4.3 Visual Quality

Physical changes to a man-made environment (e.g., buildings and streets) or natural environment (e.g., mountains and trees) can change the quality or character of views to these environments. This section summarizes Federal, State and local regulations that guide the consideration, preservation, and protection of scenic resources, views, and visual quality and character. This section also describes the existing visual environment (what can be seen within the Study Area), the physical changes that would occur to that environment as a result of implementing the Project, and the resulting change to visual quality or aesthetic character (sense of beauty). Based on consideration of the regulatory setting and affected environment within the Study Area, an assessment of the potential for impacts, both beneficial and negative, and recommended strategies for avoiding, minimizing, or mitigating negative impacts was conducted. The overall findings of the visual assessment are that the station designs would complement the areas in which they are located and not alter their visual quality. The information presented in this section summarizes the *Westside Subway Extension Project Visual and Aesthetic Resources Impact Technical Report*.

4.3.1 Regulatory Setting

The Project is required to consider potential impacts to the existing visual environment. This requirement is based on Federal, State, and local rules and policies. These rules and policies focus on preserving visual quality, minimizing conflicts, improving aesthetic character, and mitigating adverse effects. The Federal, State, and local regulations and policies that affect this Project are listed below, with a brief explanation.

Federal

- National Environmental Policy Act (NEPA) (42 USC 4321-4347)—Federal government is to "use all practicable means" to ensure a pleasant visual environment
- Code of Federal Regulations (23 CFR 771)—Urban mass transit projects must consider adverse impacts to aesthetic values
- Federal Transit Authority (FTA) Circular 9400.1A, *Design and Art in Transit Projects*—Encourages using design and art in transit projects
- Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (PL 109-59) (SAFETEA-LU) Sections 6002-6009—Emphasizes consideration of context-sensitive solutions and using visualization techniques to improve public understanding
- U.S. Department of Transportation (USDOT) Act, Section 4(f) —Focuses on preserving aesthetic integrity for parks, recreational facilities, wildlife and waterfowl refuges, and historic sites
- Historic Preservation Act of 1966, Section 106—Furthers preserving historic resources to include their setting (visual environment)

State

The California Environmental Quality Act (CEQA) (Public Resources Code, Div 13, Sec. 21000-21177) and State CEQA Guidelines (14 CCR 15000-15387 with appendices)—

requires consideration of project effects on the quality of the environment to include history, context, and area sensitivity

Local

The following planning policies of the County of Los Angeles and the Cities of Los Angeles, West Hollywood, Beverly Hills, and Santa Monica apply to the Project:

- Beverly Hills General Plan
- Century City North Specific Plan
- Greening Century City Plan
- Park Mile Specific Plan
- Santa Monica Land Use and Circulation Element
- West LA Community Plan
- West Wilshire Boulevard Plan
- Westwood Village Specific Plan

4.3.2 Affected Environment/Existing Conditions

This section describes the Study Area's existing visual environment, its general character, key features, and overall visual quality.

Because the Project is primarily a subway where trains would travel underground, the visual impact would be limited to station areas and maintenance facility sites. The visual Study Areas, or viewsheds, are the areas that have a view of the stations. The viewshed includes the area within one-half mile of a given viewpoint unless other elements such as terrain, vegetation, or buildings are blocking views.

Overall, the Study Area's visual setting varies and includes a combination of residential, commercial, transportation and utilities, industrial, and public/institutional buildings of varied height and scale. Residences, both single-family and multi-story apartments and condominiums, are the primary land use. Commercial buildings are concentrated along major roadways, such as Wilshire and Santa Monica Boulevards and La Brea, Fairfax, and La Cienega Avenues.

The existing visual quality of each station area was categorized as low, moderate, or high, as follows.

- **Low Visual Quality**—Areas that have low visual quality exhibit features that seem visually out of place, lack visual consistency, do not have well organized parts, and contain eyesores.
- **Moderate Visual Quality**—These areas are generally pleasant appearing but may lack any distinct or memorable features and harmony of organization, or may be common and ordinary landscapes that lack strong and consistent design features.
- **High Visual Quality**—These areas tend to be memorable, distinctive, unique (in a positive way), intact natural or park-like areas, or urban areas with strong and consistent design features.

Table 4-12 briefly summarizes the proposed stations' visual character and their category. There is a photo for each station area included, and the location and/or feature where the photo was taken appears at the end of the general visual character descriptions.

4.3.3 Environmental Impacts/Environmental Consequences

This visual impact assessment focuses on areas where the Project would affect the visual environment. Analyzing potential visual impacts includes evaluating the following effects:

- Conflicts with or compliments the existing visual character
- Changes in visual quality
- Effects on viewers (considers viewer sensitivity)
- Intrudes on or blocks sensitive views (emphasizes views protected by local jurisdictions)
- Creates shadows
- Creates new light or glare sources

No Build Alternative

The No Build Alternative would not result in visual changes beyond those previously considered for approved projects; therefore, no visual impacts would occur.

Transportation System Management Alternative

The Transportation System Management (TSM) Alternative expands the bus services. These activities would not affect visual resources and community character.

Build Alternatives

Table 4-12 summarizes the visual impacts associated with each station. In the visual environment, effects are related to the visibility of station components and tunnel ventilation structures. Typical station components include signage; lighting; streetscape amenities, such as benches, landscaping, special paving, and art; and bicycle facilities, such as racks or lockers. The below-ground station components visible to viewers would include escalators, elevators, stairs, and station waiting area platforms. Other support facilities such as traction power substations would be located within the stations. The location of these support facilities would be noticeable when located at the surface, but would not result in dramatic effects to the visual environment Emergency generators would be visible facilities on the surface near the following stations: Wilshire/La Brea, Wilshire/Rodeo, Century City (either Santa Monica Boulevard or Constellation Boulevard), Westwood/VA Hospital, and Wilshire/26th Street. The emergency generators would be completely enclosed in small metal buildings, about 20 feet by 60 feet in size, and sited on property of about 50 feet by 100 feet. Although they would be noticeable in views, the buildings would be screened from public view with a wall or fence. In addition, exterior landscaping would be installed around the site per the regulations of the jurisdiction where the facilities would be located.

In addition to the typical station components, three entrance types would be used for stations: plazas with covered entries, entries integrated with existing buildings, and entries incorporated into future joint developments. Open plazas adjacent to the buildings would be affected by some station entrances. These plazas are discussed in Table 4-12. In most of the cases, the entrances would impact the landscaping and plaza design. The landscape designs in these plazas would be removed and replaced in kind.

The plazas would be redesigned to accommodate the station entrance area and the associated canopy structure.

Based on the urban design analysis conducted, it was determined that stations may contribute to improved visual quality within the neighborhoods where they would be located (*Station Planning & Urban Design Concept Report*). This determination was based on design guidelines that include, but are not limited to, the following:

- Preserve and enhance the unique cultural identity of each station area and its surrounding community by implementing art and landscaping
- Promote a sense of place, safety, and walkability by providing street trees, walkways or sidewalks, lighting, awnings, public areas, and street furniture

Design of the station entrances is expected to complement the cultural, historic, geographic, and aesthetic character of the surrounding areas. Where practicable, entrances would be integrated into existing buildings or could be integrated into future development.

Table 4-12 also includes the potential visual impacts that may result for each station.

In addition to the typical station components, three entrance types would be used for stations: plazas with covered entries, entries integrated with existing buildings, and entries incorporated into future joint developments. To illustrate how station areas may appear after construction, simulations were prepared for the following six stations:

- Wilshire/La Brea (Figure 4-25)
- Wilshire/Fairfax (Figure 4-26)
- Wilshire/ La Cienega (Figure 4-27)
- Wilshire/Rodeo (Figure 4-28)
- Wilshire/4th (Figure 4-29)
- Hollywood/Highland (Figure 4-30)

Table 4-12. Stations, Rail Operations Center, and Maintenance Facility Visual Character, Category, and Potential Impacts

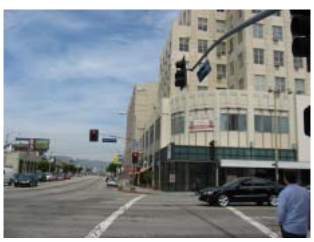
Station/Facility (Alternatives)	General Visual Character	Category	Potential Visual Impacts
Wilshire/Crenshaw (Alternatives 1, 2, 3, 4, 5, MOS 1, MOS 2)	Mixed commercial and residential uses; moderate visual order and consistency; some notable visual resources, including Hancock Park neighborhood, Harbor Insurance, Los Altos Apartments, Modern Scottish Rite Temple, Queen Anne Higgins/Verbeck/Hirsch, Gothic Revival Wilshire United Methodist Church, and Renaissance Revival Ebell of Los Angeles Women's Club.  *Looking west on Wilshire Boulevard from intersection with Crenshaw Boulevard*	Moderate: generally pleasant appearance.	Entrance plaza area design is expected to complement the cultural, historic, geographic, and aesthetic character of the low-density residential areas to the north and south of Wilshire Boulevard and the local aesthetic of Hancock Park neighborhood and the neighborhood's Art Deco history. Portal-defining lighting and signage impacts would be minimal. The station would not alter scenic vistas.
Wilshire/La Brea (Alternatives 1, 2, 3, 4, 5, MOS 1, MOS 2)	Located in the Miracle Mile District of Los Angeles, a designated scenic highway. Variety of retail and mixed-uses; varying building heights; large surface parking lots; prominent and notable visual resources include vegetation, landscaping, buildings, and distant vistas. Notable Art Deco buildings include the E. Clem Wilson (or "Samsung"), which has a large iconic vibrant neon sign atop; the Dominguez-Wilshire; the historical El Rey Theater; and the Wilshire Tower. The Prudential Insurance building is an example of Modern architecture.  *Looking north on S. La Brea Avenue to Santa Monica Mountains*	Moderate: generally pleasant appearance but lacking strong consistent architectural and urban design features.	Design of the entrance plaza area is expected to complement the aesthetic of the area's Art Deco character. Within Miracle Mile Corridor, but no adverse impacts to the scenic highway would occur. The station entrance may contribute to improving visual quality along the Miracle Mile Corridor. Portal-defining lighting and signage impacts would be minimal. The station would not alter scenic vistas.

Table 4-12. Stations, Rail Operations Center, and Maintenance Facility Visual Character, Category, and Potential Impacts (continued)

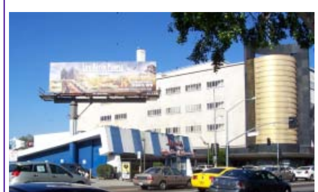
Station/Facility (Alternatives)	General Visual Character	Category	Potential Visual Impacts
Wilshire/Fairfax (Alternatives 1, 2, 3, 4, 5, MOS 1, MOS 2)	Home to several regional visual resources; the Los Angeles County Museum of Art (LACMA), the La Brea Tar Pits, Hancock Park, and the Petersen Automotive Museum. Buildings are multi-story (1-15 stories). Tall palm trees and other street trees are planted in center medians along Wilshire Boulevard, and Hancock Park is landscaped and includes several mature trees. Several buildings with noteworthy architectural styles, including the Petersen Automotive Museum, the LACMA building, May Company/LACMA West building, and Johnie's Coffee Shop. Johnie's is considered to be a landmark structure, a well known example of Googie style architecture and is listed under the National Register of Historic Places and California Register of Historic Resources.  *Johnie's Coffee Shop and May Company*	Moderate: generally pleasant appearance but lacking strong consistent architectural and urban design features.	The aboveground station components are expected to complement the regional visual resources along Wilshire Boulevard, such as the LACMA West building and Petersen Automotive museum buildings, within the Miracle Mile Corridor. A station entrance is located in between Johnie's and the retail stores to avoid intrusion on the structure. The station entrance may contribute to improving visual quality along the Miracle Mile Corridor. Portal-defining lighting and signage impacts would be minimal. The station would not alter scenic vistas. No adverse impacts to scenic highways would occur.
Wilshire/La Cienega (Alternatives 1, 2, 3, 4, 5, MOS 2)	S. La Cienega Boulevard includes "Restaurant Row." The Flynt Building is a prominent visual resource with its unique oval shape and a plaza with the John Wayne statue and a view of the historic Art Deco Fox Wilshire Theater. The historical Clock Market, now the Beverly Hills Porsche-Audi Dealership, is a unique example of the Spanish Revival architectural style. The building is also an example of the car-oriented development that was built along Wilshire Boulevard in the 1920s. The Wilshire Theater is an Art Deco monument. Newer commercial architecture is more eclectic with a mix of Modern, International, Post-Modern, and non-descript building styles. La Cienega is a prominent neighborhood open space.  *Flynt Building Plaza, John Wayne statue, and Fox Wilshire Theater*	High: because of its distinctive and unique architectural features.	The Flynt building and the iconic statue of John Wayne are prominent visual features, and the station entrance would change the setting and visual character at the intersection of Wilshire Boulevard and S. Hamilton Drive. At the southwest station entrance, the statue and landscape in front of the Flynt publications building will have to be relocated and reinstalled in kind. The entrance to the building will be visually hidden and access area to the building will be reduced. However, this change would not be significant. Portal-defining lighting and signage impacts would be minimal. The station would not alter scenic vistas.

Table 4-12. Stations, Rail Operations Center, and Maintenance Facility Visual Character, Category, and Potential Impacts (continued)

Station/Facility (Alternatives)	General Visual Character	Category	Potential Visual Impacts
Wilshire/Rodeo (Alternatives 1, 2, 3, 4, 5, MOS 2)	High-end retail, hotel, commercial, gallery, and mixed-uses; densely developed with limited open-space areas; unique and varied architecture; memorable views of the Santa Monica Mountains and slopes of Beverly Hills. The predominant architectural style is eclectic with Modern, Neo-Traditional, International, Art Deco, and less distinguishable commercial, retail, and mixed-use buildings. Prominent visual resource include the Beverly Wilshire Hotel; nearby neighborhood includes a variety of residential architectural styles, including bungalow, Spanish Eclectic, courtyard, Tudor, and Colonial styles, among others. Prominent buildings that contribute to the visual character include the California Bank Building. an Art Deco wedding-cake-style building; Security Pacific Plaza with its modern architecture; the Usonian Anderton Court Shops and its steeple, designed by Frank Lloyd Wright; the Saks Fifth Avenue building's Hollywood Regency Modern architecture; and the Home Federal Savings Building, which showcases Modern architecture with its white parabolic arches and window boxes.  *Looking west on Wilshire Boulevard*	High: strong and consistent architectural and urban design features.	One station entrance is located on the open plaza at the intersection of Wilshire and Canon Drive. The landscape design at the plaza will be removed and replaced in kind. The design of the station entrances are expected to complement the eclectic, Modern, Neo-Traditional, International, Art Deco, and less distinguishable buildings that contribute to the area's visual character. Portal-defining lighting and signage impacts would be minimal. The station would not alter scenic vistas.
Century City (Alternatives 1, 2, 3, 4, 5, MOS 2)	Dense auto-oriented urban center with tall buildings and wide boulevards; multi-level plazas with pedestrian overpasses; the Century City high-rises are a visual landmark; prominent buildings contribute to the visual character; views are limited, but include distant mountains and the Hollywood sign; mature trees, corporate plazas, and banners are prominent visual elements. Prominent buildings that contribute to the visual character include the curved Century Plaza Hotel and the Century Plaza Towers.  *Looking south on Avenue of the Stars*	Moderate: generally pleasant appearance, but lacking strong consistent architectural and urban design features.	The landscape and water fountain in front of office building on the southeast corner of Santa Monica/ Avenue of Stars will be removed and relocated/ replaced to accommodate a station entrance. Designs for the above-ground station components are expected to complement the prominent buildings that contribute to the area's visual character. Portal-defining lighting and signage impacts would be minimal. The station would not alter scenic vistas.

