



WESTSIDE SUBWAY EXTENSION

Climate Change Technical Report



August 2010



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Acronyms and Abbreviations

AA	Alternatives Analysis
AB	State of California Assembly Bill
ADA	<i>Americans with Disabilities Act</i> (42 USC 126)
APM	automated people mover
AQMD	Air Quality Management District
BRT	bus rapid transit
CAA	U.S. Clean Air Act
CAFE	Corporate Average Fuel Economy
CARB	California Air Resource Board
CCTV	closed-circuit television
CEQA	<i>California Environmental Quality Act</i> (PRC 21000-21177)
CFC	chlorofluorocarbons
CFR	Code of Federal Regulations
CH ₄	methane
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalent
CSOP	control standard operating procedure
EIR	environmental impact report
EIS	environmental impact statement
EMFAC	Emission Factor Model
EPA	U.S. Environmental Protection Agency
Expo 1	Exposition Boulevard Light Rail Phase I
Expo 2	Exposition Boulevard Light Rail Phase II
FAI	fresh air intakes
GHG	greenhouse gas(es)
GLAVA	Greater Los Angeles Veterans Administration
GWP	global warming potential
HCFC	hydrochlorofluorocarbons
HFC	hydrofluorocarbons
HFE	hydrofluorinated ether
HOV	high-occupancy vehicle
HRT	heavy rail transit
HRV	heavy rail vehicles
HSC	Health and Safety Code
I-10	Interstate 10 Freeway
I-405	Interstate 405 Freeway
IPCC	Intergovernmental Panel on Climate Change



LADOT	Los Angeles Department of Transportation
LAX	Los Angeles Airport
LPA	Locally Preferred Alternative
LRT	light rail transit
LRTP	Long Range Transportation Plan
Metro	Los Angeles County Metropolitan Transportation Authority
Mt	metric ton
MOS	minimum operable segments
mph	miles per hour
MPO	Metropolitan Planning Organization
NASA	National Aeronautics and Space Administration
NF ₃	nitrogen trifluoride
N ₂ O	nitrous oxide
NOAA	National Oceanic and Atmospheric Administration
OAL	Office of Administrative Law
OPR	Governor's Office of Planning and Research
OTE	over track exhaust
PFC	perfluorocarbons
PTEL	passenger assistance telephones
ROC	Rail Operations Center
RTAC	<i>Regional Targets Advisory Committee</i>
RTIP	<i>Regional Transportation Improvement Plan</i>
RTP	<i>Regional Transportation Plan</i>
SB	State of California Senate Bill
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCS	sustainable communities strategies
SF ₆	sulfur hexafluoride
SIP	state implementation plan
SOP	standard operating procedure
TPIS	transit passenger information system
TPSS	traction power substation
TSM	transportation system management
TVM	ticket vending machines
UPE	under platform exhaust
UPRR	Union Pacific Railroad
VA	Department of Veterans Affairs
VMT	vehicle miles traveled



1.0 INTRODUCTION

This Climate Change Technical report has been prepared in support of the Westside Subway Extension. The objective of this report is to evaluate the project's potential impact on greenhouse gases (GHGs). This includes the following:

- Explain the Greenhouse Effect and its implications
- Describe the principal GHGs
- Present California's current GHG emission inventory
- Describe Federal, State and local GHG rules and regulations
- Explain the methodology for the calculation of GHG emissions
- Evaluate the project's operational impact on regional greenhouse gas levels
- Evaluate the project's construction impact on regional greenhouse gas levels
- Specify mitigation, if necessary

Related energy and air quality issues are addressed in separate Energy and Air Quality Technical Reports.



2.0 PROJECT DESCRIPTION

This chapter describes the alternatives that have been considered to best satisfy the Purpose and Need and have been carried forward for further study in the Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR). Details of the No Build, Transportation Systems Management (TSM), and the five Build Alternatives (including their station and alignment options and phasing options (or minimum operable segments [MOS])) are presented in this chapter.

2.1 No Build Alternative

The No Build Alternative provides a comparison of what future conditions would be like if the Project were not built. The No Build Alternative includes all existing highway and transit services and facilities, and the committed highway and transit projects in the Metro Long Range Transportation Plan (LRTP) and the Southern California Association of Governments (SCAG) Regional Transportation Plan (RTP). Under the No Build Alternative, no new 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 adopted Metro LRTP.

2.2 TSM Alternative

The TSM Alternative emphasizes more frequent bus service than the No Build Alternative to reduce delay and enhance mobility. The TSM Alternative contains all elements of the highway, transit, Metro Rail, and bus service described under the No Build Alternative. In addition, the TSM Alternative increases the frequency of service for Metro Bus Line 720 (Santa Monica–Commerce via Wilshire Boulevard and Whittier Boulevard) to between three and four minutes during the peak period.

In the TSM Alternative, Metro Purple Line rail service to the Wilshire/Western Station would operate in each direction at 10-minute headways during peak and off-peak periods. The Metro Red Line service to Hollywood/Highland Station would operate in each direction at five-minute headways during peak periods and at 10-minute headways during midday and off-peak periods.

2.3 Build Alternatives

The Build Alternatives are considered to be the “base” alternatives with “base” stations. Alignment (or segment) and station options were developed in response to public comment, design refinement, and to avoid and minimize impacts to the environment.

The Build Alternatives extend heavy rail transit (HRT) service in subway from the existing Metro Purple Line Wilshire/Western Station. HRT systems provide high speed (maximum of 70 mph), high capacity (high passenger-carrying capacity of up to 1,000 passengers per train and multiple unit trains with up to six cars per train), and reliable service since they operate in an exclusive grade-separated right-of-way. The subway will operate in a tunnel at least 30 to 70 feet below ground and will be electric powered.



Furthermore, the Build Alternatives include changes to the future bus services. Metro Bus Line 920 would be eliminated and a portion of Line 20 in the City of Santa Monica would be eliminated since it would be duplicated by the Santa Monica Blue Bus Line 2. Metro Rapid Bus Line 720 would operate less frequently since its service route would be largely duplicated by the Westside Subway route. In the City of Los Angeles, headways (time between buses) for Line 720 are between 3 and 5 minutes under the existing network and will be between 5 and 11.5 minutes under the Build Alternatives, but no change in Line 720 would occur in the City of Santa Monica segment. Service frequencies on other Metro Rail lines and bus routes in the corridor would be the same as for the No Build Alternative.

2.3.1 Alternative 1—Westwood/UCLA Extension

This alternative extends the existing Metro Purple Line from the Wilshire/Western Station to a Westwood/UCLA Station (Figure 2-1). From the Wilshire/Western Station, Alternative 1 travels westerly beneath Wilshire Boulevard to the Wilshire/Rodeo Station and then southwesterly toward a Century City Station. Alternative 1 then extends from Century City and terminates at a Westwood/UCLA Station. The alignment is approximately 8.60 miles in length.

Alternative 1 would operate in each direction at 3.3-minute headways during morning and evening peak periods and at 10-minute headways during midday. The estimated one-way running time is 12 minutes 39 seconds from the Wilshire/Western Station.

2.3.2 Alternative 2—Westwood/Veterans Administration (VA) Hospital Extension

This alternative extends the existing Metro Purple Line from the Wilshire/Western Station to a Westwood/VA Hospital Station (Figure 2-2). Similar to Alternative 1, Alternative 2 extends the subway from the Wilshire/Western Station to a Westwood/UCLA Station. Alternative 2 then travels westerly under Veteran Avenue and continues west under the I-405 Freeway, terminating at a Westwood/VA Hospital Station. This alignment is 8.96 miles in length from the Wilshire/Western Station.

Alternative 2 would operate in each direction at 3.3-minute headways during the morning and evening peak periods and at 10-minute headways during the midday, off-peak period. The estimated one-way running time is 13 minutes 53 seconds from the Wilshire/Western Station.

2.3.3 Alternative 3—Santa Monica Extension

This alternative extends the existing Metro Purple Line from the Wilshire/Western Station to the Wilshire/4th Station in Santa Monica (Figure 2-3). Similar to Alternative 2, Alternative 3 extends the subway from the Wilshire/Western Station to a Westwood/VA Hospital Station. Alternative 3 then continues westerly under Wilshire Boulevard and terminates at the Wilshire/4th Street Station between 4th and 5th Streets in Santa Monica. The alignment is 12.38 miles.

Alternative 3 would operate in each direction at 3.3-minute headways during the morning and evening peak periods and operate with 10-minute headways during the midday, off-

peak period. The estimated one-way running time is 19 minutes 27 seconds from the Wilshire/Western Station.

