected, or candidate species or a species of special concern or a federally listed critical habitat
- Loss of individuals, the reduction of existing habitat of a locally designated species, or a reduction in a locally designated natural habitat or plant community
- Interference with habitat such that normal species behaviors are disturbed (e.g., from introducing noise, light) to a degree that may diminish the chances for long-term survival of a sensitive species

The LPA is located in a densely developed urban land area. No impacts to sensitive ecosystems/biological resources will occur during operation of the LPA, including station, alignment, and station entrance options under both the Concurrent Construction Scenario and the Phased Construction Scenario. No mitigation measures will be required.

The opening of the LPA as a single phase under the Concurrent Construction Scenario or in three sequential phases under the Phased Construction Scenario will not result in differing direct or indirect impacts to ecosystems or biological resources, as discussed in Section 4.10.3. The only difference between the two scenarios is the timing of potential impacts on ecosystems and biological resources. Under the Phased Construction Scenario, the potential for impacts to ecosystems and biological resources along Phase 2 and Phase 3 will occur later than under the Concurrent Construction Scenario due to an extended construction timeline. The timing for potential impacts to ecosystems and biological resources along Phase 1 of the LPA will occur earlier than under the Concurrent Construction Scenario since Phase 1 will open for operation in 2020.