Table 4-12. Stations, Rail Operations Center, and Maintenance Facility Visual Character, Category, and Potential Impacts (continued)

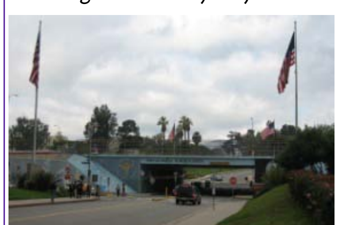
Station/Facility (Alternatives)	General Visual Character	Category	Potential Visual Impacts
Westwood/UCLA (Alternatives 1, 2, 3, 4, 5)	Dense development contrasts with open expanse of Veterans cemetery and pedestrian-scale Westwood Village; prominent and defining features are views of Santa Monica Mountains, palm trees, overhead power lines, street lighting, wall-style and stand-alone billboards, and I-405 freeway. The predominant Westwood Village architectural style is Mediterranean, with tile roofs, decorative Spanish tile, courtyards, paseos, and patios. Notable buildings include the Janss Investment Company with its prominent dome and portico; the Fox Theater and Ralph's Grocery Store with its red-tiled Spanish Revival roof; and the Hammer Museum with its large gray and white stripes. The National Cemetery, Westwood Park, and Westwood Memorial Park Cemetery provide open expanses.  *Hammer Museum at Westwood Village entrance*	High: distinctive and unique architectural features.	Designs of the above-ground station components for both options would complement the surrounding mid- to high-rise residential towers, hotels, and office buildings. Portal-defining lighting and signage impacts would be minimal. The station would not alter scenic vistas.
Westwood/ VA Hospital (Alternatives 2, 3, 4, 5)	Large, open landscaped areas surround the VA Hospital; prominent features include I-405, overhead utilities, large billboards, and wall-type signage; views include Santa Monica Mountains, Hollywood Hills, and tall buildings in Century City.  *Underpass on Wilshire Boulevard*	Moderate: generally pleasant appearance, but lacking strong consistent architectural and urban design features.	Designs of the above-ground station components for both options would complement the surroundings. None of the components for either station option would conflict with the area's character, which includes large parking lots and other buildings on the VA property. Portal-defining lighting and signage impacts would be minimal. The station would not alter scenic vistas.
Wilshire/Bundy (Alternatives 3, 5)	Mixed residential and commercial uses with a variety of unremarkable architecture; billboards are defining visual features; views include VA Hospital campus, Wilshire Boulevard office towers, and distinct palm trees. Prominent features include overhead utilities, street lights, billboards, and palm trees. The area's architectural style is eclectic, with some International-style glass towers.  *Looking north across Wilshire Blvd at Bundy Drive*	Moderate: generally pleasant appearance, but lacks strong consistent architectural and urban design features.	The designs for the above-ground station components are expected to complement the surrounding office towers and smaller one- and two-story buildings that contribute to the area's visual character. Portal-defining lighting and signage impacts would be minimal. The station would not alter scenic vistas.

Table 4-12. Stations, Rail Operations Center, and Maintenance Facility Visual Character, Category, and Potential Impacts (continued)

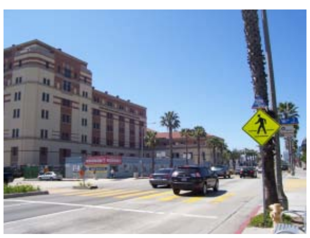
Station/Facility (Alternatives)	General Visual Character	Category	Potential Visual Impacts
Wilshire/ 26th Street (Alternatives 3, 5)	Mix of retail, commercial, and residential uses, architectural styles in various heights, shapes, and sizes; notable features include buildings, a mural, Douglas Park, brightly painted crosswalks, distant views of the Santa Monica Mountains, office towers on Wilshire Boulevard, palm trees, and an intermittent landscaped median. The most prominent building is a three-story mustard-shade commercial/office building with a turret on the southwest corner.  *Looking west on Wilshire Boulevard from 26th Street intersection*	Moderate: generally pleasant appearance, but lacks strong consistent architectural and urban design features.	Designs for the above-ground station components are expected to complement the eclectic mix of architectural styles of varying heights, shapes, and sizes that contribute to the area's visual character. Portal-defining lighting and signage impacts would be minimal. The station would not alter scenic vistas.
Wilshire/ 16th Street (Alternatives 3, 5)	Mixed urban setting with a variety of building heights, setbacks, and lot sizes; distinct and dominant features include UCLA Medical Center and palm trees with thick trunks; views include 100 Wilshire Tower, other office towers, billboards, the Santa Monica Mountains, and on clear days, the Pacific Ocean .  *UCLA Medical Center*	High: strong and consistent architectural and urban design features.	The plaza in front of the Santa Monica UCLA Medical Center would be reconfigured to accommodate the southwest entrance to the station. Designs for the above-ground station components are expected to complement the variety of low- and mid-rise commercial buildings, as well as the distinctive UCLA Medical Center. Portal-defining lighting and signage impacts would be minimal. The station would not alter scenic vistas.
Wilshire/4th Street (Alternatives 3, 5)	In the core of Downtown Santa Monica near Third Street Promenade (one of the busiest shopping districts in the Los Angeles region) and Santa Monica Beach; densely developed mix of office buildings, apartments, shops, and restaurants; variety of architectural styles (eclectic, Modern, Post-Modern, Art Deco, and Streamline Moderne); prominent visual resources include California Bank & Trust building and palm trees along Wilshire Boulevard; awnings, street furniture, bus shelters, and a variety of pedestrian amenities create a pedestrian-friendly environment.  *South from Wilshire Boulevard down the Third Street Promenade*	High: strong and consistent architectural and urban design features.	The plaza structure at the intersection of Wilshire Blvd. and 4th Street in front of the 12 story office building would be removed and redesigned to accommodate a station entrance. Designs for the above-ground station components are expected to complement the area's eclectic mix of Modern, Post-Modern, Art Deco, and Streamline Moderne architecture. Portal-defining lighting and signage impacts would be minimal. The station would not alter scenic vistas.

Table 4-12. Stations, Rail Operations Center, and Maintenance Facility Visual Character, Category, and Potential Impacts (continued)

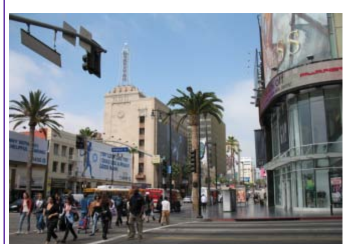
Station/Facility (Alternatives)	General Visual Character	Category	Potential Visual Impacts
Hollywood/ Highland (Alternatives 4, 5)	Heart of historic Hollywood supporting a major entertainment/tourist center with theaters, museums, restaurants, hotels, and shopping; a mix of building shapes and sizes and frequent parking lots create variety; prominent visual features include 13-story 1920s First National Bank Building, Chinese Theater, Hollywood/Highland mega-mall complex, two-story Ripley's "Believe it or Not" Museum, simple two-story shop front, and billboards and building-size billboards. Views include Hollywood Hills, Hollywood United Methodist Church, historic Hollywood corridor, and Mid-Wilshire corridor; over-sized billboards; tall, thin palm trees; star-studded sidewalk; and historic buildings make Hollywood/Highland an important visual resource for entire LA region.  *Looking west on Hollywood Boulevard at the Historic El Capitan Theater with Hollywood/ Highland Development to the right*	High: distinct and unique architectural features with several memorable and unique visual features.	Designs for the above-ground station components are expected to complement the area's diverse visual character, which includes an eclectic mix of building shapes and sizes. Portal-defining lighting and signage impacts would be minimal. The station would not alter scenic vistas.
Santa Monica/ La Brea (Alternatives 4, 5)	Eastern gateway to West Hollywood; prominent visual feature is a large, two-story retail development; major commercial corridors with billboards, strip malls, fast-food businesses, pleasant sidewalk-oriented buildings, older industrial buildings with few windows, and some pedestrian-friendly amenities; visual features include historic Formosa Café and Poinsettia Recreation Center  *West Hollywood Gateway Development at southwest corner*	Moderate: generally pleasant appearance, but lacks strong consistent architectural and urban design features.	The outdoor dining area on the southwest corner of Santa Monica Boulevard and La Brea Avenue would be removed and redesigned to integrate the southwest station entrance. Designs for the above-ground station components are expected to complement the area's tightly knit commercial character. Portal-defining lighting and signage impacts would be minimal. The station would not alter scenic vistas.

Table 4-12. Stations, Rail Operations Center, and Maintenance Facility Visual Character, Category, and Potential Impacts (continued)

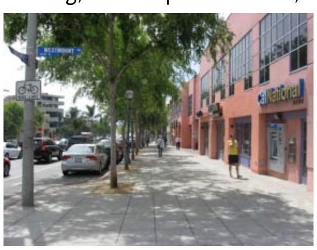
Station/Facility (Alternatives)	General Visual Character	Category	Potential Visual Impacts
Santa Monica/ Fairfax (Alternatives 4, 5)	Gateway to "east" part of West Hollywood; major commercial corridors with a mix of shops, restaurants, and bars backed by integrated residential neighborhoods; a strip-mall tower is a visual landmark in the area; Santa Monica Boulevard is the primary open space and supports attractive and pedestrian-friendly amenities; Fairfax Avenue carries traffic from major attractions, including the Farmer's Market at the Grove and a historic district (containing the famous Canter's Deli), to Sunset Boulevard at the foot of the Hollywood Hills; views include the Hollywood and Baldwin Hills; billboards are a prominent feature .  *Strip mall tower*	High: strong and consistent architectural and urban design features.	Designs for the above-ground station components are expected to complement the area's diverse visual character, which includes a diverse mix of shops, restaurants, and bars. Portal-defining lighting and signage impacts would be minimal. The station would not alter scenic vistas.
Santa Monica/ San Vicente (Alternatives 4, 5)	Vibrant entertainment district with restaurants, bars, clubs, and shops; similar-sized, street-facing buildings on small lots and a varied mix of one- to two-story buildings; billboards providing a sense of Hollywood are a defining feature; wide sidewalks, streets trees, café seating, landscaped medians, and rotating public art provide a sense of open space; views include the Hollywood Hills and the iconic Emser Tile building.  *Looking west on Santa Monica Boulevard*	High: strong and consistent architectural and urban design features.	Designs for the above-ground station components are expected to complement the area's eclectic, varied buildings and the Santa Monica Boulevard "Main Street" beautification project. Portal-defining lighting and signage impacts would be minimal. The station would not alter scenic vistas.
Beverly Center (Alternatives 4, 5)	Beverly Center occupies an entire block and is a prominent visual feature; the Beverly Center and Cedars Sinai Hospital create a canyon effect along Beverly Boulevard; buildings along San Vicente Boulevard are more pedestrian scaled; commercial buildings with mixed architectural styles and small California-style residential bungalows with well-kept yards; parking lots occupy key urban spaces, and irregularly planted street trees provide little continuity.  *Looking north on Beverly Boulevard toward the Beverly Center*	Moderate: generally pleasant appearance, but lacks strong, consistent architectural and urban design features.	Designs for the above-ground station components would complement commercial buildings in the area. Portal-defining lighting and signage impacts would be minimal. The station would not alter scenic vistas.

Table 4-12. Stations, Rail Operations Center, and Maintenance Facility Visual Character, Category, and Potential Impacts (continued)

Station/Facility (Alternatives)	General Visual Character	Category	Potential Visual Impacts
Division 20 Maintenance and Storage Facility, South Expansion Yard between 4th and 6th Streets (Alternatives 1, 2, MOS 1, MOS 2)	Industrial area with maintenance buildings, several rows of rail tracks, paving, and no landscaped areas; prominent visual features include two bridges over the LA River built in 1929 and 1930, which are good examples of the City Beautiful style; no notable views from the site; however, the site is visible from an architectural school.  *Looking north toward the 4th Street Bridge from Santa Fe Avenue*	Low, lacks visual order and harmony, plus land uses include heavy industry; contains overhead power lines and flood lights on tall poles.	Visible changes would include new trackwork and modifying existing buildings. These changes would not result in significant visual impacts to surrounding viewers because the sites are surrounded by relatively wide streets/highways and paved areas that act as visual buffers. In addition, surrounding land uses are industrial, and no important visual resources are in proximity to either of the proposed sites. No changes to visual character or quality would occur, and the facility would not be highly visible to large numbers of people. Although the 4th and 6th Street Bridges over the LA River are prominent visual features that frame each boundary of the site, their visual setting would not be adversely affected.
Union Pacific Railroad Los Angeles Transportation Center Rail Yard (Alternatives 3, 4, 5)	Site is mainly concrete open space parking and circulation areas for trucks containing a single building, railroad tracks, and heavy industrial uses; site is adjacent to the LA River; recent LA River Revitalization Master Plan calls for greening and open space improvements along the river and across the river to the west; I-5, U.S. Highway 101, and the LA River visually isolate the site, but increased grades to the east allow for views to and from the river, which include the LA County Hospital, the USC Medical Center area, and commercial, industrial, and residential buildings; views south include tall buildings in Downtown LA  *Looking east toward the LA County Hospital and the USC Medical Center on the hill*	Low: lacks visual order and harmony, plus land uses include heavy industry; contains overhead power lines and flood lights on tall poles.	Visible changes would include new trackwork and modifying existing buildings. A new rail bridge would be constructed over the LA River and the historic Union Pacific Bridge. The new rail bridge would be visible in territorial views to the south from the residential neighborhood northwest of the site, but it would not be a dominant feature or change the neighborhood's visual character or quality. The new rail bridge would, however, change the visual setting of the historic Union Pacific Bridge below it. Views from areas surrounding the site are already affected by the existing industrial setting. Other than the Union Pacific Bridge, no important visual resources are in proximity to the site.