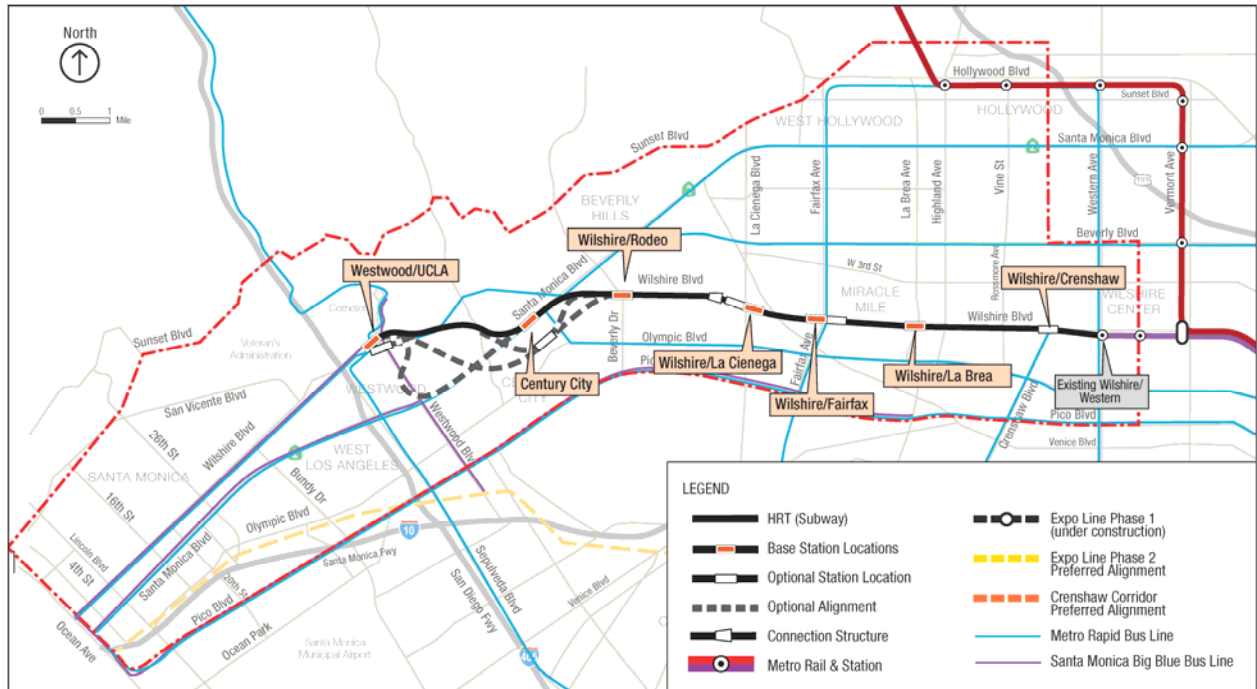


Figure 2-1. Alternative 1—Westwood/UCLA Extension

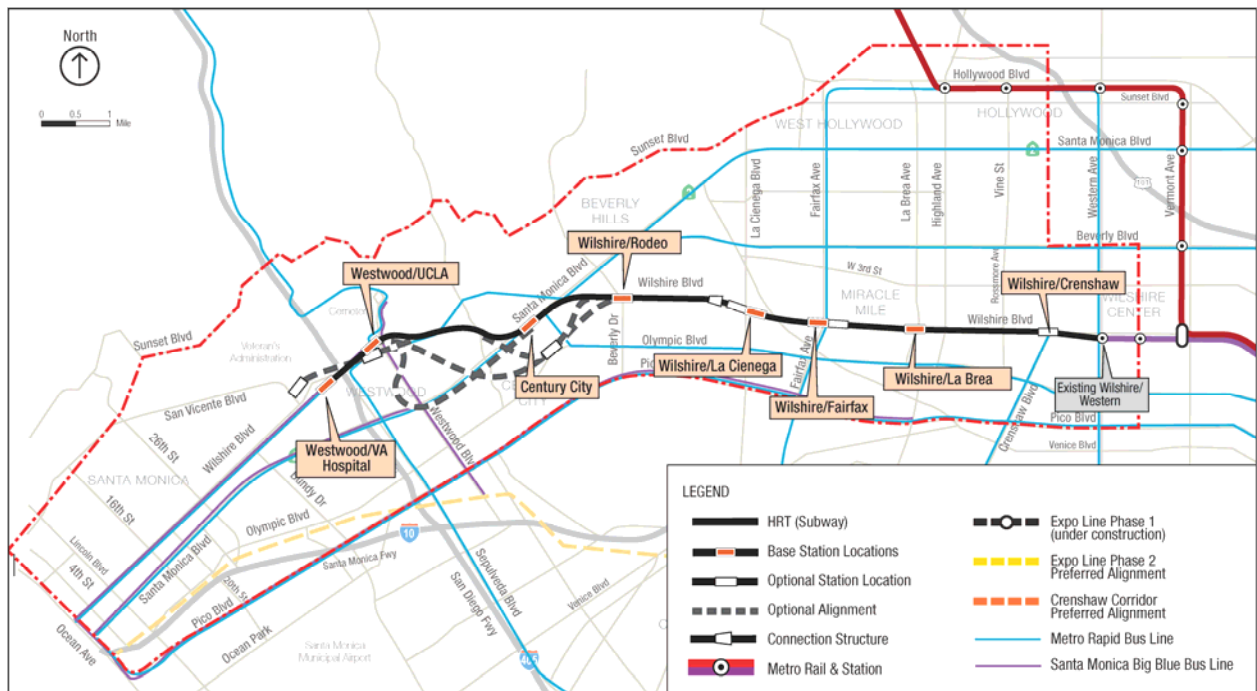


Figure 2-2. Alternative 2—Westwood/Veterans Administration (VA) Hospital Extension

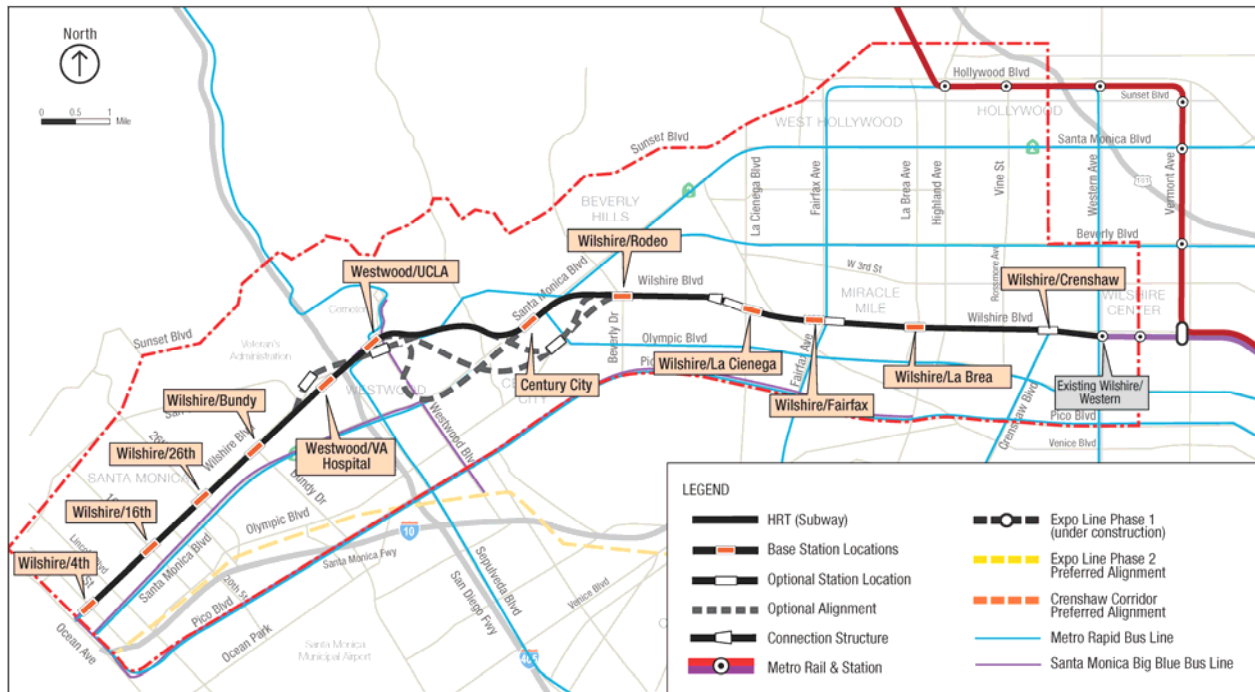


Figure 2-3. Alternative 3—Santa Monica Extension

2.3.4 Alternative 4—Westwood/VA Hospital Extension plus West Hollywood Extension

Similar to Alternative 2, Alternative 4 extends the existing Metro Purple Line from the Wilshire/Western Station to a Westwood/VA Hospital Station. Alternative 4 also includes a West Hollywood Extension that connects the existing Metro Red Line Hollywood/Highland Station to a track connection structure near Robertson and Wilshire Boulevards, west of the Wilshire/La Cienega Station (Figure 2-4). The alignment is 14.06 miles long.

Alternative 4 would operate from Wilshire/Western to a Westwood/VA Hospital Station in each direction at 3.3-minute headways during morning and evening peak periods and 10-minute headways during the midday off-peak period. The West Hollywood extension would operate at 5-minute headways during peak periods and 10-minute headways during the midday, off-peak period. The estimated one-way running time for the Metro Purple Line extension is 13 minutes 53 seconds, and the running time for the West Hollywood from Hollywood/Highland to Westwood/VA Hospital is 17 minutes and 2 seconds.

2.3.5 Alternative 5—Santa Monica Extension plus West Hollywood Extension

Similar to Alternative 3, Alternative 5 extends the existing Metro Purple Line from the Wilshire/Western Station to the Wilshire/4th Station and also adds a West Hollywood Extension similar to the extension described in Alternative 4 (Figure 2-5). The alignment is 17.49 miles in length. Alternative 5 would operate the Metro Purple Line extension in each direction at 3.3-minute headways during the morning and evening peak periods and 10-minute headways during the midday, off-peak period. The West Hollywood extension

would operate in each direction at 5-minute headways during peak periods and 10-minute headways during the midday, off-peak period. The estimated one-way running time for the Metro Purple Line extension is 19 minutes 27 seconds, and the running time from the Hollywood/Highland Station to the Wilshire/4th Station is 22 minutes 36 seconds.

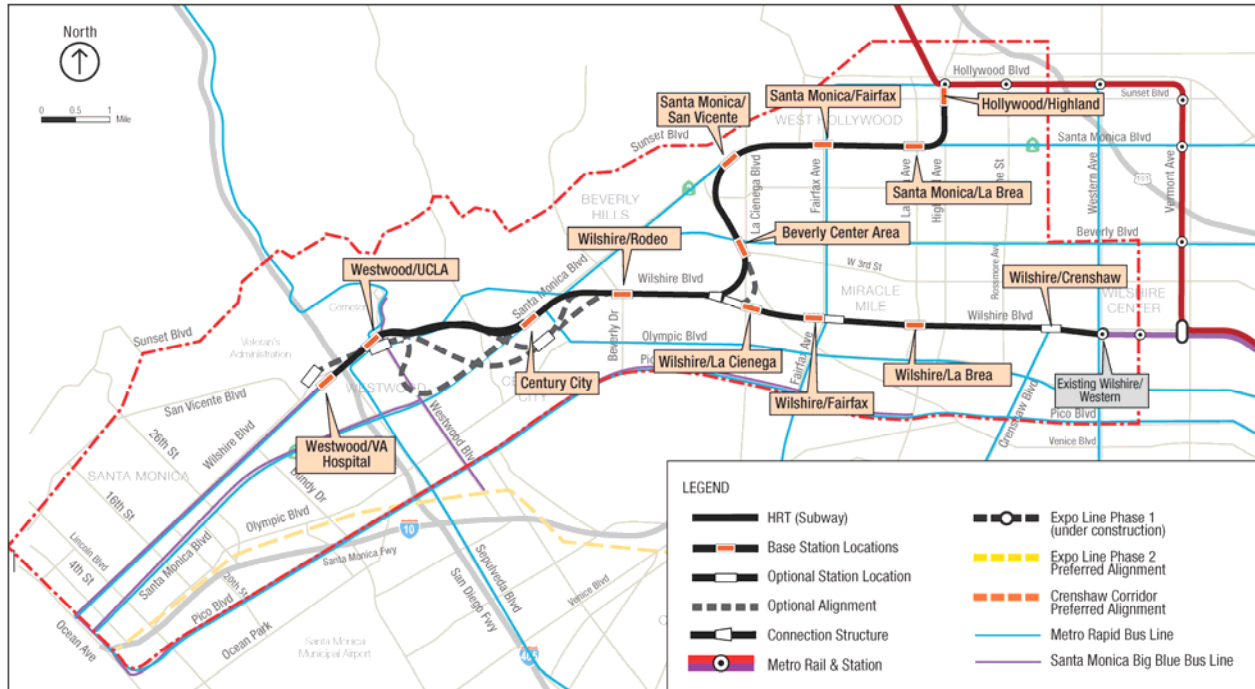


Figure 2-4. Alternative 4—Westwood/VA Hospital Extension plus West Hollywood Extension