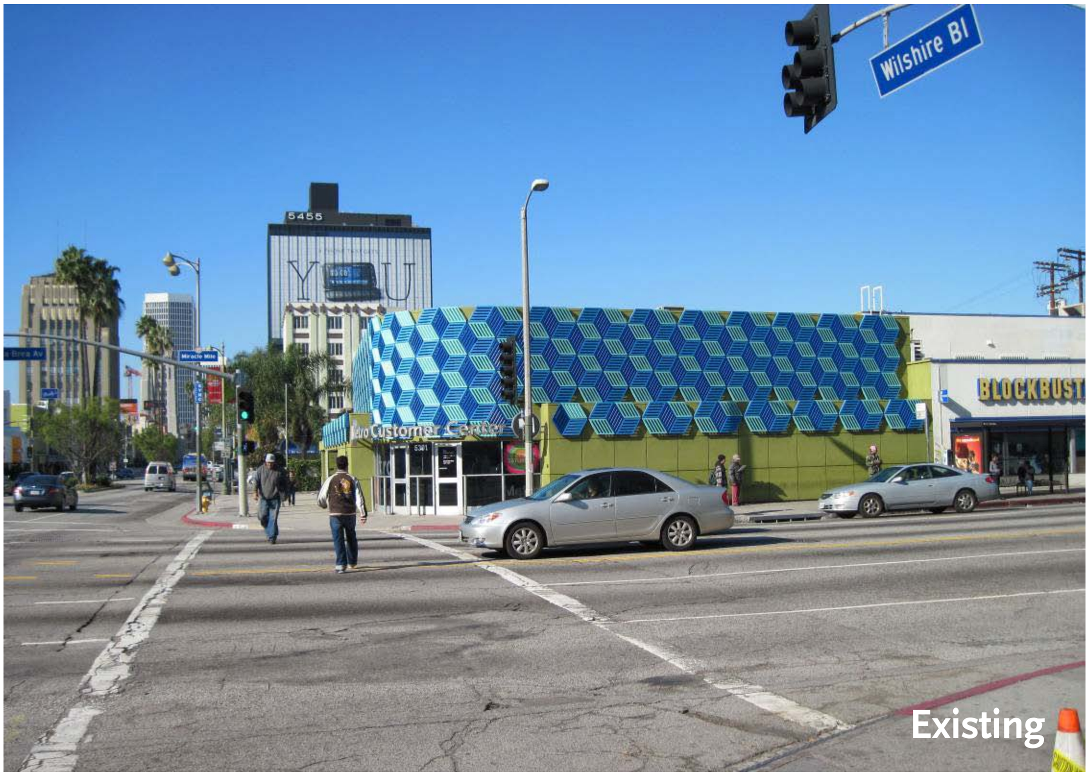


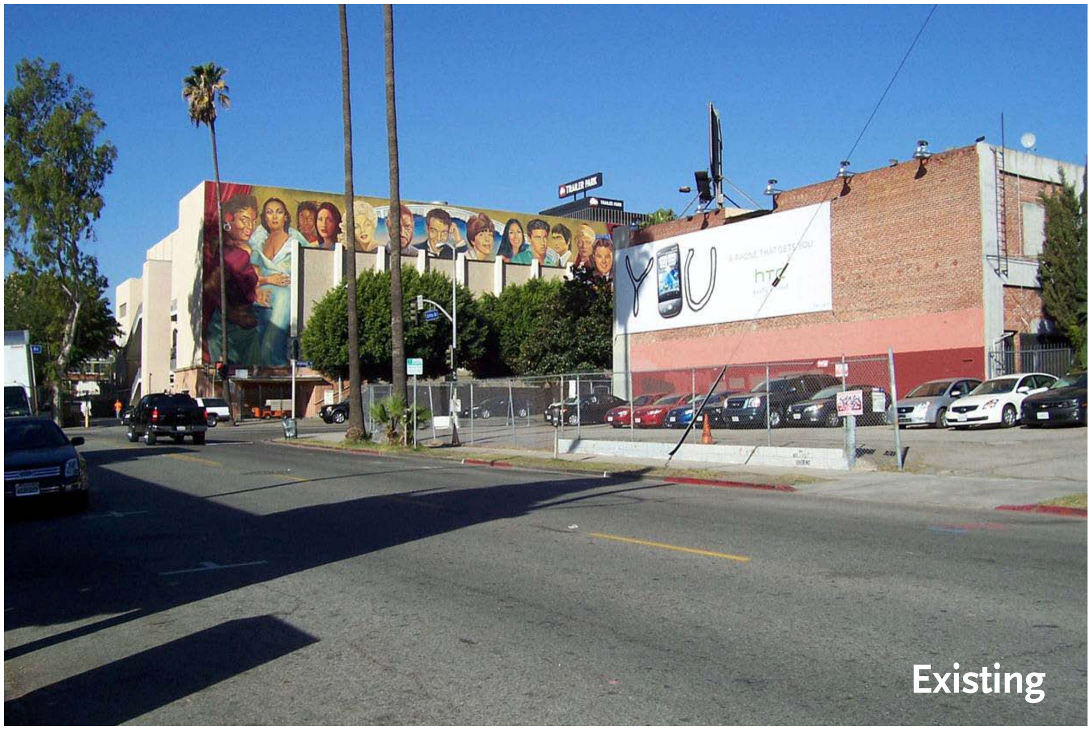
Figure 4-25. Wilshire/La Brea Station—Potential Station Entrance at Metro Service Center and Blockbuster Video (Existing and Simulation)

Figure 4-26. Wilshire/Fairfax Station East Option–Potential Station Entrance at the West Los Angeles County Museum of Art (Existing and Simulation)

Figure 4-27. Wilshire/La Cienega Station East (Existing and Simulation)

Figure 4-28. Wilshire/Rodeo Station—Potential Station Entrance at the Sterling Building (Existing and Simulation)

Figure 4-29. Wilshire/4th Station—Potential Station Entrance at the First Federal Bank Building Plaza (Existing and Simulation)



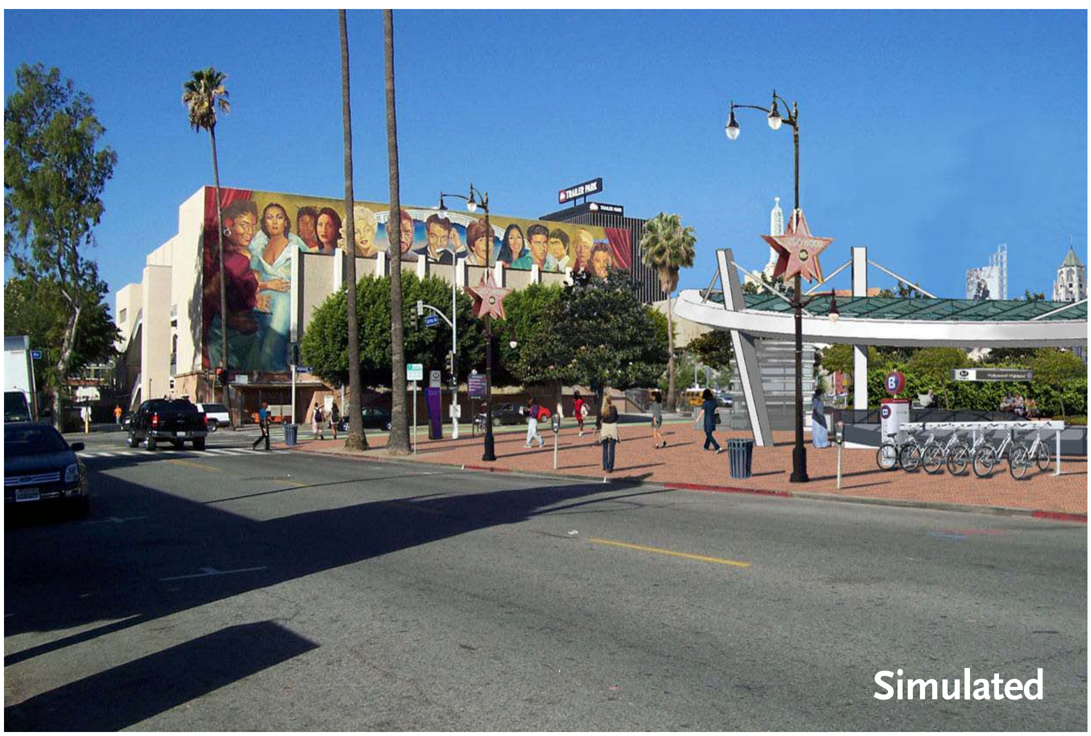


Figure 4-30. Hollywood/Highland Station—Potential Station Entrance East of North Highland Avenue (Existing and Simulation)

4.3.4 Station and Alignment Options

None of the station or alignment options would adversely impact a scenic highway or visual resources or alter scenic vistas. The alignment options are below grade and would not affect visual resources. In general, the visual impacts for the station options are similar to the stations under Alternatives 1 and 2 on Table 4-12 as described below.

- **Option 1: No Crenshaw Station**—This option does not include a Wilshire/Crenshaw Station. However, a vent shaft would be constructed midway between Crenshaw Boulevard and Lorraine Boulevard. Vent shafts are not above grade. It would be designed to blend with the other components.
- **Option 2: Fairfax East Station**—Visual impacts would be similar to those discussed for the Wilshire/Fairfax Station described under Alternative 1. The potential entrances with this option would be integrated within existing buildings. Other than signage, the integrated entrances would not be highly visible or prominent from the street.
- **Option 3: Wilshire/La Cienega Station with Transfer** —This option would result in visual impacts similar to, but less than, those for the base Wilshire/La Cienega Station with the connection structure. No buildings would be removed and the building settings where the entrances would be located do not include any iconic visual resources. The landscaping at the Cedars Sinai Medical Group building plaza would be removed and replaced.
- **Option 4: Century City (Constellation Boulevard) Station and Alignment Options**—This option would be similar to the potential entrances for the Century City (Santa Monica Boulevard) Station, since each would include a plaza with a canopy-covered entrance that would be highly visible from the street and upper floors of surrounding buildings. However, the Century City (Constellation Boulevard) Station is located at a busy intersection that is surrounded by office towers, and the canopy in this setting would be less prominent than the canopy for the Century City (Santa Monica Boulevard) Station. Stairs to the Westfield Mall from Constellation Boulevard would be removed and entrance to the plaza in the mall would be redesigned to integrate station entrance with access to shops in the mall.
- **Option 5: Westwood/UCLA On-Street Station**—Visual impacts would be similar to, but less than, those for the off-street station. With the Westwood/UCLA On-Street Station, no buildings would be demolished and the potential entrances would be incorporated into existing sidewalks and plaza spaces of buildings along Wilshire Boulevard.
- **Option 6: Westwood/VA Hospital North Station**—This option is located north of Wilshire Boulevard and just west of Bonsall Avenue. The features of the north station option are the same as the Westwood/VA Hospital Station on the south side of Wilshire Boulevard. Designs of the aboveground station components would complement the surroundings. None of the station components would detract from the area's visual character.

4.3.5 Other Components of the Build Alternatives

Table 4-12 includes a summary of the visual impacts associated with the maintenance and storage facilities and the Rail Operations Center.

4.3.6 Mitigation Measures

The Project would be designed consistent with Metro Design Criteria. Mitigation measures, as listed below, are proposed for the Build Alternatives to avoid, minimize, and mitigate impacts related to conflicts between scale and visual character, building removal and right-of-way acquisition, removal of mature vegetation, location of ancillary facilities, and introduction of new sources of light and glare.

- **VIS-1**—To minimize visual clutter, system components should be integrated and the potential for conflicts reduced between the transit system and adjacent communities; design of the system stations and components would follow the recommendations and guidance developed in the urban design analysis conducted for the Project (*Station Planning & Urban Design Concept Report,* Metro 2009). These guidelines include, but are not limited to, the following: (1) preserve and enhance the unique cultural identity of each station area and its surrounding community by implementing art and landscaping; and (2) promote a sense of place, safety, and walkability by providing street trees, walkways or sidewalks, lighting, awnings, public art, and/or street furniture.
- **VIS-2**—Where mature trees are removed, replacement with landscape amenities of equal value would be considered to enhance visual integrity of the station area.
- **VIS-3**—Source shielding in exterior lighting at stations and maintenance facilities would be used to limit spillover light and glare.
- **VIS-4**—Station designs would be integrated with area redevelopment plans.

4.3.7 California Environmental Quality Act Determination

Combining landscaping and design elements already included in the Project and implementing mitigation measures described in Section 4.3.6 would reduce potential visual impacts to a less-than-significant level. In addition, executing these mitigation measures would not result in any impacts after mitigation.

4.4 Air Quality

This section summarizes the analysis presented in the *Air Quality Technical Report*. The air quality regulations, existing conditions, and potential impacts and benefits are presented.

4.4.1 Regulatory Setting

Federal

The U.S. Environmental Protection Agency (EPA) administers the Clean Air Act. 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, 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

NAAQS 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 4-13. 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 (MSATs). The EPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources (66 *Federal Register* 17229, March 29, 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 the California Clean Air Act, as amended, 1992 provisions are met and establishes the California Ambient Air Quality Standards (CAAQS) (Table 4-13). It is also responsible for setting emission standards for vehicles sold in California and for other emission sources, such as certain off-road equipment. CARB also oversees the local air pollution control districts (APCD) and air quality management districts (AQMD), which administer air quality at the county and regional levels, respectively.

Table 4-13. 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 (O3)	1 Hour	0.09 ppm (180 µg/m3)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m3)		0.075 ppm (147 µg/m3)		
Respirable Particulate Matter (PM10)	24 Hour	50 µg/m3	Gravimetric or Beta Attenuation	150 µg/m3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m3		—		
Fine Particulate Matter (PM2.5)	24 Hour	No Separate State Standard		35 µg/m3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m3	Gravimetric or Beta Attenuation	15.0 µg/m3		
Carbon Monoxide (CO)	8 Hour	9.0 ppm (10mg/m3)	Non-Dispersive Infrared Photometry (NDIR)	9 ppm (10 mg/m3)	None	Non Dispersive Infrared Photometry (NDIR)
	1 Hour	20 ppm (23 mg/m3)		35 ppm (40 mg/m3)		
	8 Hour (Lake Tahoe)	6 ppm (7mg/m3)		—	—	—
Nitrogen Dioxide (NO2)	Annual Arithmetic Mean	0.030 ppm (57 µg/m3)	Gas Phase Chemiluminescence	0.053 ppm (100 µg/m3)	Same as Primary Standard	Gas Phase Chemiluminescence
	1 Hour	0.18 ppm (339 µg/m3)		0.100 ppm [8]	None	
Sulfur Dioxide (SO2)	Annual Arithmetic Mean	—	Ultraviolet Fluorescence	0.030 ppm (80 µg/m3)	—	Spectrophotometry (Pararosaniline Method)
	24 Hour	0.04 ppm (105 µg/m3)		0.14 ppm 365 µg/m3)	—	
	3 Hour	—		—	0.5 ppm (1300µg/m3)	
	1 Hour	0.25 ppm (655 µg/m3)		—	—	
Lead [9]	30 Day Average	1.5 µg/m3	Atomic Absorption	—	—	—
	Calendar Quarter	—		1.5 µg/m3	Same as Primary Standard	High Volume Sampler and Atomic Absorption
	Rolling 3-Month Average[10]	—		0.15 µg/m3		
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/m3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m3)	Ultraviolet Fluorescence			
Vinyl Chloride[9]	21 Hour	0.01 ppm (26 µg/m3)	Gas Chromatography			

For more information please call Air Resources Board-Public Information Office at (916) 322-2990. California Air Resources Board (02/16/10).
See next page for footnotes.

Table 4-13. 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).

[9]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.

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

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 regional transportation plan (RTP) that 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.

The Southern California Association of Governments (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 a RTP and TIP for Los Angeles, Orange, San Bernardino, Riverside, Ventura, and Imperial Counties. The Project 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 Draft Amendment 3 to the RTP. The project design concept and scope have not changed significantly from the 2008 RTP and Draft 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 NAAQS. SCAG adopted the 2008 RTP on May 8, 2008.

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. It also is included in the Metro 2009 Long Range Transportation Plan (LRTP) under Candidates for Private Sector Financial Participation –Transit Projects. The South Coast Air Quality Management District (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.

4.4.2 Existing Conditions/Affected Environment

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 CARB-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 4-14.

The 1977 Clean Air Act Amendment, Section 107 requires the EPA to publish a list of geographic areas and their compliance with the NAAQS. Areas not in NAAQS compliance are deemed non-attainment areas. Designations are based on a pollutant-by-pollutant basis. As shown in Table 4-15, 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.

Table 4-14. Air Quality Summary for Project Study Area Monitoring Stations

Air Pollutant	Standard/Exceedance**	Veterans Hospital West Los Angeles			North Main Street Los Angeles		
		2006	2007	2008	2006	2007	2008
Carbon Monoxide (CO)	Year Coverage*	99%	94%	96%	95%	95%	97%
	Max. 1-hour Concentration (ppm)	2.9	2.7	2.7	3.5	3.2	2.9
	Max. 8-hour Concentration (ppm)	2.0	1.96	1.76	2.68	2.15	1.96
	# Days>Federal 1-hour Std. of >35 ppm	0	0	0	0	0	0
	# Days>Federal 8-hour Std. of >9 ppm	0	0	0	0	0	0
	# Days>California 8-hour Std. of >9.0 ppm	0	0	0	0	0	0
Ozone (O_3)	Year Coverage*	98%	98%	96%	98%	97%	96%
	Max. 1-hour Concentration (ppm)	0.099	0.117	0.111	0.108	0.115	0.109
	Max. 8-hour Concentration (ppm)	0.074	0.088	0.097	0.079	0.103	0.090
	# Days>Federal 8-hour Std. of >0.075 ppm	0	2	2	3	3	3
	# Days>California 1-hour Std. of >0.09 ppm	3	2	3	8	3	3
	# Days>California 8-hour Std. of >0.07 ppm	2	2	8	7	6	6
Nitrogen Dioxide (NO_2)	Year Coverage*	94%	93%	96%	97%	96%	95%
	Max. 1-hour Concentration (ppm)	0.078	0.082	0.090	0.111	0.104	0.122
	Annual Average (ppm)	0.017	0.019	0.018	0.029	0.030	0.027
	# Days>California 1-hour Std. of >0.18 ppm	0	0	0	0	0	0
Sulfur Dioxide (SO_2)	Year Coverage*	NM	NM	NM	99%	90%	96%
	Max. 24-hour Concentration (ppm)	NM	NM	NM	0.006	0.005	0.003
	Annual Average (ppm)	NM	NM	NM	0.001	0.000	0.000
	# Days>Federal 24-hour Std. of >0.14 ppm	NM	NM	NM	0	0	0
Suspended Particulates (PM_{10})	Year Coverage*	NM	NM	NM	95%	93%	79%
	Max. 24-hour Concentration (μg/m^3)	NM	NM	NM	59.0	78.0	66.0
	#Days>Fed. 24-hour Std. of>150 μg/m^3	NM	NM	NM	0	0	0
	#Days>California 24-hour Std. of>50 μg/m^3	NM	NM	NM	3	5	2
	State Annual Average (μg/m^3)	NM	NM	NM	30.1	33.0	NA
Suspended Particulates ($PM_{2.5}$)	Year Coverage*	NM	NM	NM	90%	86%	88%
	Max. 24-hour Concentration (μg/m^3)	NM	NM	NM	56.2	64.1	78.3
	State Annual Average (μg/m^3)	NM	NM	NM	16.0	NA	16.2
	#Days>Fed. 24-hour Std. of>35 μg/m^3	NM	NM	NM	11	20	10
	National Annual Average (μg/m^3)	NM	NM	NM	15.5	16.7	15.9
Lead	Maximum Monthly Concentration (μg/m^3)	NM	NM	NM	NM	NM	NM
	# Months Exceeding Federal Std.	NM	NM	NM	NM	NM	NM
	# Months Exceeding State Std.	NM	NM	NM	NM	NM	NM
Sulfates	Max. 24-hour Concentration (μg/m^3)	NM	NM	NM	NM	NM	NM
	#Samples>California 24-hour Std.>=25 μg/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

*Year Coverage indicates how extensive monitoring was during the time of year when high pollutant concentrations were expected.

**The number of days above the standard is not necessarily the number of violations of the standard for the year.

Table 4-15. 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 (EPA) 2010.

4.4.3 Environmental Impacts/ Environmental Consequences

Regional and Study Area Emissions Analyses

The regional emissions burden of a project determines its overall air quality impact. For this Project, regional and Study Area analyses were conducted for the No Build and Build Alternatives.

The analyses were based on estimated regional vehicle miles traveled (VMT) and vehicle hours traveled (VHT). The CARB emission factors from the EMFAC2007 were used with the Los Angeles County parameters. The regional analysis results are shown in Table 4-16 and the Study Area results are shown in Table 4-17. The Project is predicted to lower all regional pollutant burden levels on the regional and Study Area levels. Project impacts are below the regional significance thresholds the SCAQMD developed. While all alternatives are predicted to reduce overall emission burden levels within the Study Area and regionally, Alternative 5 (Santa Monica Extension plus West Hollywood Extension) is estimated to lower emissions the most on a regional level and within the Study Area.

Overall, the project air quality impacts are below the SCAQMD regional significance thresholds.

Hot Spot Assessment

CO microscale air quality modeling was performed using the most current CARB's mobile source emission factor model (EMFAC2007) and the EPA CAL3QHC (Version 2.0) air quality dispersion model to estimate existing and future CO levels. Because CO emissions are generally localized, five intersections were selected for this microscale analysis. The sites listed in Table 4-18 and shown in Figure 4-31 are the Study Area intersections with the highest volumes, highest delays, and/or the highest volume increases between 2010 and 2035.

CO concentrations were predicted for 2010, the existing year and 2035, the design year. Maximum one-hour CO concentrations are shown inTable 4-19. Maximum eight-hour CO concentrations are shown in Table 4-20. Existing conditions have the highest predicted one-hour and eight-hour CO concentrations, with Site 5 (La Brea Avenue and Olympic Boulevard) having the highest CO concentrations—4.00 ppm (one-hour) and 2.74 ppm (eight-hour).

Table 4-16. Regional Emission Burden Assessment

Alternative	VMT		CO			Total Organic Gases (TOG)			NOx			PM_{10}			$PM_{2.5}$		
	Daily Vehicle Miles Traveled (millions)	Percent change from No Build	Emission Burden (Kg/day)	Change from No Build (Kg/day)	Percent change from No Build	Emission Burden (Kg/day)	Change from No Build (Kg/day)	Percent change from No Build	Emission Burden (Kg/day)	Change from No Build (Kg/day)	Percent change from No Build	Emission Burden (Kg/day)	Change from No Build (Kg/day)	Percent change from No Build	Emission Burden (Kg/day)	Change from No Build (Kg/day)	Percent change from No Build
No Build	504,281		550,123.9		—	40,766.2		—	125,151.1		—	30,856.7	—		22,329.6	—	
TSM	504,281	-0.01%	550,103.7	-20.2	-0.01%	40,766.1	-0.1	0.0%	125,147.2	-4.0	0.0%	30,856.0	-0.7	0.0%	22,329.3	-0.3	0.0%
1	504,281	-0.07%	549,734.3	-389.5	-0.07%	40,737.0	-29.2	-0.1%	125,062.4	-88.7	-0.1%	30,834.8	-21.8	-0.1%	22,313.8	-15.8	-0.1%
2	504,281	-0.07%	549,737.2	-386.7	-0.07%	40,738.2	-28.0	-0.1%	125,063.5	-87.7	-0.1%	30,835.2	-21.5	-0.1%	22,314.1	-15.5	-0.1%
3	504,281	-0.07%	549,715.4	-408.4	-0.07%	40,736.7	-29.5	-0.1%	125,059.7	-91.5	-0.1%	30,833.5	-23.1	-0.1%	22,314.2	-15.4	-0.1%
4	504,281	-0.07%	549,732.9	-391.0	-0.07%	40,737.8	-28.3	-0.1%	125,062.5	-88.6	-0.1%	30,834.9	-21.7	-0.1%	22,313.9	-15.6	-0.1%
5	504,281	-0.07%	549,714.7	-409.1	-0.1%	40,735.0	-31.2	-0.1%	125,057.8	-93.3	-0.1%	30,833.5	-23.1	-0.1%	22,312.7	-16.9	-0.1%
MOS 1	504,281	-0.07%	549,734.7	-389.2	-0.07%	40,735.5	-30.7	-0.1%	125,061.9	-89.2	-0.1%	30,834.4	-22.3	-0.1%	22,313.2	-16.4	-0.1%
MOS 2	504,281	-0.07%	549,729.2	-394.6	-0.07%	40,735.1	-31.0	-0.1%	125,060.6	-90.5	-0.1%	30,834.2	-22.5	-0.1%	22,313.1	-16.5	-0.1%
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 4-17. Study Area Emission Burden Assessment

Alternative	VMT		CO			TOG			NOx			PM_{10}			$PM_{2.5}$		
	Daily Vehicle Miles Traveled (millions)	Percent change from No Build	Emission Burden (Kg/day)	Change from No Build (Kg/day)	Percent change from No Build	Emission Burden (Kg/day)	Change from No Build (Kg/day)	Percent change from No Build	Emission Burden (Kg/day)	Change from No Build (Kg/day)	Percent change from No Build	Emission Burden (Kg/day)	Change from No Build (Kg/day)	Percent change from No Build	Emission Burden (Kg/day)	Change from No Build (Kg/day)	Percent change from No Build
No Build	5,056	—	5,182.3	—	—	326.0	—	—	1,146.0	—	—	278.1	—	—	194.3	—	—
TSM	5,056	0.00%	5,185.4	3.1	0.1%	326.4	0.4	0.00%	1,146.5	0.5	0.0%	278.6	0.4	0.2%	194.7	0.4	0.2%
1	5,027	-0.57%	5,116.5	-65.8	-1.3%	319.0	-7.0	-0.57%	1,130.9	-15.1	-1.3%	273.1	-5.0	-1.8%	189.8	-4.5	-2.3%
2	5,024	-0.63%	5,116.5	-65.8	-1.3%	319.0	-7.0	-0.63%	1,130.8	-15.2	-1.3%	273.1	-5.0	-1.8%	189.8	-4.5	-2.3%
3	5,018	-0.75%	5,107.2	-75.0	-1.4%	318.4	-7.6	-0.75%	1,128.8	-17.2	-1.5%	272.6	-5.5	-2.0%	189.4	-4.9	-2.5%
4	5,021	-0.69%	5,110.3	-72.0	-1.4%	318.6	-7.4	-0.69%	1,129.5	-16.5	-1.4%	272.8	-5.4	-1.9%	189.5	-4.8	-2.5%
5	5,015	-0.82%	5,103.3	-78.9	-1.5%	318.1	-7.8	-0.82%	1,128.0	-18.0	-1.6%	272.4	-5.7	-2.1%	189.3	-5.0	-2.6%
MOS 1	5,041	-0.30%	5,169.4	-12.8	-0.2%	325.2	-0.8	-0.30%	1,143.1	-2.9	-0.3%	277.5	-0.7	-0.2%	193.9	-0.4	-0.2%
MOS 2	5,032	-0.48%	5,160.1	-22.1	-0.4%	324.6	-1.4	-0.48%	1,141.0	-5.0	-0.4%	276.9	-1.2	-0.4%	193.5	-0.8	-0.4%
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 4-18. 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

For Build Alternatives 1 and 4, predicted CO concentrations would be lower than No Build at Site 1 and the same as No Build at Sites 2 through 5. For Build Alternative 2, predicted CO concentrations would be lower than No Build at Sites 1 and 2 and the same as No Build at Sites 3 through 5. For Build Alternatives 3 and 5, predicted CO concentrations would be the same as No Build at all sites. At Sites 1, 2, and 3, MOS 1 and MOS 2 have lower predicted CO concentrations than the No Build Alternative. At Sites 3 and 4, MOS 1 and MOS 2 have the same CO concentrations as the No Build Alternative.

No violations of the NAAQS are predicted under any alternative.

The area is classified as nonattainment for PM_{10} and $PM_{2.5}$. Therefore, a PM_{10}/$PM_{2.5}$ qualitative hot-spot analysis will be conducted following the EPA March 29, 2006, guidance: *Transportation Conformity Guidance for Qualitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (EPA420-B-06-902).

The Project would be electrically powered. Buses would be powered by compressed natural gas. As such, the Project is not anticipated to increase diesel traffic within the study area and is considered a project not of air quality concern. An interagency consultation, following SCAG procedures, is expected to confirm this finding.

Mobile Source Air Toxics

On February 3, 2006, the FHWA released *Interim Guidance on Air Toxic Analysis in NEPA Documents.* This guidance was superseded on September 30, 2009, by FHWA *Interim Guidance Update on Air Toxic Analysis in NEPA Documents.* 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.