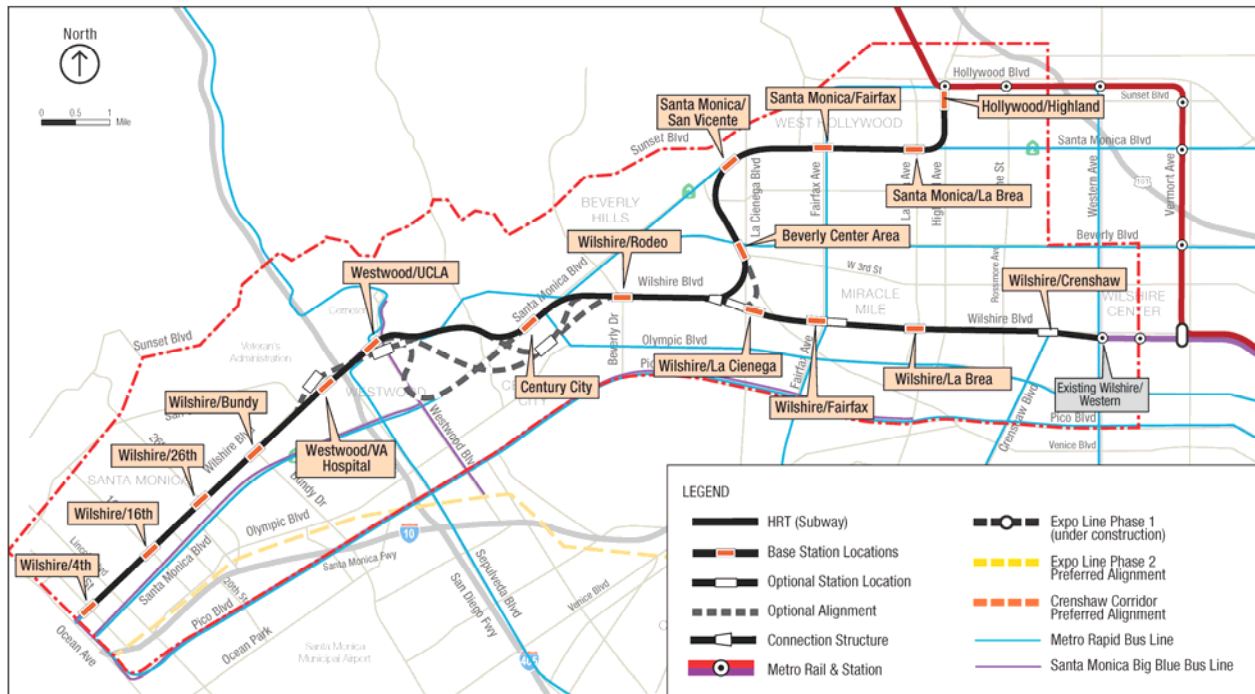


Figure 2-5. Alternative 5—Santa Monica Extension plus West Hollywood Extension

2.4 Stations and Segment Options

HRT stations consist of a station “box,” or area in which the basic components are located. The station box can be accessed from street-level entrances by stairs, escalators, and elevators that would bring patrons to a mezzanine level where the ticketing functions are located. The 450-foot platforms are one level below the mezzanine level and allow level boarding (i.e., the train car floor is at the same level as the platform). Stations consist of a center or side platform. Each station is equipped with under-platform exhaust shafts, over-track exhaust shafts, blast relief shafts, and fresh air intakes. In most stations, it is anticipated that only one portal would be constructed as part of the Project, but additional portals could be developed as a part of station area development (by others). Stations and station entrances would comply with the *Americans with Disabilities Act of 1990*, Title 24 of the California Code of Regulations, the California Building Code, and the Department of Transportation Subpart C of Section 49 CFR Part 37.

Platforms would be well-lighted and include seating, trash receptacles, artwork, signage, safety and security equipment (closed-circuit television, public announcement system, passenger assistance telephones), and a transit passenger information system. The fare collection area includes ticket vending machines, fare gates, and map cases.

Table 2-1 lists the stations and station options evaluated and the alternatives to which they are applicable. Figure 2-6 shows the proposed station and alignment options. These include:

- Option 1—Wilshire/Crenshaw Station Option
- Option 2—Fairfax Station Option



- Option 3—La Cienega Station Option
- Option 4—Century City Station and Alignment Options
- Option 5—Westwood/UCLA Station Option
- Option 6—Westwood/VA Hospital Station Option

Table 2-1. Alternatives and Stations Considered

Stations	Alternatives				
	1	2	3	4	5
	Westwood/ UCLA Extension	Westwood/ VA Hospital Extension	Santa Monica Extension	Westwood/ VA Hospital Extension Plus West Hollywood Extension	Santa Monica Extension Plus West Hollywood Extension
Base Stations					
Wilshire/Crenshaw	•	•	•	•	•
Wilshire/La Brea	•	•	•	•	•
Wilshire/Fairfax	•	•	•	•	•
Wilshire/La Cienega	•	•	•	•	•
Wilshire/Rodeo	•	•	•	•	•
Century City (Santa Monica Blvd)	•	•	•	•	•
Westwood/UCLA (Off-street)	•	•	•	•	•
Westwood/VA Hospital		•	•	•	•
Wilshire/Bundy			•		•
Wilshire/26th			•		•
Wilshire/16th			•		•
Wilshire/4th			•		•
Hollywood/Highland				•	•
Santa Monica/La Brea				•	•
Santa Monica/Fairfax				•	•
Santa Monica/San Vicente				•	•
Beverly Center Area				•	•
Station Options					
1—No Wilshire/Crenshaw	•	•	•	•	•
2—Wilshire/Fairfax East	•	•	•	•	•
3—Wilshire/La Cienega (Transfer Station)	•	•	•	•	•
4—Century City (Constellation Blvd)	•	•	•	•	•
5—Westwood/UCLA (On-street)	•	•	•	•	•
6—Westwood/VA Hospital North		•	•	•	•

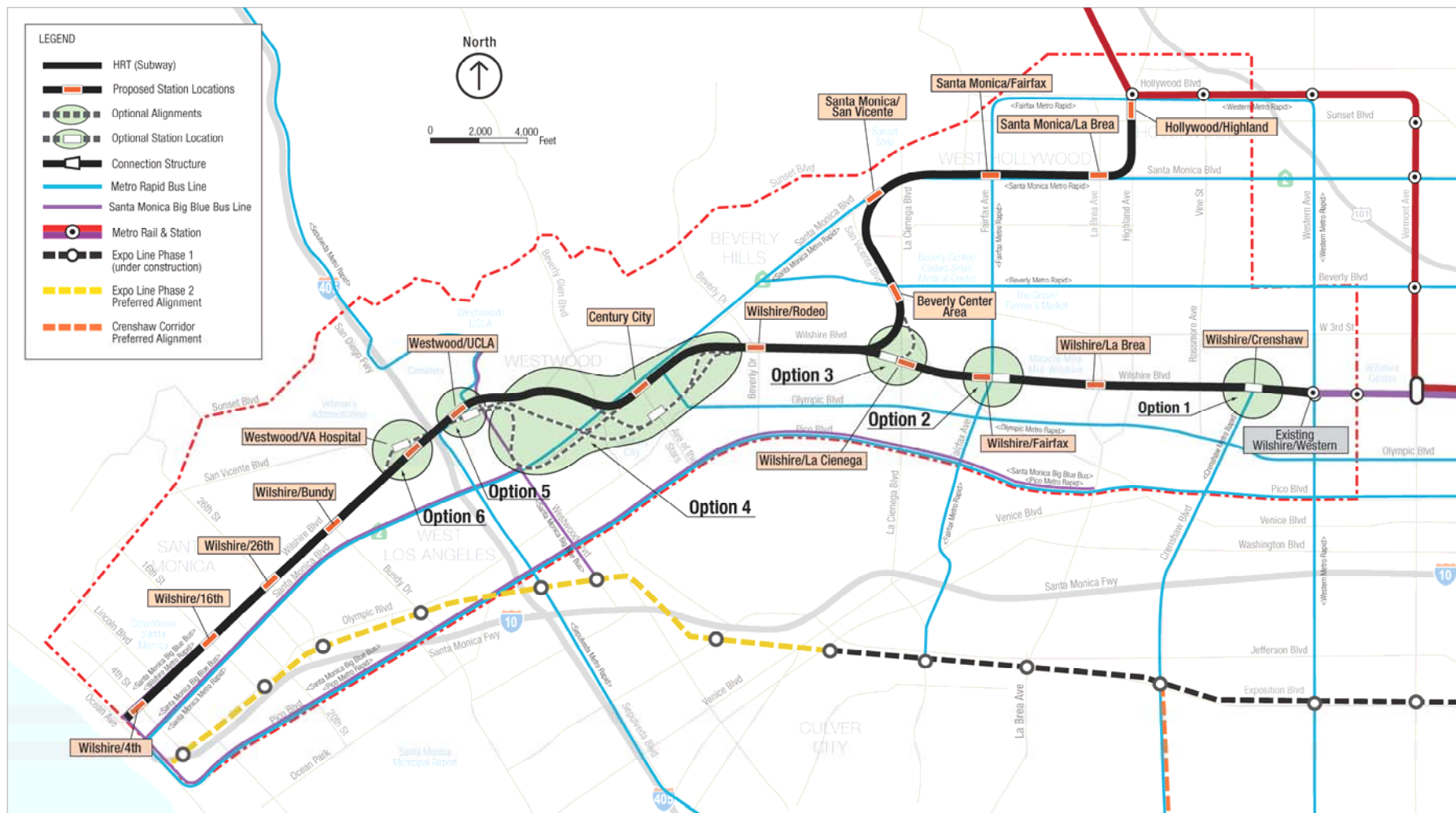


Figure 2-6. Station and Alignment Options

WESTSIDE SUBWAY EXTENSION



2.4.1 Option 1—Wilshire/Crenshaw Station Option

- **Base Station: Wilshire/Crenshaw Station**—The base station straddles Crenshaw Boulevard, between Bronson Avenue and Lorraine Boulevard.
- **Station Option: Remove Wilshire/Crenshaw Station**—This station option would delete the Wilshire/Crenshaw Station. Trains would run from the Wilshire/Western Station to the Wilshire/La Brea Station without stopping at Crenshaw. A vent shaft would be constructed at the intersection of Western Avenue and Wilshire Boulevard (Figure 2-7).

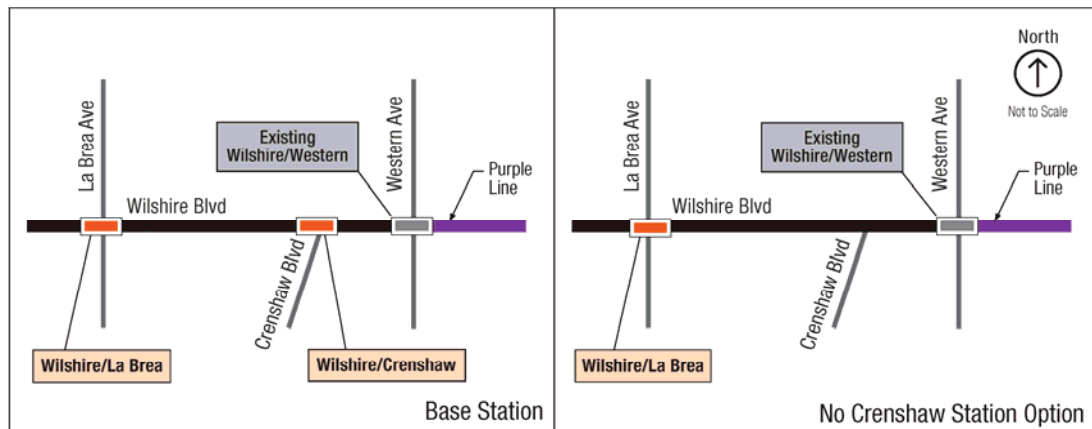


Figure 2-7. Option 1—No Wilshire/Crenshaw Station Option

2.4.2 Option 2—Wilshire/Fairfax Station East Option

- **Base Station: Wilshire/Fairfax Station**—The base station is under the center of Wilshire Boulevard, immediately west of Fairfax Avenue.
- **Station Option: Wilshire/Fairfax Station East Station Option**—This station option would locate the Wilshire/Fairfax Station farther east, with the station underneath the Wilshire/Fairfax intersection (Figure 2-8). The east end of the station box would be east of Orange Grove Avenue in front of LACMA, and the west end would be west of Fairfax Avenue.

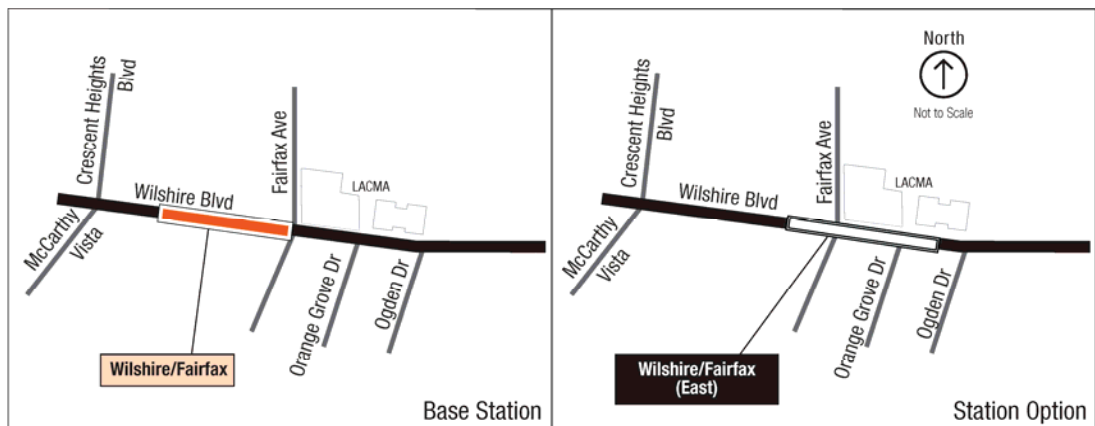


Figure 2-8. Option 2—Fairfax Station Option

2.4.3 Option 3—Wilshire/La Cienega Station Option

- **Base Station: Wilshire/La Cienega Station**—The base station would be under the center of Wilshire Boulevard, immediately east of La Cienega Boulevard. A direct transfer between the Metro Purple Line and the potential future West Hollywood Line is not provided with this station. Instead, a connection structure is proposed west of Robertson Boulevard as a means to provide a future HRT connection to the West Hollywood Line.
- **Station Option: Wilshire/La Cienega Station West with Connection Structure**—The station option would be located west of La Cienega Boulevard, with the station box extending from the Wilshire/Le Doux Road intersection to just west of the Wilshire/ Carson Road intersection (Figure 2-9). It also contains an alignment option that would provide an alternate HRT connection to the future West Hollywood Extension. This alignment portion of Option 3 is only applicable to Alternatives 4 and 5.

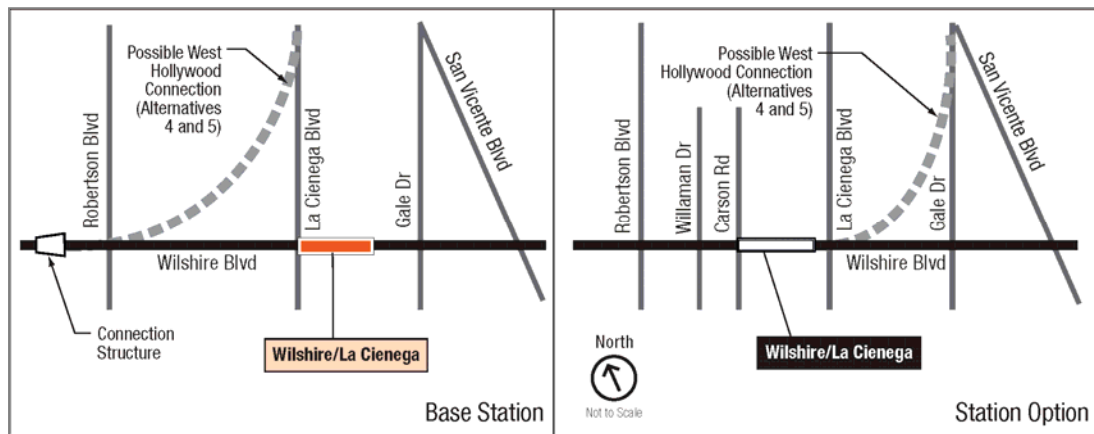


Figure 2-9. Option 3—La Cienega Station Option

2.4.4 Option 4—Century City Station and Segment Options

2.4.4.1 Century City Station and Beverly Hills to Century City Segment Options

- **Base Station: Century City (Santa Monica) Station**—The base station would be under Santa Monica Boulevard, centered on Avenue of the Stars.
- **Station Option: Century City (Constellation) Station**—With Option 4, the Century City Station has a location option on Constellation Boulevard (Figure 2-10), straddling Avenue of the Stars and extending westward to east of MGM Drive.
- **Segment Options:** Two route options are proposed to connect the Wilshire/Rodeo Station to Century City (Constellation) Station: Constellation North and Constellation South. As shown in Figure 2-10, the base segment to the base Century City (Santa Monica) Station is shown in the solid black line and the segment options to Century City (Constellation) Station are shown in the dashed grey lines.



2.4.4.2 Century City to Westwood Segment Options

Three route options considered for connecting the Century City and Westwood stations include: East, Central, and West. As shown in Figure 2-10, each of these three segments would be accessed from both Century City Stations and both Westwood/UCLA Stations. The base segment is shown in the solid black line and the options are shown in the dashed grey lines.

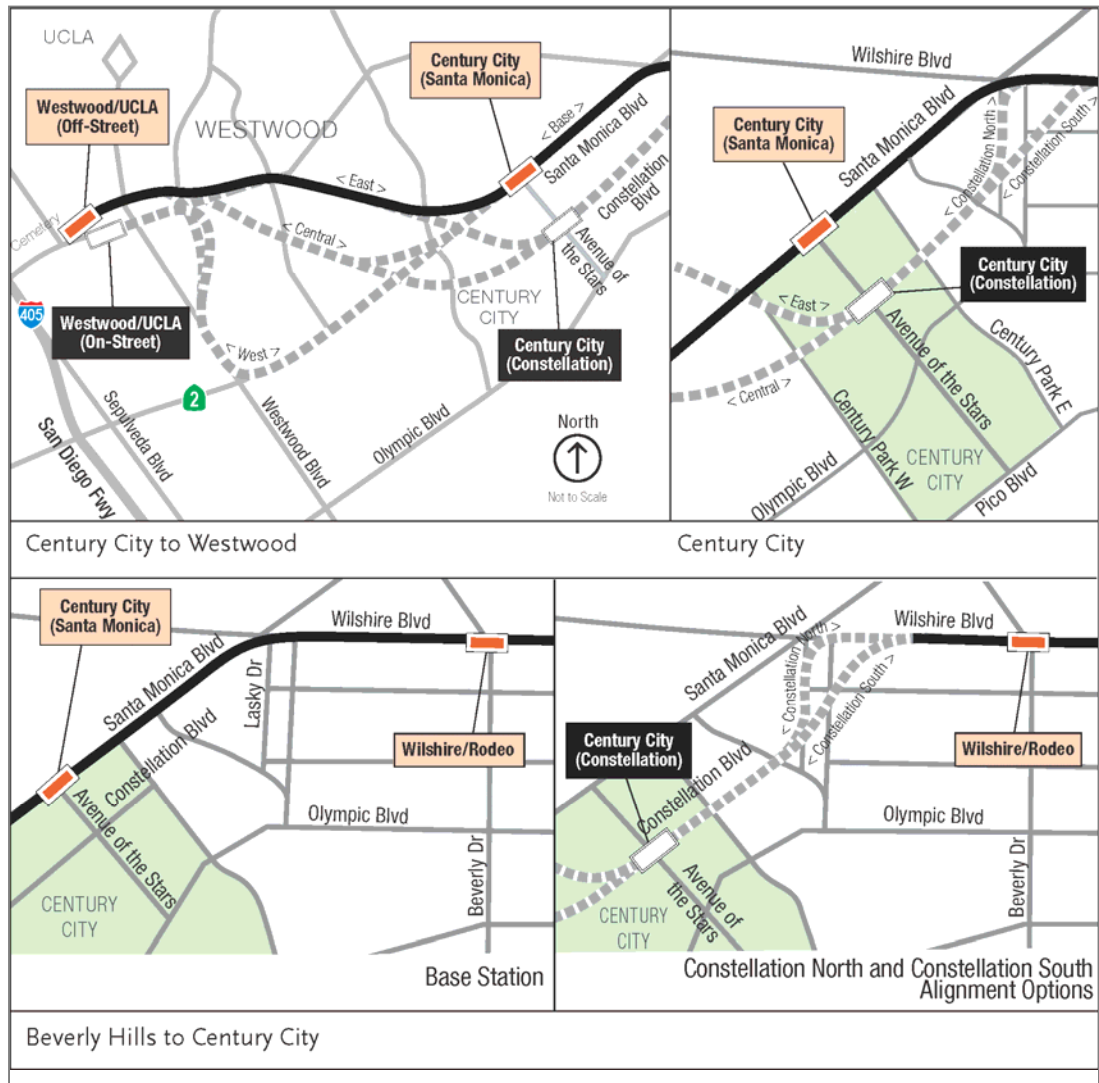


Figure 2-10. Century City Station Options

2.4.5 Option 5—Westwood/UCLA Station Options

- **Base Station: Westwood/UCLA Station Off-Street Station Option**—The base station is located under the UCLA Lot 36 on the north side of Wilshire Boulevard between Gayley and Veteran Avenues.

- **Station Option: Westwood/UCLA On-Street Station Option**—This station option would be located under the center of Wilshire Boulevard, immediately west of Westwood Boulevard (Figure 2-11).

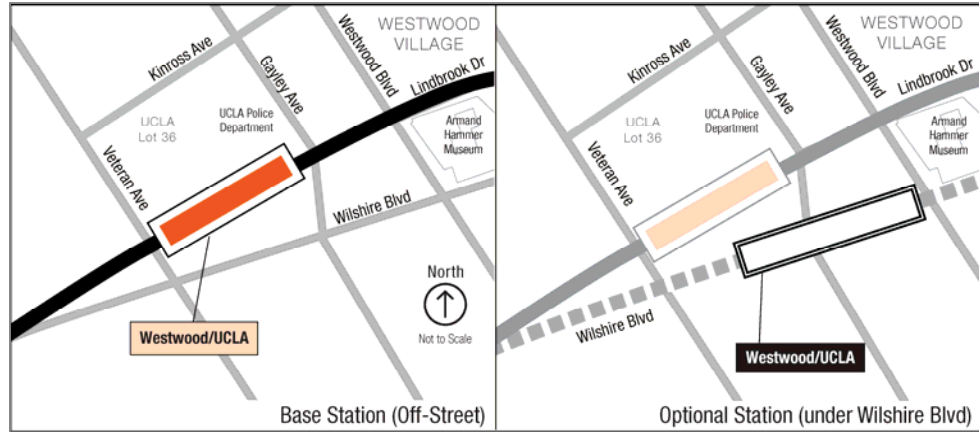


Figure 2-11. Option 5—Westwood/UCLA Station Options

2.4.6 Option 6—Westwood/VA Hospital Station Option

- **Base Station: Westwood/VA Hospital**—The base station would be below the VA Hospital parking lot on the south side of Wilshire Boulevard in between the I-405 exit ramp and Bonsall Avenue.
- **Station Option: Westwood/VA Hospital North Station**—This station option would locate the Westwood/VA Hospital Station on the north side of Wilshire Boulevard between Bonsall Avenue and Wadsworth Theater. (Shown in Figure 2-12)

To access the Westwood/VA Hospital Station North, the alignment would extend westerly from the Westwood/UCLA Station under Veteran Avenue, the Federal Building property, the I-405 Freeway, and under the Veterans Administration property just east of Bonsall Avenue.