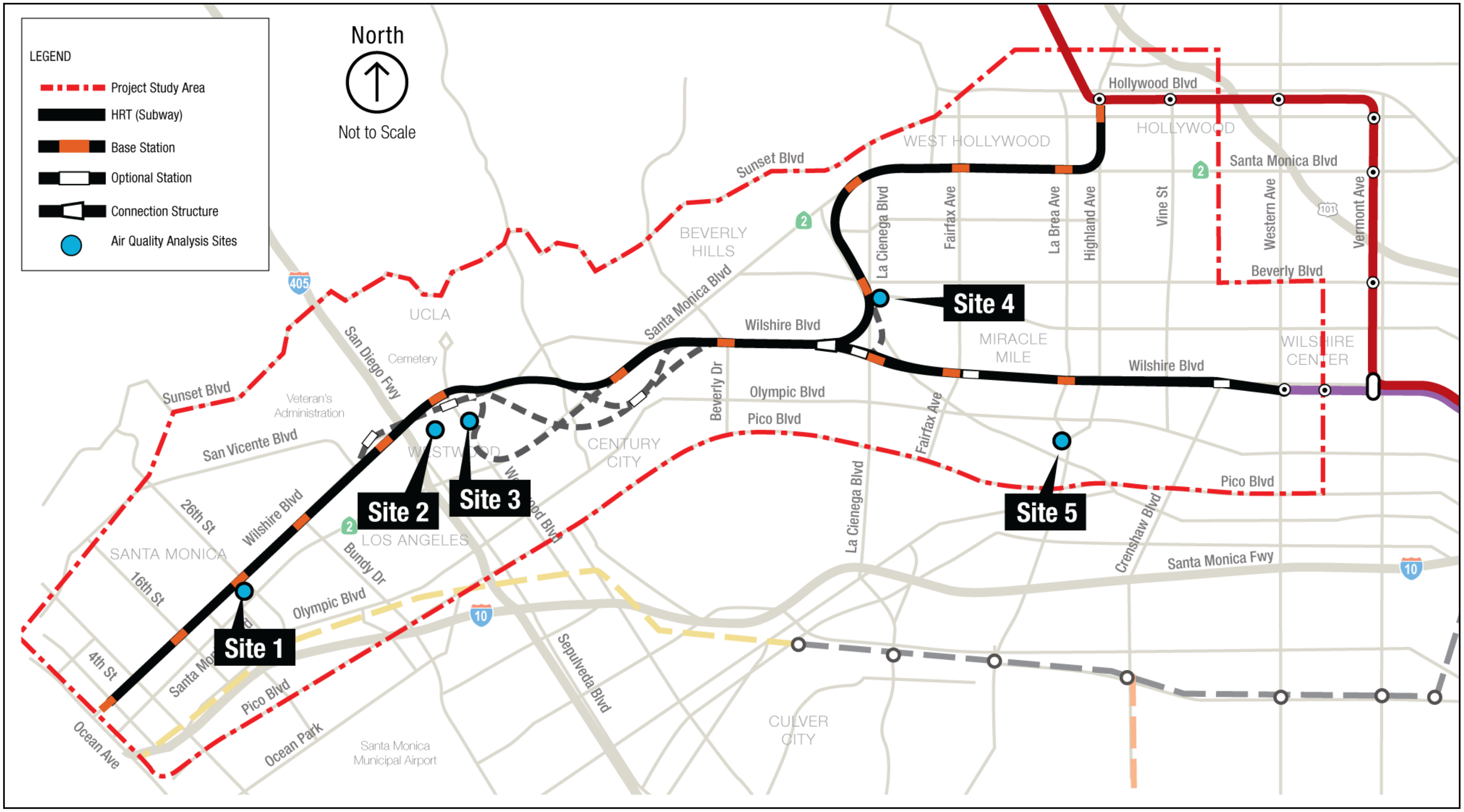


Figure 4-31. Air Quality Analysis Sites

Table 4-19. Predicted Worst-Case One-hour CO Concentrations (parts per million [ppm])

No	Site Description	Existing		No Build		Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5		MOS1		MOS2	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1	26th Street and Wilshire Boulevard	3.60	3.60	3.00	3.00	2.80	2.80	2.80	2.80	3.00	3.00	2.80	2.80	3.00	3.00	2.80	2.80	2.80	2.80
2	Veteran Avenue and Wilshire Boulevard	3.80	3.80	3.20	3.10	3.20	3.10	3.10	3.10	3.20	3.10	3.20	3.10	3.20	3.10	2.80	2.80	2.80	2.80
3	Glendon Avenue and Wilshire Boulevard	3.70	3.70	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	2.80	2.80	2.80	2.80
4	La Cienega Boulevard and Beverly Boulevard	3.60	3.70	3.00	3.00	3.00	3.00	3.00	3.00	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	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10

Concentrations include one-hour CO background = 2.8 ppm
One-hour NAAQS = 35 ppm
CAAQS = 20 ppm

Table 4-20. Predicted Eight-hour CO Concentrations (ppm)

No.	Site Description	Existing	No Build	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	MOS1	MOS2
1	26th Street and Wilshire Boulevard	2.46	2.04	1.90	1.90	2.04	1.90	2.04	1.90	1.90
2	Veteran Avenue and Wilshire Boulevard	2.60	2.18	2.18	2.11	2.18	2.18	2.18	1.90	1.90
3	Glendon Avenue and Wilshire Boulevard	2.53	2.11	2.11	2.11	2.11	2.11	2.11	1.90	1.90
4	La Cienega Boulevard and Beverly Boulevard	2.53	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04
5	La Brea Avenue and Olympic Boulevard	2.74	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11

Concentrations include one-hour CO background = 2.8 ppm
One-hour NAAQS = 35 ppm
CAAQS = 20 ppm

As a result, a qualitative analysis is used to provide a basis for identifying and comparing potential differences among MSAT emissions from the project alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA: *A Methodology for Evaluating Mobile Source Air Toxic Emissions among Transportation Project Alternatives*.

The FHWA Interim Guidance groups projects into the three tier categories, from those having the least to those having the most potential for MSAT effects. Based on this approach, the Project 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. . ."

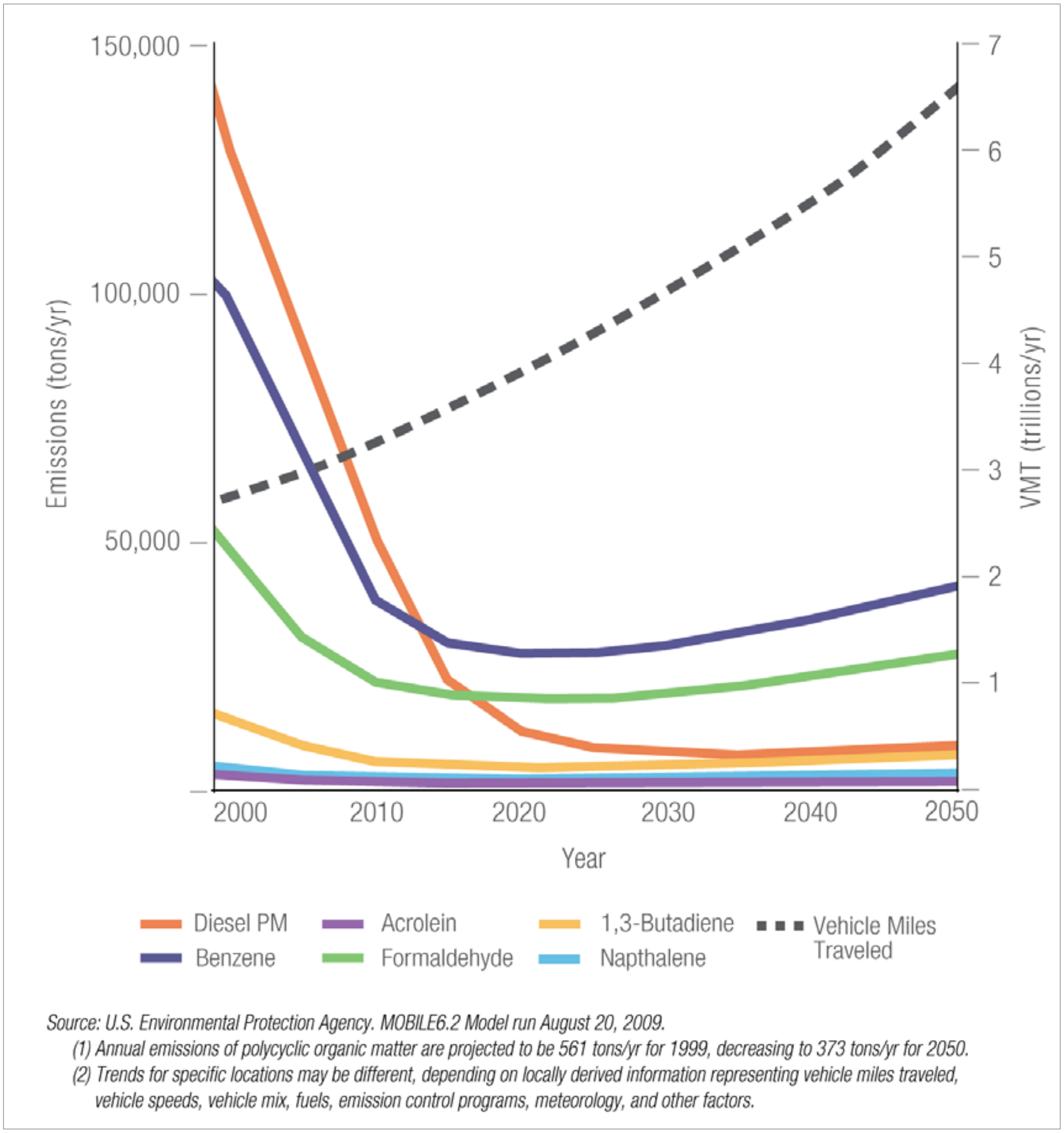
The FHWA considers acrolein, benzene, 1.3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter the priority MSATs,

For each Project alternative, MSAT emissions would be proportional to VMT, assuming that other variables, such as fleet mix, are the same. The VMT estimates for the Build Alternatives are lower or the same as for the No Build Alternative VMT. Alternative 5 is predicted to demonstrate the largest VMT reduction.

In 2035, the Build Alternatives would reduce regional and study area mobile source air toxics emissions as a result of reduced VMT associated with using mass transit and the EPA reduction programs.

Based on these results, the Build Alternatives would reduce MSATs, while the No Build Alternative would not. In addition, regardless of the alternative chosen, MSAT emissions would likely be lower than present levels in 2035, the design year 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 would likely be lower in nearly all cases. This is shown in Figure 4-32.

As the majority of the Project is located underground, localized MSAT impacts would be limited to areas where additional traffic may occur, generally near stations, where there would be bus and commuter traffic. Based on the Project's traffic analysis, the greatest increase in intersection volume (272 vehicles) would occur under Alternative 1 at the Gayley Avenue and Le Conte Avenue intersection (less than 2,500 vehicles during peak periods). This intersection is predicted to operate at Level-of-Service (LOS) B and D for the a.m. and p.m. peak periods, respectively, under all alternatives. The highest volume intersection would be Veteran Avenue and Wilshire Boulevard, with an overall peak volume of approximately 11,000 vehicles. This intersection operates at LOS F in both peak periods under all alternatives and would increase by 119 vehicles under Alternative 2.



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/yr for 1999, decreasing to 373 tons/yr 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 4-32. National MSAT Emission Trends 1999–2050 for Vehicles Operating on Roadways Using EPA Mobile6.2 Model

Under several alternatives, however, overall traffic volumes would decrease at this intersection. MSAT effects resulting from increased traffic would be reduced by using compressed natural gas buses, which generally emit less MSAT than traditional diesel buses.

The MSAT emissions qualitative analysis acknowledges that the project alternatives 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 the President's Council on Environmental Quality (CEQ) regulations (40 CFR, 1502.22[b]) regarding incomplete or unavailable information.

It is the 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, assessments results would not be useful.

4.4.4 Conformity Assessment

The Project is not predicted to cause or exacerbate a violation of applicable ambient air quality standards. An application to the SCAG Transportation Conformity Working Group is being prepared to determine if the Project is one of air quality concern for PM_{10}/$PM_{2.5}$. The Project is predicted to reduce regional emission levels. The Project is included in the Draft Amendment #08-34 to the 2008 RTIP as Project ID #UT101, #1TR1002, and #1TR1003. It also is included in the Metro 2009 LRTP under Candidates for Private Sector Financial Participation—Transit Projects.

4.4.5 Mitigation Measures

Based on the above analysis and results, the Build Alternatives would not exceed CAAQS or SCAQMD significance thresholds during project operation. Depending on the alternative selected, the Project could result in lower emissions of some criteria pollutants. Therefore, mitigation measures are not required for operation of the Project.

4.4.6 California Environmental Quality Act (CEQA) Determination

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 would:

- Conflict with or obstruct implementation of the applicable air quality plan
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation
- Result 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)
- Expose sensitive receptors to substantial pollutant concentrations
- Create objectionable odors affecting a substantial number of people

Project operation would not exceed CAAQS or SCAQMD significance thresholds. Depending on the alternative selected, the Project could result in lower emissions of some criteria pollutants. Project operation would not result in significant air quality impact. However, construction would generate emissions and objectionable odors, which would be significant but limited to the duration of construction.

In some locations, the Build Alternative has options for tunnel alignments and underground station locations. As these options are not expected to affect the above-ground street traffic for any of the Build Alternatives, they are also not expected to change the results of the air quality/climate change analysis for that particular alternative.

4.5 Climate Change

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. GHGs 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 U.S. 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 and requires mandatory reporting of GHG emissions from large sources in the U.S. The reporting will 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 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—the *Global Warming Solution Act of 2006*)—Executive Order S-3-05, Executive Order S-01-07, and AB 1493, 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 GHGs." 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.

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 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 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 10, 2010.

Local

South Coast Air Quality Management District adopted *Interim CEQA GHG Significance Thresholds for Stationary Sources, Rules and Plans* on December 5, 2008. Under these guidelines, interim GHG significance thresholds would apply to stationary source/industrial projects where 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 discretion approval (i.e., projects that require discretionary air quality permits from AQMD.

4.5.2 Affected Environment/Existing Conditions

GHGs 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 4-33). As concentrations of GHGs increase, however, the Earth's temperature increases.

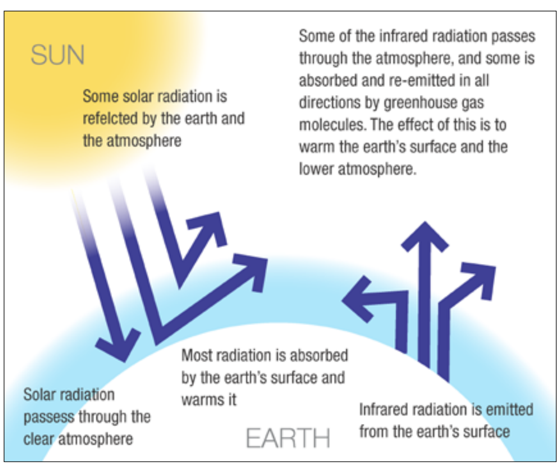


Figure 4-33. The Greenhouse Effect

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. Eleven of the last 12 years (1995 to 2006)—the exception being 1996—rank among the 12 warmest years on record since 1850. 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. GHGs 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 global warming potential, 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 described below.

- **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 [CFCs], hydrochlorofluorocarbons [HCFCs], and halons). These gases are typically emitted in smaller quantities but, because they are potent GHGs, they are sometimes referred to as high global warming potential gases (high GWP gases).

An inventory of GHG emission sources compiled by CARB for the years 2000–2006 is shown in Table 4-21. 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 the overall GHG emissions in the State of California.