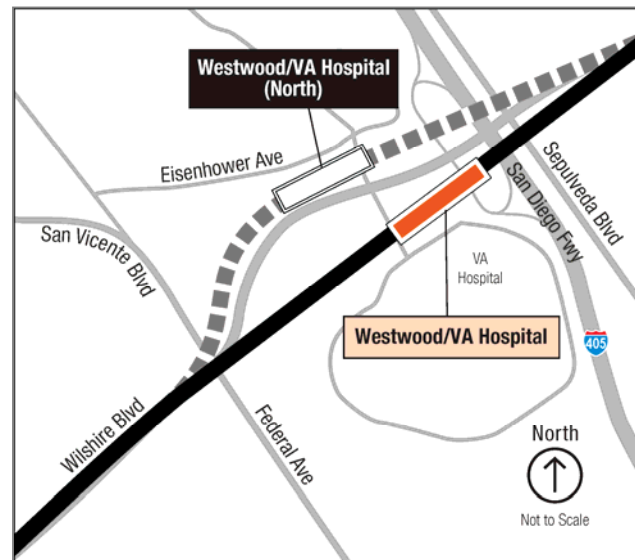


Figure 2-12. Option 6—Westwood/VA Hospital Station North

2.5 Base Stations

The remaining stations (those without options) are described below.

- **Wilshire/La Brea Station**—This station would be located between La Brea and Cloverdale Avenues.
- **Wilshire/Rodeo Station**—This station would be under the center of Wilshire Boulevard, beginning just west of South Canon Drive and extending to El Camino Drive.
- **Wilshire/Bundy Station**—This station would be under Wilshire Boulevard, east of Bundy Drive, extending just east of Saltair Avenue.
- **Wilshire/26th Station**—This station would be under Wilshire Boulevard, with the eastern end east of 26th Street and the western end west of 25th Street, midway between 25th Street and Chelsea Avenue.
- **Wilshire/16th Station**—This station would be under Wilshire Boulevard with the eastern end just west of 16th Street and the western end west of 15th Street.
- **Wilshire/4th Station**—This station would be under Wilshire Boulevard and 4th Street in Santa Monica.
- **Hollywood/Highland Station**—This station would be located under Highland Avenue and would provide a transfer option to the existing Metro Red Line Hollywood/Highland Station under Hollywood Boulevard.
- **Santa Monica/La Brea Station**—This station would be under Santa Monica Boulevard, just west of La Brea Avenue, and would extend westward to the center of the Santa Monica Boulevard/Formosa Avenue.
- **Santa Monica/Fairfax Station**—This station is under Santa Monica Boulevard and would extend from just east of Fairfax Avenue to just east of Ogden Drive.



- **Santa Monica/San Vicente Station**—This station would be under Santa Monica Boulevard and would extend from just west of Hancock Avenue on the west to just east of Westmount Drive on the east.
- **Beverly Center Area Station**—This station would be under San Vicente Boulevard, extending from just south of Gracie Allen Drive to south of 3rd Street.

2.6 Other Components of the Build Alternatives

2.6.1 Traction Power Substations

Traction power substations (TPSS) are required to provide traction power for the HRT system. Substations would be located in the station box or in a box located with the crossover tracks and would be located in a room that is about 50 feet by 100 feet in a below grade structure.

2.6.2 Emergency Generators

Stations at which the emergency generators would be located are Wilshire/La Brea, Wilshire/La Cienega, Westwood/UCLA, Westwood/VA Hospital, Wilshire/26th, Highland/Hollywood, Santa Monica/La Brea, and Santa Monica/San Vicente. The emergency generators would require approximately 50 feet by 100 feet of property in an off-street location. All would require property acquisition, except for the one at the Wilshire/La Brea Station, which uses Metro's property.

2.6.3 Mid-Tunnel Vent Shaft

Each alternative would require mid-tunnel ventilation shafts. The vent shafts are emergency ventilation shafts with dampers, fans, and sound attenuators generally placed at both ends of a station box to exhaust smoke. In addition, emergency vent shafts could be used for station cooling and gas mitigation. The vent shafts are also required in tunnel segments with more than 6,000 feet between stations to meet fire/life safety requirements. There would be a connecting corridor between the two tunnels (one for each direction of train movement) to provide emergency egress and fire-fighting ingress. A vent shaft is approximately 150 square feet; with the opening of the shaft located in a sidewalk and covered with a grate about 200 square feet.

Table 2-2. Mid-Tunnel Vent Shaft Locations

Alternative/Option	Location
Alternatives 1 through 5, MOS 2	Part of the connection structure on Wilshire Boulevard, west of Robertson Boulevard
Alternatives 2 through 5	West of the Westwood/VA Hospital Station on Army Reserve property at Federal Avenue and Wilshire Boulevard
Option 4 via East route	At Wilshire Boulevard/Manning Avenue intersection
Option 4 to Westwood/UCLA Off-Street Station via Central route	On Santa Monica Boulevard just west of Beverly Glen Boulevard
Option 4 to Westwood/UCLA On-Street Station via Central route	At Santa Monica Boulevard/Beverly Glen Boulevard intersection
Options 4 via West route	At Santa Monica Boulevard/Glendon Avenue intersection
Options 4 from Constellation Station via Central route	On Santa Monica Boulevard between Thayer and Pandora Avenues
Option from Constellation Station via West route	On Santa Monica Boulevard just east of Glendon Avenue

2.6.4 Trackwork Options

Each Build Alternative requires special trackwork for operational efficiency and safety (Table 2-3):

- Tail tracks—a track, or tracks, that extends beyond a terminal station (the last station on a line)
- Pocket tracks—an additional track, or tracks, adjacent to the mainline tracks generally at terminal stations
- Crossovers—a pair of turnouts that connect two parallel rail tracks, allowing a train on one track to cross over to the other
- Double crossovers—when two sets of crossovers are installed with a diamond allowing trains to cross over to another track

Table 2-3. Special Trackwork Locations

Station	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
	Westwood/ UCLA Extension	Westwood/ VA Hospital Extension	Santa Monica Extension	Westwood/VA Hospital Extension Plus West Hollywood Extension	Santa Monica Extension Plus West Hollywood Extension
Special Trackwork Locations—Base Trackwork Alternatives					
Wilshire/Crenshaw	None	None	None	None	None
Wilshire/La Brea	Double Crossover	Double Crossover	Double Crossover	Double Crossover	Double Crossover
Wilshire/Fairfax	None <i>MOS 1 Only: Terminus Station with Tail tracks</i>	None <i>MOS 1 Only: Terminus Station with Tail tracks</i>	None <i>MOS 1 Only: Terminus Station with Tail tracks</i>	None <i>MOS 1 Only: Terminus Station with Tail tracks</i>	None <i>MOS 1 Only: Terminus Station with Tail tracks</i>
Wilshire/La Cienega	None	None	None	None	None
<i>Station Option 3 - Wilshire/La Cienega West</i>	Turnouts	Turnouts	Turnouts		
Wilshire/Robertson Connection Structure	Equilateral Turnouts—for future West Hollywood connection	Equilateral Turnouts—for future West Hollywood connection	Equilateral Turnouts—for future West Hollywood connection	Equilateral Turnouts	Equilateral Turnouts
Wilshire/Rodeo	None	None	None	None	None
Century City	Double Crossover <i>MOS 2 Only: Terminus Station with Double Crossover and tail tracks</i>	Double Crossover <i>MOS 2 Only: Terminus Station with Double Crossover and tail tracks</i>	Double Crossover <i>MOS 2 Only: Terminus Station with Double Crossover and tail tracks</i>	Double Crossover <i>MOS 2 Only: Terminus Station with Double Crossover and tail tracks</i>	Double Crossover <i>MOS 2 Only: Terminus Station with Double Crossover and tail tracks</i>
Westwood/UCLA	End Terminal with Double Crossover and tail tracks	Double Crossover	Double Crossover	Double Crossover	Double Crossover
Westwood/VA Hospital	N/A	End Terminal with Turnouts and tail tracks	Turnouts	End Terminal with Turnouts and tail tracks	Turnouts
Wilshire/Bundy	N/A	N/A	None	N/A	None
Wilshire/26th	N/A	N/A	None	N/A	None
Wilshire/16th	N/A	N/A	None	N/A	None
Wilshire/4th	N/A	N/A	End Terminal with Double Crossover. Pocket Track with Double Crossover, Equilateral Turnouts and tail tracks	N/A	End Terminal with Double Crossover, Pocket Track with Double Crossover, Equilateral Turnouts and tail tracks
Hollywood/ Highland	N/A	N/A	N/A	Double Crossover and tail tracks	Double Crossover and tail tracks
Santa Monica/La Brea	N/A	N/A	N/A	None	None
Santa Monica/Fairfax	N/A	N/A	N/A	None	None
Santa Monica/ San Vicente	N/A	N/A	N/A	Double Crossover	Double Crossover
Beverly Center	N/A	N/A	N/A	None	None
Additional Special Trackwork Location (Optional Trackwork)					
Wilshire/Fairfax	Double Crossover	Double Crossover	Double Crossover	Double Crossover	Double Crossover
Wilshire/La Cienega	Double Crossover	Double Crossover	Double Crossover	Double Crossover	Double Crossover
Wilshire/ Rodeo	Pocket Track	Pocket Track	Pocket Track	Pocket Track	Pocket Track
Wilshire/26th	N/A	N/A	Double Crossover	N/A	Double Crossover

2.6.5 Rail Operations Center

The existing Rail Operations Center (ROC), shown on the figure below, located in Los Angeles near the intersection of Imperial Highway and the Metro Blue Line does not have sufficient room to accommodate the new transit corridors and line extensions in Metro’s expansion program. The Build Alternatives assume an expanded ROC at this location.