Table 4-21. California Greenhouse Gas Inventory for 2000–2006 by Category

	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	28.03	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	12.80	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	16.80	18.95	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

	2000	2001	2002	2003	2004	2005	2006
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
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	7.78	7.88
Manure Management	6.46	6.84	7.11	7.36	7.29	7.63	7.80
Crop Growing & Harvesting	8.12	7.62	9.63	9.57	9.65	9.19	9.24
Fertilizers	6.96	6.63	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 Emissions Inventory sectors
[3]This category is listed in the Electric Power sector of ARB's GHG Emissions Inventory sectors
[4]Reflects use of updated USEPA models for determining emissions from livestock and fertilizers
Note: Million tons of CO2 equivalent–based upon IPCC Second Assessment Report's Global Warming Potentials

4.5.3 Environmental Impacts/Environmental Consequences

The project operations have the potential to affect 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 CO_2e, 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.

The roadway traffic impact will be reflected in changes in the Study Area's VMT and associated vehicular speed. GHG emission burdens are estimated based on the on-road fleet's GHG emission factors multiplied by VMT. The current version of CARB's emission factor program, referred to as the Emission Factor Model (EMFAC2007), was used to estimate on-road GHG mobile source emission factors. EMFAC2007 GHG emission factors are based on parameters set within the program for Los Angeles County and reflect estimated speed.

The results for the region are shown in Table 4-22. 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.

Table 4-22. Regional Roadway CO_2e Emission Burden Assessment (Metric Tons/Day)

	VMT		CO_2e		
Alternative	Daily VMT	% Change from No Build	Emission Burden (Metric Tons/day)	Change from No Build (Metric Tons/day)	% Change from No Build
No Build	504,651,236	—	359,678	—	—
TSM	504,622,466	0.0%	359,670	-8.0	0.0%
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%
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%

The proposed project would require electrical power for vehicle propulsion and station operation. 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 power demand calculated in the Project's energy analysis and documented in the Energy Technical Report. The estimated GHG emission burden generated due to the increased power usage is shown in Table 4-23. These 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 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 will be lower than those used in this analysis.

Table 4-23. CO_2e Emission Burdens from Power Requirements (Metric Tons/Day)

Alternative	Emission Factor CO_2e (Metric Tons/MWH)	Estimated Electric Usage	Total CO2e (Metric Tons/Day)	% Change from No Build
No Build	0.32	5004.1	1,601	—
TSM	0.32	5005.3	1,602	0%
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%
MOS-1	0.32	5115.5	1,637	2%
MOS-2	0.32	5312.2	1,700	6%

As shown in Table 4-24, combining the emission burdens from the roadway VMT (Table 4-22) with the emission burdens due to power usage (Table 4-23) for each alternative, the Build Alternatives are predicted to have a slightly beneficial, though no measurable, impact on overall CO_2e emissions.

Table 4-24. 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%
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%
MOS 1	359,417	1,637	361,054	-0.06%
MOS 2	359,415	1,700	361,115	-0.05%

No Build Alternative

The No Build Alternatives does not propose construction activity beyond what is currently in construction or planned in the *Regional Transportation Plan* or Metro's Long-Range Transportation Plan. The No Build Alternative is the baseline condition for comparison of the other alternatives. The No Build Alternative would not result in operational impacts.

TSM Alternative

As shown in Table 4-24, the TSM Alternative is predicted to lower regional GHG emission burden. The TSM Alternative is predicted to demonstrate a small reduction (less than 0.01 percent) of VMT and regional roadway emissions burden, as compared to the No Build Alternative. The TSM Alternative exhibits a negligible increase in power use over the No Build Alternative. The TSM Alternative is predicted to have no measurable impact on overall CO_2e emissions.

Build Alternatives

While all Build Alternatives are predicted to reduce overall GHG emission burden levels within the region, Alternative 5 is predicted to demonstrate the largest reduction in VMT and regional roadway GHG emission burden, as compared to the No Build Alternative (Table 4-22). Alternatives 3 and 5 are predicted to require the most energy and, thus, will result in the largest increase in CO_2e emissions, compared to the No Build Alternative (Table 4-23).

Combining the emission reductions from reduced roadway VMT (Table 4-22) with the emission increases due to power usage (Table 4-23), the Build Alternatives are predicted to have a beneficial impact on overall CO_2e emissions. As shown in Table 4-24, the Build Alternatives are predicted to slightly lower all regional GHG emission burden levels.

4.5.4 Mitigation Measures

The No Build Alternative would not result in operational impacts. No mitigation is required for the No Build Alternative.

The TSM and Build Alternatives would result in beneficial impacts. No mitigation is required. However, Metro recognizes that climate change is a serious issue. In addition to the measures proposed for energy impacts, the following measures would be implemented:

- **CC-1**—Metro would continue to promote and implement pedestrian oriented and TOD at stations
- **CC-2**—Energy conservation would be implemented throughout design.
- **CC-3**—Metro would implement marketing and education plans to promote ridership.
- **CC-4**—All new Metro facilities over 10,000 square feet for this project would be constructed to LEED Silver Standards, according to Metro's environmental policy.

4.5.5 CEQA Determination

Under CEQA Guidelines (Appendix G, VII), a project would result in significant impact if the project would

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

Currently, there are no GHG significance thresholds for transportation projects, though CARB is in the process of developing these thresholds. For this analysis, the thresholds of significance are based on the SCAQMD-adopted *Interim CEQA Greenhouse Gas Significance Thresholds for Stationary Sources, Rules and Plans*.

All of the alternatives are consistent with GHG regulations as they do not measurably increase GHG emissions. The project is predicted to reduce GHG emissions from roadway vehicles due to predicted reductions in VMT. 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 of increasing the use of green energy sources.

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

4.6 Noise and Vibration

This section discusses the existing noise and vibration environment in the Study Area near the alignments where sensitive receptors could be affected by potential impacts resulting from the Project. For additional information about existing noise and vibration levels, see the *Westside Subway Extension Noise and Vibration Technical Report*.

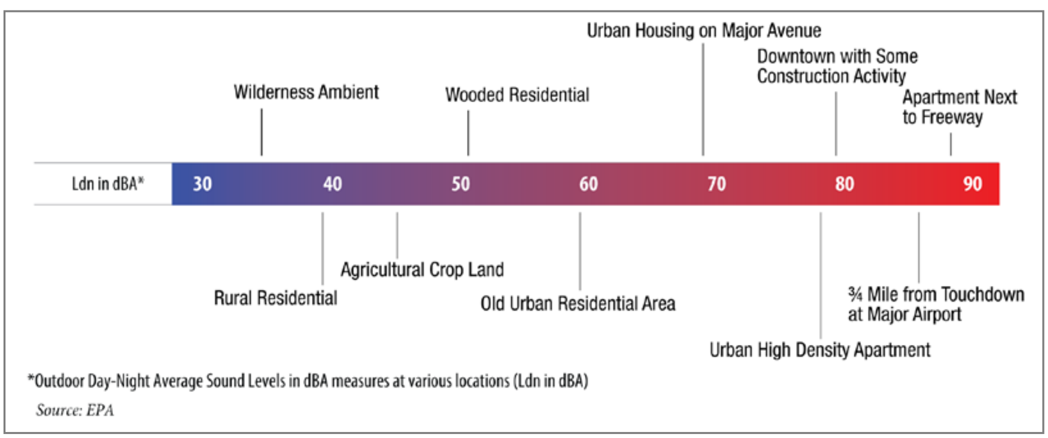
4.6.1 Background and Methodology

This noise and vibration impact analysis is based on criteria defined in the Federal Transit Administration (FTA) guidance manual *Transit Noise and Vibration Impact Assessment* (FTA 2006a). The approach also addresses the requirements of the California Environmental Quality Act (CEQA), uses Metro Design Criteria, and reviewed noise regulations of local jurisdictions, namely the County and City of Los Angeles and the Cities of Hollywood, West Hollywood, Beverly Hills and Santa Monica.

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:

- Leq 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.
- Leq(h) is the Leq for a one-hour period. For land uses involving daytime and evening use only, the noise impact analysis uses Leq(h) representing the noisiest hour of transit–related activity during which human activities occur at noise sensitive locations.
- Ldn 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 penalty to nighttime noise. Typical Ldn sound levels are shown above in Figure 4-34.



Source: USEPA.

Figure 4-34. Typical Day-Night (Ldn) Sound Levels

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 4-25

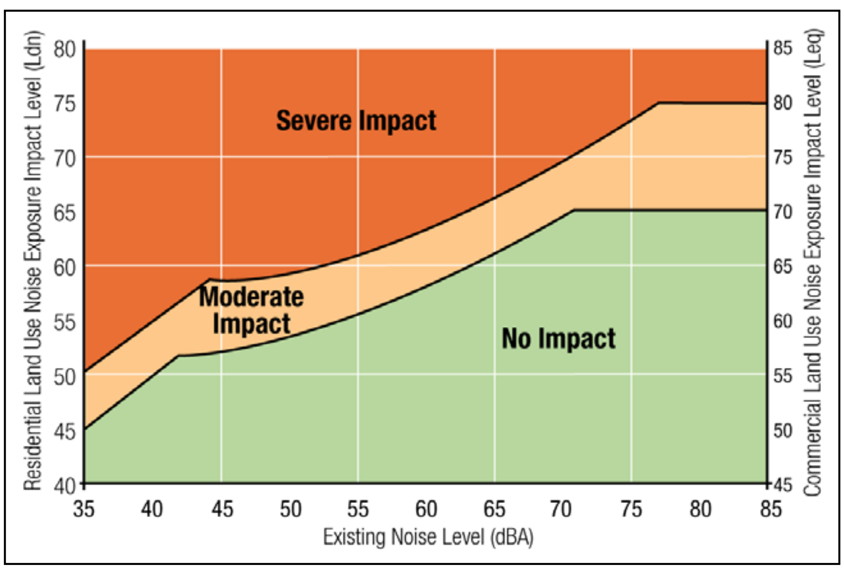
Table 4-25. FTA Land Use Categories and Metrics for Transit Noise

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor Leq(h)*	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 Ldn	Residences and buildings where people normally sleep—include homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor Leq(h)*	Institutional land uses with primary daytime and evening use—include 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).

* Leq(h) is the Leq for the noisiest hour of transit-related activity during hours of noise sensitivity.

Figure 4-35 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 4-35. 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 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 and ground-borne noise (GBN) impact criteria are shown in Table 4-26.

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 ground-borne vibration and GBN criteria for these special buildings are shown in Table 4-27.

Specification of mitigation measures requires a frequency distribution, or spectrum, of the vibration energy to determine whether the vibrations are likely to generate a significant response in a receiving building or structure. The FTA Detailed Vibration Analysis method provides an estimate of building response in terms of a one-third octave band frequency spectrum.

The vibration impact criteria are shown in Figure 4-36 where the international standard curves and the industry standards are plotted on the same figure. Explanations of the various criteria curves are presented in Table 4-28. Band levels that exceed a particular criterion curve indicate the need for mitigation and the frequency range within which the treatment needs to be effective.

These criteria use a frequency spectrum because vibration-related problems generally are caused by resonances of the structural components of a building or vibration-sensitive equipment. Resonant response is frequency-dependent. A detailed analysis can provide an assessment that identifies potential problems resulting from resonances.

Table 4-26. 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/sec)			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[4]	N/A[4]	N/A[4]
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 4-27. FTA Ground-borne Vibration and GBN Impact Criteria for Special Buildings

Land Use Category	Ground-borne Vibration Levels (VdB re 1 micro-inch/sec)		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.
3 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.

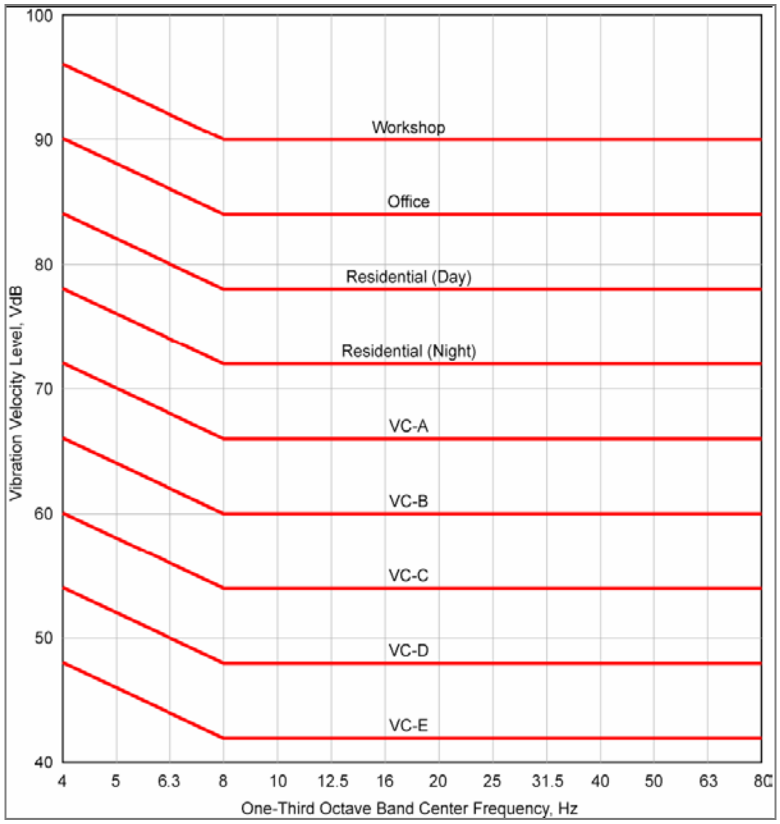


Figure 4-36. Criteria for Detailed Vibration Analysis

Table 4-28. Interpretation of Vibration Criteria for Detailed Analysis

Criterion Curve (see Figure 4-36)	Max Level—micro-inch/sec (VdB)	Description of Use
Workshop (ISO)	32000 (90)	Distinctly feel able vibration. Appropriate to workshops and nonsensitive areas.
Office (ISO)	16000 (84)	Feel able vibration. Appropriate to offices and nonsensitive areas.
Residential Day (ISO)	8000 (78)	Barely fellable vibration. Appropriate to sleep areas in most instances. Probably adequate for computer equipment, probe test equipment and low-power (to 20X) microscopes.
Op. Theatre (ISO)	4000 (72)	Vibration not feelable. Suitable for sensitive sleep areas. Suitable in most instances for microscopes to 100X and for other equipment of low sensitivity.
VC-A	2000 (66)	Adequate in most instances for optical microscopes to 400X, microbalances, optical balances, proximity and projection aligners, etc.
VC-B	1000 (60)	An appropriate standard for optical microscopes to 1000X, inspection and lithography equipment (including steppers) to 3 micron line widths.
VC-C	500 (54)	A good standard for most lithography and inspection equipment to 1 micron detail size.
VC-D	250 (48)	Suitable in most instances for the most demanding equipment including electron microscopes (TEMs and SEMs) and E-Beam systems, operating to the limits of their capability.
VC-E	125 (42)	A difficult criterion to achieve in most instances. Assumed to be adequate for the most demanding of sensitive systems including long path, laser-based, small target systems and other systems requiring extraordinary dynamic stability.

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

4.6.2 Affected Environment/Existing Conditions

This section presents the noise measurements conducted to quantify the existing noise environment along the Project alignments. The existing vibration environment was determined in part using FTA's range of typical ambient vibration levels derived from measurements conducted around the country for various types of land use including suburban and urban areas. This information is shown on Figure 4-37. In addition, this section draws from the *Westside Extension Transit Corridor Study: Metro Red Line Vibration Study* (Metro 2009), which is a special vibration study of ambient ground vibration measured at multiple locations easterly of the proposed Westside Subway Extension Project in quiet residential areas and near busy streets. This study included measurement of vibration at the ground surface directly over Metro West Hollywood Line (Red Line) tunnels during subway train operations. The measurements were performed over tunnel sections that did not have special vibration isolation features. The same train type operating in the Metro Red Line subway during the measurements are the proposed trains for this Project. A noteworthy conclusion of the special vibration report was that subway train vibration was not perceptible or separately measurable at the surface above tunnels where the tracks are between 50 to 65 feet below ground.

Existing Noise Environment

The existing levels of environmental noise were based on long-term (24-hour) measurements and short-term (15-minute) measurements, conducted at 18 sites. The sites were located near the proposed stations and station options, as shown on Figure 4-37. The measurements were taken near residences and other buildings where people normally sleep, such as hospitals and hotels/motels, if they were located near project-noise-producing activities or facilities. An additional short-term (15-minute) noise measurement at the VA Campus was conducted to obtain additional existing noise level information. All noise measurements were conducted consistent with applicable American National Standards Institute (ANSI) procedures for community noise measurements. The measurements were performed near the stations because that is where potential Project surface noise may be expected to cause a noise impact. Measurements were not conducted above potential tunnel sections of the project because subway operations noise from the tunnels will be underground and inaudible at the surface. Thus, there would be no potential for causing noise impact.

As summarized in Table 4-29, land uses adjacent to the stations are typically retail, office, and other commercial uses. Multi-family residential units, either apartments or condominiums, occur near the Wilshire/Crenshaw, Wilshire/La Brea, Wilshire/Fairfax, Wilshire/La Cienega, Hollywood/Highland, Santa Monica/La Brea, Santa Monica/San Vicente, Beverly Center, and Century City (Constellation) Stations. Single-family residential areas occur behind the retail and office uses for all station areas except the Wilshire/Rodeo, Beverly Center, Westwood/UCLA, Westwood/VA Hospital, Santa Monica/La Brea, and Century City (Constellation) Stations.

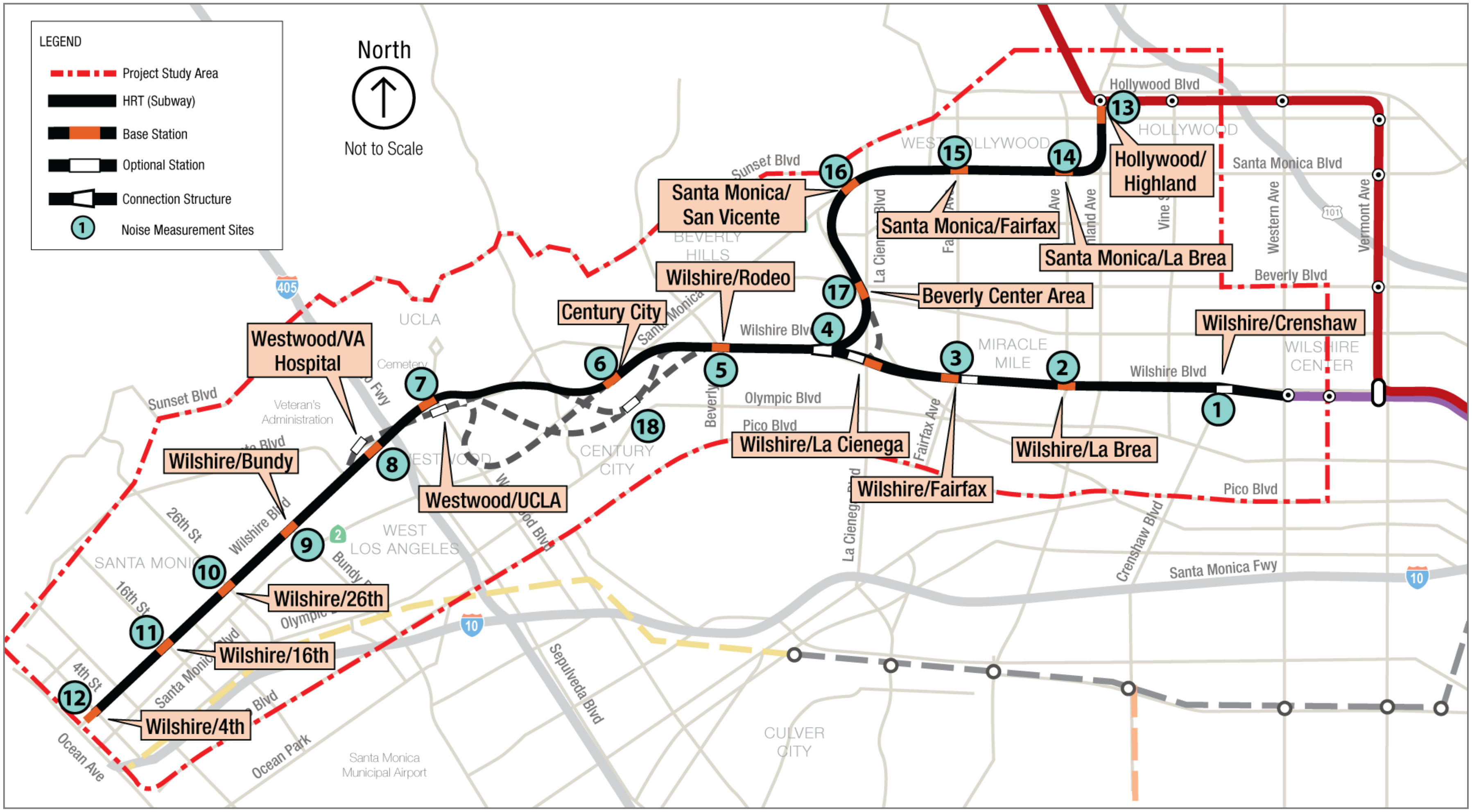


Figure 4-37. Map of Noise Measurement Sites

Table 4-29. Existing Noise Levels

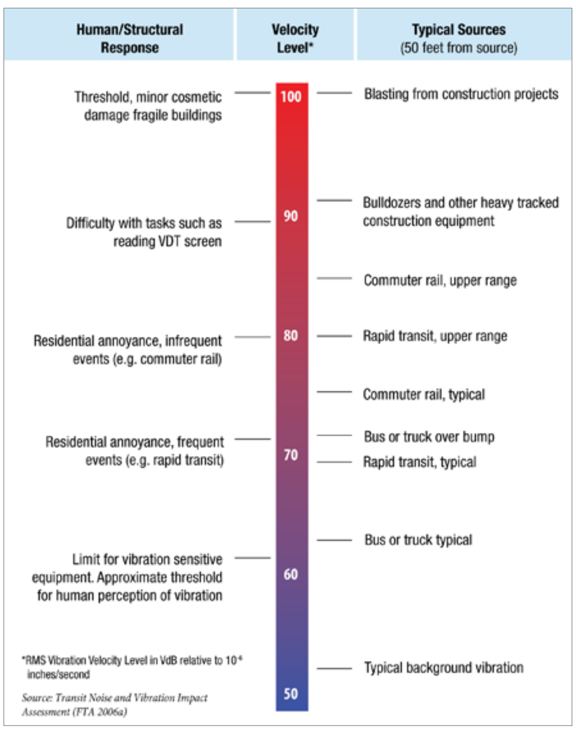
Measurement Site	Station	Address	Adjacent Land Uses	Average Day-Night Noise Ldn	Peak Hour Noise Leq(h)	Time of Peak-hour Noise
1	Wilshire/Crenshaw	4100 Wilshire Boulevard	Apartments, hotel, offices, parking lots*	74	74	4:00 p.m.
2	Wilshire/La Brea	5353 Wilshire Boulevard	Apartments, retail, service stores, parking lots*	67	67	6:00 p.m.
3	Wilshire/Fairfax	6224 Orange Street	Apartments, retail, service stores, parking lots*	76	73	6:00 a.m.
4	Wilshire/La Cienega	8601 Wilshire Boulevard	Apartments, retail, movie theatre, restaurants, medical building, gas station, offices*	71	78	1:00 p.m.
5	Wilshire/Rodeo Station	120 Canon Drive	Retail, offices	64	66	3:00 p.m.
6	Century City (Santa Monica Boulevard)	1743 Club View Drive	Retail, office buildings, Los Angeles County Golf Club *	63	65	4:00 p.m.
7	Westwood/UCLA	Veterans Avenue and Wilshire Boulevard	Cemetery, retail, offices	74	79	3:00 p.m.
8	Westwood/VA Hospital	VA Hospital	Hospital, offices, parking lot, green space	60	64	3:00 p.m.
9	Wilshire/Bundy	1224 Saltair Avenue	Retail, service stores, grocery store, offices*	65	67	3:00 p.m.
10	Wilshire/26th	1138 26th Street	Gas station, retail*	70	69	7:00 a.m.
11	Wilshire/16th	1142 16th Street	Retail, offices, hospital, medical center*	62	61	2:00 p.m.
12	Wilshire/4th	1122 4th Street	Retail, offices, restaurants*	67	64	5:00 p.m.
13	Hollywood/Highland	6767 Selma Place	Retail, offices, school, museum*	69	67	6:00 a.m.
14	Santa Monica/La Brea	7119 Detroit Street	Retail, offices, industrial, apartments	74	76	10:00 a.m.
15	Santa Monica/Fairfax	1050 Orange Grove Avenue	Retail, offices, industrial*	67	68	5:00 p.m.
16	Santa Monica/San Vicente	909 Westbourne Drive	Retail, offices, industrial*	68	65	8:00 a.m.
17	Beverly Center Area	Westbury Terrance Residence	Retail, apartments, parking structures	73	70	7:00 to 9:00 a.m.
18	Century City (Constellation)	Future residence at Avenue of the Stars and Constellation Boulevard	Future condominium, hotel, office buildings*	74	78	4:00 p.m.

*Sites with residential land uses behind land uses adjacent to the station (i.e., residential land uses as second-row receivers).

Existing noise levels are typical of an urban environment, with Ldn ranging from 60 to 76 dBA. With Ldn less than 65 dBA, the Wilshire/Rodeo, Century City (Santa Monica), Westwood/VA Hospital, and Wilshire/16th Stations have the lowest ambient noise levels. Wilshire/Fairfax has the highest existing noise level with an Ldn of 76 dBA. However, the Wilshire/La Cienega, Westwood/UCLA, and Century City (Constellation) Stations have the highest Leq(h). Peak-hour noise is at or exceeds 78 dBA at these locations.

Existing Vibration Environment

The Project is located in the urban core of the cities of Los Angeles, West Hollywood, Beverly Hills, and Santa Monica, plus 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 4-38 presents the typical range of ground-borne vibration levels.



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

Figure 4-38. Typical Ground Vibration Levels

Residential areas (including areas in Westwood and Beverly Hills) and potentially vibration-sensitive buildings were identified along the proposed alignments. Representative sensitive uses in the Study Area near the alignments include the Hollywood High School Auditorium, Beverly Hills High School Auditorium, Bel Air Surgical Center, Santa Monica-UCLA Medical Center, VA Campus, and the Wadsworth Theatre. Auditoriums and theaters are considered uses especially sensitive to ground-borne noise.

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 4-39. 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.

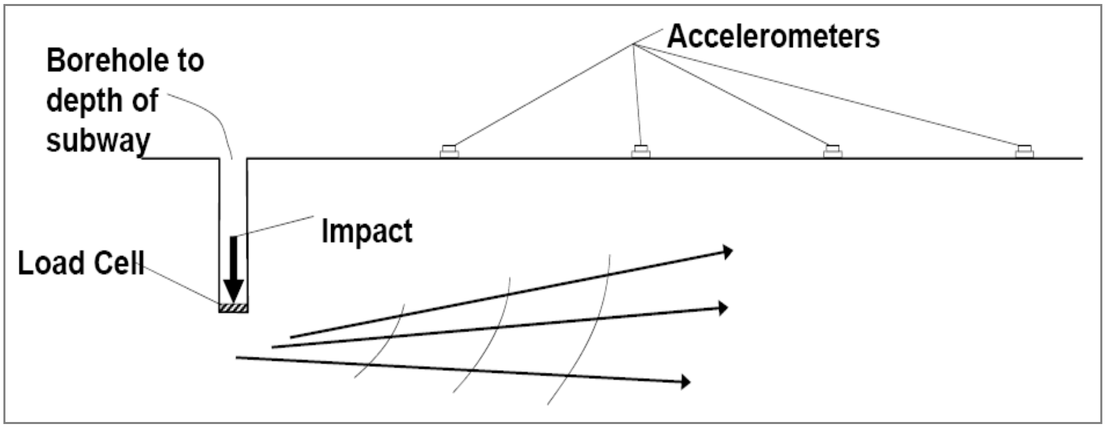


Figure 4-39. Transfer Mobility Determined by Vibration Measurements

A vibration propagation test was conducted at Fox Hills Drive and Missouri Avenue in Century City on June 9, 2010 (Figure 4-40). The borehole was constructed as part of the geotechnical studies that were being performed at that location. The transfer mobility tests conducted for the 1st Street Tunnel as part of the *Los Angeles Eastside Corridor Final Supplemental Environmental Impact Statement/Final Subsequent Environmental Impact Report* (Metro 2005) were also used. The geology of the Eastside LRT 1st Street Tunnel is representative of the soil attenuation along the Westside Subway Extension. The geology and soil conditions for both of these areas consist of alluvial soils, with the tunnel profiles within the older, denser alluvium (clays, silts, and sands) characterized by standard penetration test (SPT) blow counts typically over 30, indicating dense to very dense granular soils and stiff to hard clays.