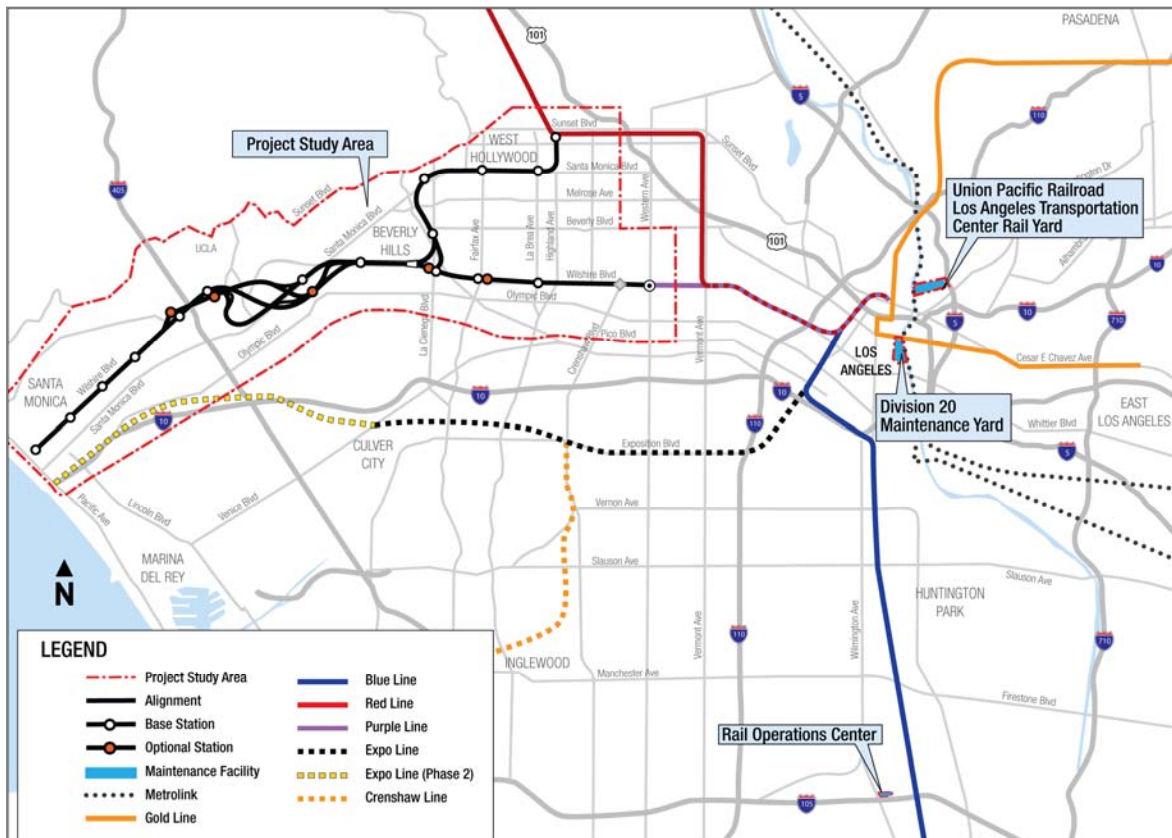


Figure 2-13. Location of the Rail Operations Center and Maintenance Yards

2.6.6 Maintenance Yards

If any of the Build Alternatives are chosen, additional storage capacity would be needed. Two options for providing this expanded capacity are as follows:

- The first option requires purchasing 3.9 acres of vacant private property abutting the southern boundary of the Division 20 Maintenance and Storage Facility, which is located between the 4th and 6th Street Bridges. Additional maintenance and storage tracks would accommodate up to 102 vehicles, sufficient for Alternatives 1 and 2.
- The second option is a satellite facility at the Union Pacific (UP) Los Angeles Transportation Center Rail Yard. This site would be sufficient to accommodate the vehicle fleet for all five Build Alternatives. An additional 1.3 miles of yard lead tracks from the Division 20 Maintenance and Storage Facility and a new bridge over the Los Angeles River would be constructed to reach this yard (Figure 2-14).

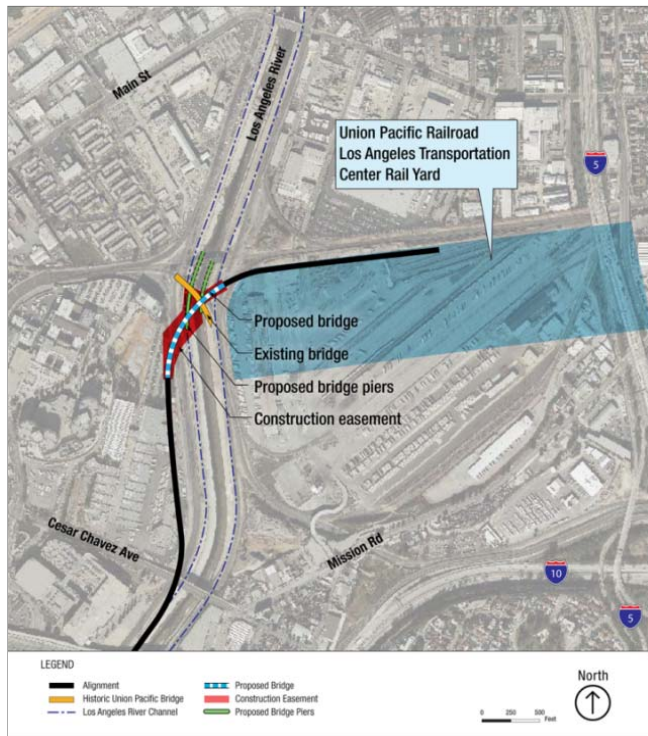


Figure 2-14. UP Railroad Rail Bridge

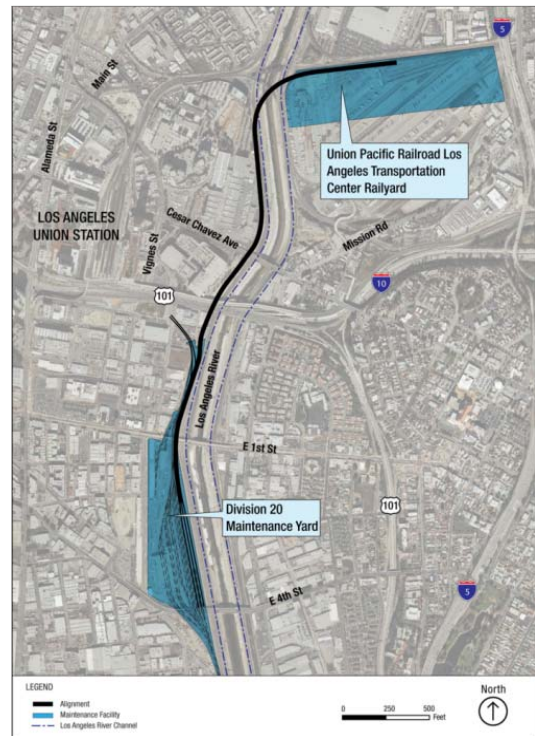


Figure 2-15. Maintenance Yard Options

2.7 Minimum Operable Segments

Due to funding constraints, it may be necessary to construct the Westside Subway Extension in shorter segments. A Minimum Operable Segment (MOS) is a phasing option that could be applied to any of the Build Alternatives.

2.7.1 MOS 1—Fairfax Extension

MOS 1 follows the same alignment as Alternative 1, but terminates at the Wilshire/Fairfax Station rather than extending to a Westwood/UCLA Station. A double crossover for MOS 1 is located on the west end of the Wilshire/La Brea Station box, west of Cloverdale Avenue. The alignment is 3.10 miles in length.

2.7.2 MOS 2—Century City Extension

MOS 2 follows the same alignment as Alternative 1, but terminates at a Century City Station rather than extending to a Westwood/UCLA Station. The alignment is 6.61 miles from the Wilshire/Western Station.

3.0 EXISTING CONDITIONS

Climate change is one of the most serious environmental challenges facing the world today. As the concentration of greenhouse gases continues to increase in the atmosphere, the Earth’s temperature is climbing above historic levels. Most of the warming in recent decades is very likely the result of increased emissions of green house gases (GHG) due to human activities. Other aspects of the climate are also changing, including rainfall patterns, snow and ice cover, and sea level.

3.1 Description of GHG and the Greenhouse Effect

Gases that trap heat in the atmosphere are often referred to as GHGs. GHG 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 3-1). As concentrations of greenhouse gases increase, however, the Earth’s temperature increases. According to National Oceanic and Atmospheric Administration (NOAA) and National Aeronautics and Space Administration (NASA) data, the Earth’s average surface temperature has increased by 1.2 to 1.4°F in the last 100 years. Eleven of the last 12 years (1995 to 2006)—the exception being 1996—rank among the 12 warmest years on record since 1850.

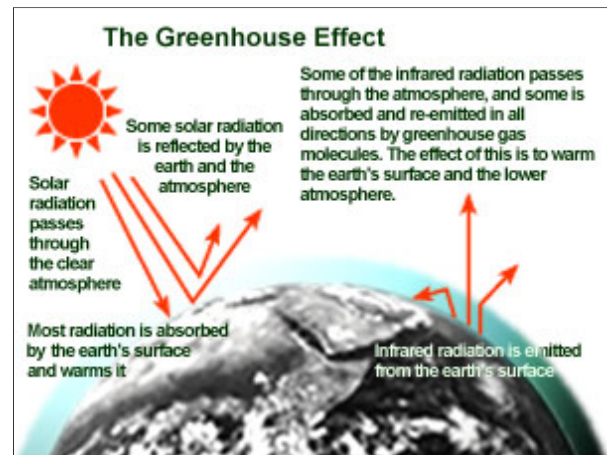


Figure 3-1. The Greenhouse Effect

Some GHG, such as carbon dioxide, occur naturally and are emitted to the atmosphere through natural processes and human activities. Other GHG (e.g., fluorinated gases) are created and emitted solely through human activities. GHG differ in their ability to trap heat. For example, one ton of emissions of CO₂ has a different effect than one ton of emissions of methane. To compare emissions of GHGs, compilers use a weighting factor called a “Global Warming Potential” or “GWP.” To use a GWP, the heat-trapping ability of one metric ton (1,000 kilograms) of CO₂ is taken as the standard, and emissions are expressed in terms of CO₂ equivalent, but can also be expressed in terms of carbon equivalent.

The principal GHGs emitted as a result of human activities are described below.

- **Carbon Dioxide (CO₂)**—Carbon dioxide 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). Carbon dioxide is also removed from the atmosphere (or “sequestered”) when it is absorbed by plants as part of the biological carbon cycle.



- **Methane (CH₄)**—Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills.
- **Nitrous Oxide (N₂O)**—Nitrous oxide 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 greenhouse gases that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances (e.g., chlorofluorocarbons [CFCs], hydrochlorofluorocarbons [HCFCs], and halons). These gases are typically emitted in smaller quantities, but because they are potent greenhouse gases, they are sometimes referred to as High Global Warming Potential gases (High GWP gases).

An inventory of GHG emission sources compiled by California Air Resources Board (CARB) for the years 2000- 2006, is shown in Figure 3-2. Transportation accounts for approximately 39% of California's GHG inventory, based on this data. The US average is 28% for the same time period. As such, reducing GHG emissions due to transportation is a key element in the goal of reducing the overall GHG emissions in the state of California.

**California Greenhouse Gas Inventory for 2000-2006
— by Category as Defined in the Scoping Plan**
million tonnes of CO2 equivalent - (based upon IPCC Second Assessment Report's Global Warming Potentials)

	2000	2001	2002	2003	2004	2005	2006
Transportation	171.94	174.62	181.32	178.90	183.03	185.82	185.77
On Road	159.42	161.71	168.41	166.20	169.24	170.85	170.55
Passenger Vehicles	126.43	128.76	134.93	132.32	133.73	134.03	133.37
Heavy Duty Trucks	32.98	32.95	33.48	33.88	35.51	36.82	37.18
Ships & Commercial Boats	3.82	3.61	3.92	4.09	4.11	4.42	4.50
Aviation (Intrastate)	3.32	3.17	3.47	3.29	3.78	3.86	3.92
Rail	1.86	1.87	2.48	2.41	2.89	3.32	3.49
Unspecified	3.53	4.25	3.04	2.92	3.01	3.38	3.30
Electric Power	102.59	115.93	101.13	105.04	115.65	106.35	105.92
In-State Generation	59.93	63.86	50.87	49.08	57.40	51.75	56.28
Natural Gas	51.06	55.55	42.42	41.01	48.66	43.21	47.62
Other Fuels	8.87	8.31	8.45	8.07	8.74	8.54	8.67
Imported Electricity	42.66	52.06	50.26	55.96	58.25	54.60	49.63
Unspecified Imports	11.97	19.44	20.20	25.20	26.36	23.33	24.29
Specified Imports	30.69	32.62	30.05	30.76	31.89	31.27	25.35
Commercial and Residential	45.18	43.03	44.68	42.95	44.68	43.90	44.37
Residential Fuel Use	32.20	30.45	30.22	29.88	31.54	30.94	31.12
Natural Gas	28.52	27.34	26.03	26.59	27.30	25.89	26.44
Other Fuels	3.68	3.11	2.19	3.29	4.24	5.04	4.69
Commercial Fuel Use	11.87	11.50	13.38	12.80	12.66	12.82	13.07
Natural Gas	10.24	10.07	12.11	11.34	11.13	10.90	11.44
Other Fuels	1.63	1.43	1.27	1.46	1.53	1.92	1.63
Commercial Cogeneration Heat Output	1.11	1.07	1.08	0.26	0.49	0.15	0.17
Industrial	101.02	98.84	101.01	99.88	94.50	93.71	96.05
Refineries	34.68	34.65	35.13	36.29	35.42	36.82	37.82
General Fuel Use	20.22	19.62	21.69	17.79	17.73	15.45	16.09
Natural Gas	13.82	11.92	12.60	10.26	10.52	9.86	9.56
Other Fuels	6.40	7.70	8.89	7.53	7.21	5.59	6.53
Oil & Gas Extraction [1]	18.55	18.57	17.53	19.69	19.48	18.17	18.64
Fuel Use	17.86	17.74	16.60	19.95	19.11	17.82	17.88
Fugitive Emissions	0.69	0.83	0.73	0.74	0.37	0.35	0.77
Cement Plants	9.53	9.64	9.74	9.85	9.95	10.05	9.90
Clinker Production	5.43	5.52	5.60	5.68	5.77	5.85	5.80
Fuel Use	4.10	4.12	4.14	4.16	4.18	4.20	4.11
Cogeneration Heat Output	11.96	10.69	10.84	10.79	6.19	6.91	6.90
Other Process Emissions	6.08	5.66	6.08	5.48	5.74	6.30	6.69
Recycling and Waste	5.86	5.94	5.89	5.97	5.91	6.21	6.31
Landfills [2]	5.86	5.94	5.89	5.97	5.91	6.21	6.31

**California Greenhouse Gas Inventory for 2000-2006
— by Category as Defined in the Scoping Plan**
million tonnes of CO2 equivalent - (based upon IPCC Second Assessment Report's Global Warming Potentials)

	2000	2001	2002	2003	2004	2005	2006
High GWP	10.94	11.42	12.06	12.90	13.79	14.51	15.15
Ozone Depleting Substance (ODS) Substitutes	8.58	9.44	10.33	11.20	12.08	12.79	13.38
Electricity Grid SF6 Losses [3]	1.13	1.12	1.04	1.01	1.02	1.01	0.99
Semiconductor Manufacturing [2]	1.23	0.86	0.69	0.69	0.69	0.71	0.77
Agriculture [4]	25.46	25.47	28.54	28.66	28.95	29.20	30.13
Livestock	13.53	14.04	14.53	14.90	14.80	15.41	15.68
Enteric Fermentation (Digestive Process)	7.07	7.21	7.42	7.54	7.50	7.70	7.60
Manure Management	6.46	6.84	7.11	7.36	7.29	7.63	7.60
Crop Growing & Harvesting	8.12	7.62	9.63	9.57	9.65	9.19	9.24
Fertilizers	6.95	6.03	8.50	8.45	8.44	7.99	7.86
Soil Preparation and Disturbances	1.07	0.91	1.06	1.04	1.13	1.12	1.31
Crop Residue Burning	0.09	0.07	0.07	0.08	0.07	0.07	0.07
General Fuel Use	3.82	3.81	4.39	4.20	4.50	4.60	5.22
Diesel	2.51	2.68	3.02	2.94	3.15	3.38	3.83
Natural Gas	1.00	0.75	0.95	0.85	0.82	0.69	0.81
Gasoline	0.31	0.38	0.40	0.41	0.52	0.52	0.57
Other Fuels	0.01	0.00	0.00	0.00	0.00	0.00	0.01
Forestry	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Wildfire (CH4 & N2O Emissions)	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Total Gross Emissions	463.19	475.43	474.82	474.50	486.71	479.89	483.87
Forestry Net Emissions	-4.74	-4.54	-4.40	-4.38	-4.36	-4.19	-4.07
Total Net Emissions	458.45	470.89	470.42	470.12	482.35	475.70	479.80

[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 ARB's GHG Emission Inventory sectors

[3] This category is listed in the Electric Power sector of ARB's GHG Emission Inventory sectors

[4] Reflects use of updated USEPA models for determining emissions from livestock and fertilizers

Figure 3-2. California Greenhouse Gas Inventory for 2000-2006



3.2 Status of Federal, State, and Local GHG Regulations

Climate change regulations are quickly evolving. Descriptions of current regulations are detailed in the following sections.

3.2.1 Federal Greenhouse Gas Regulations

Climate change and GHG emission reductions are a concern at the Federal level. In *Massachusetts v. U.S. Environmental Protection Agency (EPA), et al.*, 549 U.S. 497 (2007), the United States Supreme court ruled that GHG does fit within the Federal Clean Air Act (CAA) definition of a pollutant, and that the EPA does have the authority to regulate GHG. On April 17, 2009, the Proposed Endangerment and Cause or Contribute Findings for Green House Gases under the CAA was signed. The endangerment finding proposes that the projected concentrations of six GHGs in the atmosphere threaten the public health and welfare of current and future generations. The cause or contribute finding proposes that the combined emissions of carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and hydrofluorocarbons (HFCs) from new motor vehicles and motor vehicle engines contribute to the atmospheric concentration of key GHGs and the threat of climate change (www.epa.gov/climatechange/endangerment.html). In September 2009, EPA adopted regulations requiring certain GHG emission sources to monitor and report their GHG emissions periodically (this will affect electrical generation sources that contribute to the California grid, and may affect the State Implementation Plan (SIP), but probably will not directly apply to the HRT system) [www.epa.gov/climatechange/emissions/ghgrulemaking.html].

On September 22, 2009, the EPA published the final rule that requires mandatory reporting of GHG emissions from large sources in the U.S. The rule amends CAA Regulations under 40 CFR Parts 86, 87, 89 90 and 94 and provides a new section, Part 98. The reporting would be used by EPA to collect accurate and comprehensive emissions data to inform future policy decisions. The final rule requires that facilities that emit 25,000 metric tons (Mt) or more per year of GHG emissions, such as power plants, submit annual reports to EPA under Subpart C of the Rule. The gases covered by the final rule are CO₂, CH₄, N₂O, HFC, perfluorocarbons (PFC), sulfur hexafluoride (SF₆), and other fluorinated gases including nitrogen trifluoride (NF₃) and hydrofluorinated ethers (HFE). Currently, this is not a transportation-related regulation.

On February 18, 2010 the Council on Environmental Quality (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 the National Environmental Policy Act (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 CO₂e 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.

3.2.2 California Greenhouse Gas Regulations

California has taken proactive steps, briefly described below, to address the issues associated with GHG emissions and climate change.



3.2.2.1 Assembly Bill 1493

In 2002, with the passage of Assembly Bill 1493 (AB 1493), California launched an innovative and pro-active approach to dealing with GHG emissions and climate change at the State level. AB 1493 requires CARB to develop and implement regulations to reduce automobile and light truck GHG emissions. These stricter emissions standards were designed to apply to automobiles and light trucks beginning with the 2009-model year. Although litigation was filed challenging these regulations and EPA initially denied California's related request for a waiver, the waiver request has now been granted (<http://www.epa.gov/otaq/climate/ca-waiver.htm>).

3.2.2.2 Executive Order S-3-05

On June 1, 2005, Governor Arnold Schwarzenegger signed Executive Order S-3-05. The goal of this Executive Order is to reduce California's GHG emissions to: 1) 2000 levels by 2010, 2) 1990 levels by 2020, and 3) 80% below the 1990 levels by 2050. Executive Order S-3-05 also calls for the California Environmental Protection Agency to prepare biennial science reports on the potential impact of continued global warming on certain sectors of the California economy. The latest of these reports, *The Future Is Now: An Update on Climate Change Science, Impacts, and Response Options for California*, was published in May 2009.

3.2.2.3 Assembly Bill 32

In 2006, the goal of Executive Order S-3-05 was further reinforced with the passage of Assembly Bill 32 (AB 32), the Global Warming Solutions Act of 2006. 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 further directs State agencies to begin implementing AB 32, including the recommendations made by the State's Climate Action Team.

Among AB 32's specific requirements are the following:

- CARB shall prepare and approve a scoping plan for achieving the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions from sources or categories of sources of greenhouse gases by 2020 (Health and Safety Code (HSC §38561). The scoping plan, approved by CARB on December 12, 2008, provides the outline for future actions to reduce greenhouse gas emissions in California via regulations, market mechanisms and other measures.
- Identify the statewide level of greenhouse gas emissions in 1990 to serve as the emissions limit to be achieved by 2020 (HSC §38550). In December 2007, the CARB Board approved the 2020 emission limit of 427 million metric tons of CO₂ equivalent (MMTCO₂E) of GHG.
- *Adopt a regulation requiring the mandatory reporting of greenhouse gas emissions (HSC §38530).* In December 2007, CARB adopted a regulation requiring the largest industrial sources to report and verify their greenhouse gas emissions. The reporting regulation serves as a solid foundation to determine GHG emissions and track future changes in emission levels.

**3.2.2.4 Executive Order S-01-07**

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% by 2020.

3.2.2.5 Senate Bill 97

Senate Bill 97 (SB 97) (Chapter 185, 2007) required the Governor's Office of Planning and Research (OPR) to develop draft California Environmental Quality Act (CEQA) guidelines "for the mitigation of GHG emissions or the effects of GHG emissions." OPR was required to "prepare, develop, and transmit" the guidelines to the Natural Resources Agency on or before July 1, 2009.

On April 13, 2009, OPR submitted to the Secretary for Natural Resources its proposed amendments to the CEQA Guidelines for greenhouse gas emissions. On July 3, 2009, the Natural Resources Agency issued notice of proposed rulemaking to adopt CEQA Guidelines amendments pursuant to SB 97. The agency held hearings on the proposed Guidelines amendments in August 2009. The agency transmitted the adopted amendments and the entire rulemaking file to the Office of Administrative Law (OAL) on December 31, 2009. On February 16, 2010, the OAL approved the amendments, and filed them with the Secretary of State for inclusion in the California Code of Regulations. The amendments became effective on March 18, 2010.

3.2.2.6 Senate Bill 375

Senate Bill 375 (SB 375), signed into law by the governor on September 30, 2008, became effective January 1, 2009. This law requires CARB to develop regional reduction targets for GHG emissions, and prompts the creation of regional plans to reduce emissions from passenger vehicle use throughout the state. The targets apply to the regions in the state covered by California's 18 metropolitan planning organizations (MPO). The 18 MPOs have been tasked with creating "Sustainable Community Strategies" (SCS). The MPOs are required to develop the SCS through integrated land use and transportation planning and demonstrate an ability to attain the proposed reduction targets by 2020 and 2035. This would be accomplished through either the financially constrained SCS as part of their regional transportation plan (RTP) or an unconstrained alternative planning strategy, thereby ensuring that transportation funding is consistent with SCS. If regions develop integrated land use, housing and transportation plans that meet the SB 375 targets, new projects in these regions can be relieved of certain review requirements of CEQA, thereby ensuring CEQA streamlining for projects consistent with SCS.

Per SB 375, CARB appointed a Regional Targets Advisory Committee (RTAC) on January 23, 2009, to provide recommendations on factors to be considered and methodologies to be used in CARB's target setting process. The RTAC was required to provide its recommendations in a report to CARB by September 30, 2009. The report would include any relevant issues such as: data needs, modeling techniques, growth forecasts, jobs-housing balance, interregional travel, various land use/transportation issues impacting GHG emissions, and overall issues relating to setting these targets. CARB must propose draft targets by June 10, 2010, and adopt final targets by September 30, 2010. CARB must update the regional targets every eight years (or 4 years if it so chooses) consistent with each MPO update of its RTP. The Southern California Associations of Governments



(SCAG) is actively working with regional leaders to foster consensus-building regarding the implementation strategies for SB375.

3.2.3 South Coast Air Quality Management District CEQA GHG Significance Thresholds

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



4.0 ENVIRONMENTAL IMPACT/ENVIRONMENTAL CONSEQUENCES AND MITIGATION

To ensure that the requirements set forth in OPR’s Technical Advisory on CEQA and Climate Change (“Advisory”) and the incoming new CEQA Guidelines are met, a greenhouse gas emissions analysis was conducted for both the operational and construction phases of the project.

4.1 Operational Assessment

The project has the potential to impact GHG emissions from two major sources—roadway traffic and power requirements. As the power requirements for this project have the potential to generate 25,000 metric tons or more of CO₂e, a qualitative analysis of the project was conducted, as recommended by CEQ’s “Draft NEPA Guidance on Consideration of the effects of Climate Change and Greenhouse Gas Emissions” Memorandum.

4.1.1 Roadways

The project’s impact on roadway traffic is reflected in changes in the region’s vehicle miles traveled (VMT) and associated vehicular speed. This methodology is in agreement with draft inventory guidance being developed by the Greenhouse Gas CEQA Significance Threshold Stakeholder Working Group #9, presented at their working group meeting on March 19, 2009. The “region” is defined as Los Angeles County, and GHG emission burdens are estimated based on the on-road fleet’s GHG emission factors multiplied by VMT. The current version of the California Air Resources Board’s (CARB) emission factor program, referred to as the EMission FACtor model (EMFAC), was used to estimate on-road GHG mobile source emission factors. The current version of the EMFAC program is EMFAC2007. EMFAC2007 GHG emission factors are based on speed, vehicle mix and analysis year. It should be noted that, according to the current version of EMFAC2007, the future fuel economy factors are forecast to improve only slightly between the year 2008 and year 2035. However, this conclusion is an artifact of the current version of EMFAC2007, which does not consider recent regulatory actions. Two recent sets of regulatory actions will almost certainly result in substantial future improvements in fuel economy and CO₂ emission factors:

- The State of California recently enacted legislation requiring dramatic improvements in vehicle fuel economy for all vehicles sold in California.
- EPA updated the Corporate Average Fuel Economy (CAFE) fuel standards, which require substantial improvements in fuel economy for all vehicles sold in the United States, in 2010.

However, the current version of the EMFAC2007 model does not yet account for either of these two important factors. As a result, the current version of EMFAC2007 almost certainly under-estimates the actual fuel economy and overestimates CO₂ emissions in future years.



The results for the region are shown in Table 4-1. Significance thresholds have not yet been established for transportation-related GHG emissions. As such, the predicted emission burden levels have been compared to the emission burden levels calculated for the No Build Alternative.

As shown in Table 4-1, the project is predicted to slightly lower all regional GHG emission burden levels for all alternatives. While all alternatives are predicted to reduce overall GHG emission burden levels within the region, Alternative 5 is predicted to demonstrate the largest reduction, as compared to the No Build Alternative.

Table 4-1. Regional Roadway CO_{2e} Emission Burden Assessment (Metric Tons/Day)

Alternative	VMT			CO _{2e}	
	Daily Vehicle Miles Traveled	Percent change from No Build	Emission Burden (Metric Tons/day)	Change from No Build (Metric Tons/day)	Percent change from No Build
No Build	504,651,236		359,678		-
TSM	504,622,466	0.0%	359,670	-8.0	0.0%
MOS 1	504,307,899	-0.1%	359,417	-260.5	-0.1%
MOS 2	504,299,031	-0.1%	359,415	-262.8	-0.1%
1	504,294,153	-0.1%	359,423	-254.8	-0.1%
2	504,291,236	-0.1%	359,428	-250.1	-0.1%
3	504,285,368	-0.1%	359,428	-250.0	-0.1%
4	504,288,349	-0.1%	359,424	-253.3	-0.1%
5	504,281,492	-0.1%	359,408	-269.7	-0.1%

4.1.2 Power Requirement

The proposed project will require electrical power for vehicle propulsion and station operation. The generation of this power will 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 power demand calculated as part of the Energy Technical Report for this project. The estimated GHG emission burden generated due to the increased power usage is shown in Table 4-2. Alternative 5 is predicted to require the most energy and thus will result in the largest increase in CO_{2e} emissions, as compared to the No Build Alternative. It should be noted that the energy profile for the state of California reflects the currently energy generation mix. It is expected that these levels will be lower in the future due to the State’s policy to increase the use of green energy sources.



Table 4-2. CO_{2e} Emission Burdens from Rail Power Requirements (Metric Tons/Day)

Alternative	Emission Factor CO _{2e} (Metric Tons/MWH)	Estimated Electric Usage	Total CO _{2e} (Metric Tons/Day)	% Change from No Build
No Build	0.32	5004.1	1,601	-
TSM	0.32	5005.3	1,602	0%
MOS 1	0.32	5115.5	1,637	2%
MOS 2	0.32	5312.2	1,700	6%
1	0.32	5451.3	1,744	9%
2	0.32	5501.1	1,760	10%
3	0.32	5675.8	1,816	13%
4	0.32	5510.9	1,763	10%
5	0.32	5695.6	1,823	14%

4.1.3 Total Operational GHG Emissions

As shown in Table 4-3, combining the emission burdens from the reduced roadway VMT (Table 4-1) with the emission burdens due to power usage (Table 4-2) for each alternative, the Build Alternatives are predicted to have a slightly beneficial, though no measurable impact on overall CO_{2e} emissions. MOS 1 shows the biggest percent change (a decrease of 0.06%) in daily CO_{2e} emissions, when compared to No Build. The values presented in Table 4-3 however are conservative estimates due to the CO_{2e} emission factors applied to the power requirements. The CO_{2e} emission factors represent the current energy profile of California. In the future, it is anticipated that the energy profile of California will reflect a larger percentage of clean energy sources, which would result in a lower CO_{2e} emission rate per kilowatt hour. As such, it is anticipated that the CO_{2e} emissions from future power requirements for the system will be lower than those used in this analysis.

Table 4-3. 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 No Build
No Build	359,678	1,601	361,279	-
TSM	359,670	1,602	361,271	0.00%
MOS 1	359,417	1,637	361,054	-0.06%
MOS 2	359,415	1,700	361,115	-0.05%
1	359,423	1,744	361,167	-0.03%
2	359,428	1,760	361,188	-0.03%
3	359,428	1,816	361,244	-0.01%
4	359,424	1,763	361,188	-0.03%
5	359,408	1,822	361,231	-0.01%

4.2 Construction Assessment

An assessment of the GHG construction impacts was conducted. The assessment utilized SCAQMD OFFROAD 2007 and EMFAC2007 emission factors, both of which are



key elements in the URBEMIS2007, Version 9.2.4 program. SCAQMD OFFROAD2007 was used to develop emission factors from off-road construction equipment. Worker and delivery trip emission factors were estimated using the EMFAC2007 emission factor model. Using these various data sources, daily construction emission levels were developed. There are currently no significance thresholds for CO₂e, though the SCAQMD is currently developing them. As the construction schedule is very preliminary at this time, construction emissions were estimated for each major activity. Once a detailed construction schedule is developed, a more refined construction analysis can be conducted to determine the air quality impacts of construction.

Table 4-4. Estimated CO₂e Emission Burdens for Project Design Elements (Metric Tons/day)

Activity	CO ₂ e
Typical Station with Mining	
Construction Equipment	35
Mobile Sources (Deliveries, worker trips, hauling of material, etc.)	5
Total	40
Typical Station with No Mining	
Construction Equipment	8
Mobile Sources (Deliveries, worker trips, hauling of material, etc.)	4
Total	12
Maintenance Facility	
Construction Equipment	17
Mobile Sources (Deliveries, worker trips, hauling of material, etc.)	1
Total	18

4.3 Project Consistency with GHG Regulations

The project is consistent with GHG regulations as it does not measurably increase GHG emissions. It is predicted to reduce GHG emissions from roadway vehicles due to predicted reductions in VMT. Furthermore, it should be noted that SB 375, which calls for the integration of land use and transportation planning, should result in an even further decrease in VMT due to greater density around stations and increased ridership.

The additional power generation required by the project will result in an increase in GHG emissions. It should be noted, however, that the energy profile for the State of California reflects the current energy generation mix. It is expected that these levels will be lower in the future due to the State’s policy to increase the use of green energy sources. Furthermore, additional mitigation measures related to power generation, such as conservation, land use and transportation measures, could result in a decrease in the power requirements and associated GHG emissions of the project in the future.

The increase in GHG emissions from the power requirements of the project is predicted to be lower than the decrease in GHG emissions due to reductions in VMT. Therefore, the project is predicted to provide a net decrease in GHG emissions. The benefit of



shifting the GHG emissions from roadway vehicles (VMT) to power generation plants is that in the future, the State's policy to increase the use of green energy sources should provide a lower energy profile for the project.

It is expected that this project will be a key element in aiding the area to achieve its goal of compliance and consistency with the Global Warming Solutions Act, with regards to the regional greenhouse gas reduction targets and potential sustainable communities strategies in the Regional Transportation Plan, and with SB 97 (2007 Statutes, Ch.18) and the resultant new CEQA Guidelines addressing greenhouse gas emissions. Although there is currently a relatively small overall decrease in GHG emissions with the project, the GHG reductions are predicted to become even greater in the future with the use of more green energy sources and increased ridership from the implementation of SB 375.

4.3.1 Cumulative Impacts

Cumulative impacts are impacts on the environment that result from the incremental impact of a project when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (40 CFR § 1508.7)

The project was analyzed using traffic projections that take into account the foreseeable future. Though a conformity analysis is not done for GHG at this time, the project is included in the Draft Amendment #08-34 to the 2008 Regional Transportation Improvement Plan (RTIP) as Project ID #UT101, #1TR1002 and #1TR1003 (refer to page 5 of Draft Amendment). The Westside Subway Extension is also included in Metro's 2009 Long Range Transportation Plan (LRTP) under Candidates for Private Sector Financial Participation—Transit Projects (refer to Figure K on page 25). As such, the project is part of a program that accounts for future criteria pollutant emissions from all mobile sources and ensures that attainment will not be delayed by future projects.

Furthermore, when considering the combined effect of reduced roadway VMT and increased power usage for the rail system, most of the project alternatives show a reduction in GHG emissions, though the reduction is extremely small. As such, this project is not expected to have a cumulative impact on the environment.

5.0 REFERENCES

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