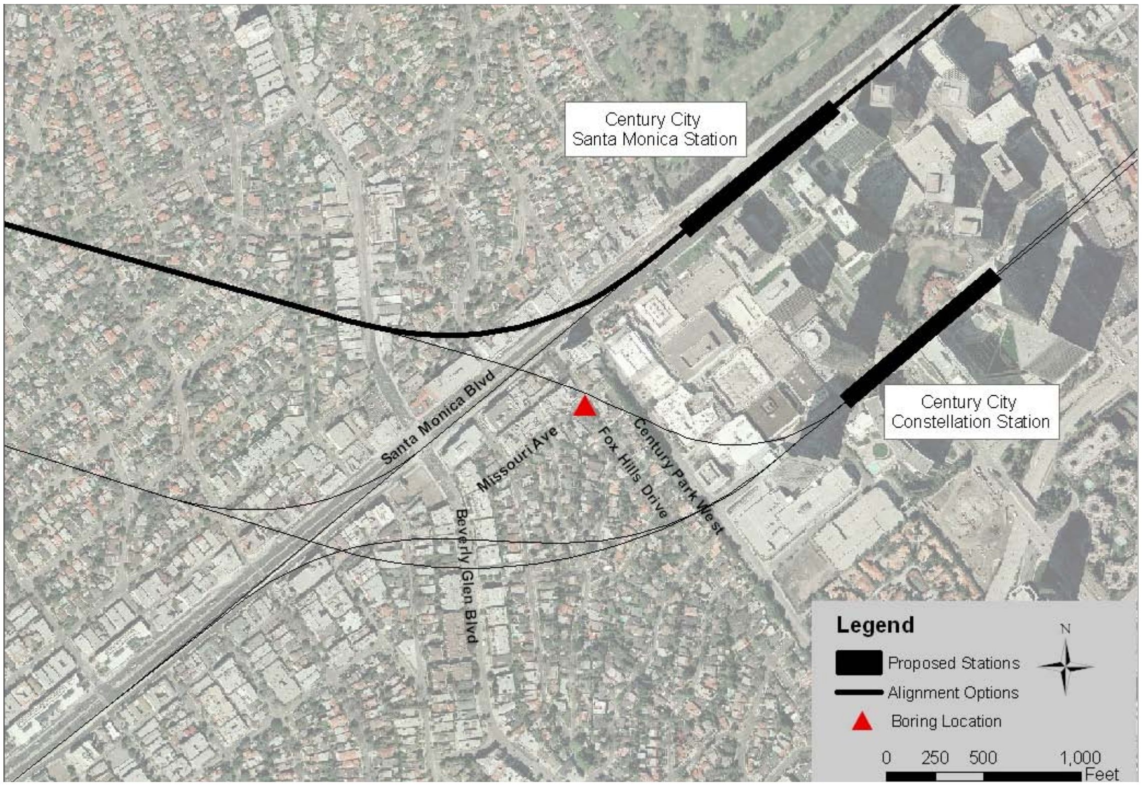


Figure 4-40. Location of Transfer Mobility Test

4.6.3 Environmental Impacts/Environmental Consequences

Transit Noise Assessment Methodology

The project-related operational noise levels used in the analysis of the Build Alternatives were based on FTA reference sound levels as provided in their guidelines, supplemented as appropriate by sound emission data from the existing Metro Red Line and Purple Line HRT subway vehicles. The operational assumptions (speed, headways, and schedule) used in estimating ridership, fare revenue, and other impacts of the proposed project were used for the operational noise and vibration analysis.

The methodology used to assess noise impact from the Project's below-grade subway operations follows the FTA methodology (FTA 2006). The analysis of project noise impact uses the existing noise levels as the baseline for comparison to existing-plus-project noise. The existing baseline conditions of the noise environment were based on the short-term measurement and long-term (24-hour) measurements that were previously discussed in Section 4.0. The FTA, in Table 2-1 of its guidance manual (FTA 2006), summarizes the common sources of transit noise. For subways, FTA lists the dominant noise components as fans and trains in tunnels producing noise through vent shafts.

Noise generated by this project's noise sources is not substantially different from noise generated by at-grade and elevated HRT projects with one very important difference: the Westside Subway Extension project is a deep subway. The subway train tracks are located between 50 and 130 feet below the ground surface. The noise generated below ground from the Westside Subway Extension rail transit operations would be from the interaction of train wheels on track, motive power, signaling and warning systems, plus the operation of traction power substations (TPSS). This noise would not be audible above ground. The guidance manual includes an *in general* comment that for subways, "Noise is not a problem."

Additional noise that would be generated above ground level by transit operations would include at-grade portions of stations, including patron portals to the underground stations, fan and vent shaft discharge locations, and emergency electrical power generators. Noise emissions from these above-ground components of the Project were evaluated, along with noise emissions from the proposed expanded Rail Operations Center, emergency egress locations, and maintenance facilities, such as yard and shop uses and the tracks servicing these facilities.

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. Vibration levels that would be high enough to cause any building damage, even minor cosmetic damage, are 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 an 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, for the purpose of this study, were adjusted to 60-mph following the FTA Detailed Vibration Analysis methodology (Figure 4-41).

The transfer mobility function data used for this analysis is shown in Figure 4-42 as a line source response for a 50 foot tunnel depth measured at horizontal distances from the borehole of 25 to 200 feet. Line source responses for tunnel depths of 30 to 100 feet were also used. The combination of the force density (Figure 4-41) and transfer mobility functions (Figure 4-42) provides an estimate at the ground surface as a function of distance from the tracks, the horizontal distance and the depth of the subway tunnels. All estimates of ground-borne vibration are calculated in one-third octave bands. The overall vibration level in VdB is calculated from the individual one-third octave bands and compared to the FTA criteria. The predicted vibration levels are at the foundation of each building and do not include any estimates of building coupling loss. These projections are representative of first floor vibration levels for buildings constructed as a concrete slab on grade. In addition, a 5-decibel safety factor has been incorporated into all of the ground-borne vibration and ground-borne noise projections. The purpose of the safety factor is to account for the normal fluctuations in ground-borne vibration due to normal wheel and track wear, and unexpected differences in the local soil and geology that were not represented by the transfer mobility tests.

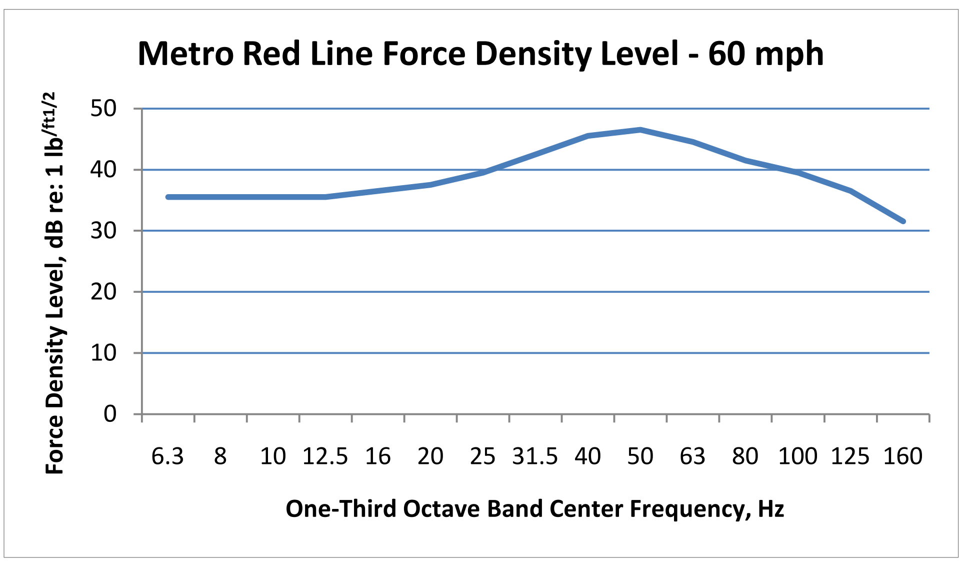


Figure 4-41. Measured Metro Red Line Force Density Level

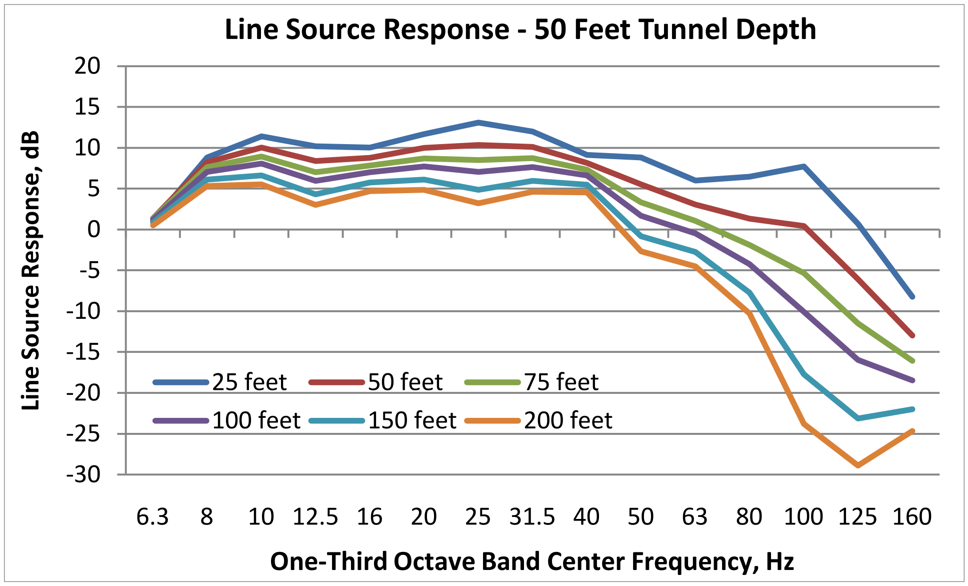


Figure 4-42. Measured Line Source Response for Tunnel Depth of 50 Feet

The ground-borne vibration and ground-borne noise were calculated at 183 receivers along the alignments of the project alternatives. Table 4-30 presents the predicted levels and FTA impacts criteria and Figure 4-43 through Figure 4-45 show the locations of the receivers.

Table 4-30. Predicted Ground-borne Vibration and Ground-borne Noise at Vibration-Sensitive Receivers

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)	Alternatives, Alignment and Station Options
1	Ramada Inn	54	35	65	72	**38**	35	1,2,3
2	St Andrews Church	54	30	65	75	38	40	1,2,3
3	Apartments	58	40	65	72	**38**	35	1,2,3
4	Los Altos Hotel	62	30	64	72	**38**	35	1,2,3
5	Dunnes Inn	50	35	65	72	**38**	35	1,2,3
6	Wilshire United Methodist Church	50	40	65	75	38	40	1,2,3
7	Scottish Rite Masonic Temple	50	40	65	75	38	40	1,2,3
8	Wilshire Bell Theatre	50	40	65	72	**38**	35	1,2,3
9	Apartments	52	40	65	72	**38**	35	1,2,3
10	Apartments	54	35	65	72	**38**	35	1,2,3
11	Apartments	54	30	65	72	**38**	35	1,2,3
12	Apartments	52	60	63	72	33	35	1,2,3
13	SFR	62	120	62	72	31	35	1,2,3
14	Apartments	68	40	64	72	**38**	35	1,2,3
15	Apartments	59	50	63	72	33	35	1,2,3
16	Wilshire Private School	59	60	63	75	33	40	1,2,3
17	Apartments	54	30	65	72	**38**	35	1,2,3
18	Apartments	50	40	65	72	**38**	35	1,2,3
19	Korea Center	50	40	65	75	**38**	35	1,2,3
20	Apartments	53	35	65	72	**38**	35	1,2,3
21	Mid Wilshire Surgery Center	58	60	63	75	33	40	1,2,3
22	Craft and Farm Art Museum	58	35	65	75	38	40	1,2,3
23	LA County Museum of Art	50	50	63	75	33	40	1,2,3
24	Apartments	49	40	68	72	**42**	35	1,2,3
25	SFR	49	270	42	72	26	35	1,2,3
26	SFR	68	200	38	72	29	35	1,2,3
27	Los Angeles Museum of the Holocaust	68	40	64	75	38	40	1,2,3
28	SFR	68	170	61	72	30	35	1,2,3
29	Saban Theatre	68	30	64	72	**38**	35	1,2,3
30	Fine Arts Theatre	58	30	65	72	**38**	35	1,2,3
31	Apartments	60	30	64	72	**38**	35	1,2,3
32	Specialty Surgical Center	65	35	64	75	**38**	35	1,2,3
33	SFR	70	150	59	72	27	35	1,2,3
34	SFR	79	190	59	72	27	35	1,2,3,4,5
35	SFR	76	200	37	72	25	35	1,2,3,4,5
36	Apartments	52	60	63	72	33	35	1,2,3,4,5
37	SFR	54	170	59	72	27	35	1,2,3,4,5
38	Beverly Wilshire Hotel	57	35	65	72	**38**	35	1,2,3,4,5
39	SFR	70	330	37	72	25	35	1,2,3,4,5
40	The Peninsula Hotel	74	160	59	72	27	35	1,2,3,4,5
41	The Beverly Hilton	71	45	64	72	**37**	35	1,2,3,4,5
42	Skin Clinic	50	15	65	75	38	40	1,2,3,4,5
43	SFR	70	50	63	72	**39**	35	1,2,3,4,5
44	SFR	98	0	60	72	31	35	1,2,3,4,5
45	Apartments	96	0	60	72	31	35	1,2,3,4,5
46	SFR	120	0	56	72	25	35	1,2,3,4,5

Table 4-30. Predicted Ground-borne Vibration and Ground-borne Noise at Vibration-Sensitive Receivers (continued)

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)	Alternatives, Alignment and Station Options
47	SFR	98	0	60	72	31	35	1,2,3,4,5
48	SFR	96	0	60	72	31	35	1,2,3,4,5
49	Apartments	78	0	64	72	**37**	35	1,2,3,4,5
50	Apartments Hi-Rise	73	0	64	72	**37**	35	1,2,3,4,5
51	Apartments Hi-Rise	75	70	63	72	34	35	1,2,3,4,5
52	Apartments Hi-Rise	80	70	60	72	29	35	1,2,3,4,5
53	Apartments Hi-Rise	84	60	60	72	29	35	1,2,3,4,5
54	Apartments Hi-Rise	95	80	59	72	27	35	1,2,3,4,5
55	Apartments Hi-Rise	96	50	59	72	29	35	1,2,3,4,5
56	Apartments Hi-Rise	99	85	59	72	27	35	1,2,3,4,5
57	Apartments Hi-Rise	96	30	60	72	31	35	1,2,3,4,5
58	Apartments	104	0	56	72	25	35	1,2,3,4,5
59	Apartments	82	0	61	72	32	35	1,2,3,4,5
60	Armand Hammer Museum (Southside)	64	40	64	75	38	40	1,2,3,4,5
61	Gayley Center	56	30	65	75	38	40	1,2,3,4,5
62	Federal Building	50	60	63	75	33	40	1,2,3,4,5
63	VA Hospital	56	300	38	72	25	35	2,3,5
64	SFR	52	140	61	72	29	35	3,5
65	SFR	54	100	47	72	18	35	3,5
66	Barrington Plaza (apartments)	68	30	64	72	**38**	35	3,5
67	Apartments	74	195	59	72	27	35	3,5
68	Wilshire Motel	61	30	64	72	**38**	35	3,5
69	Condos Hi-Rise	60	30	64	72	**38**	35	3,5
70	Apartments-Mixed	58	30	65	72	**38**	35	3,5
71	Apartments	58	185	59	72	27	35	3,5
72	SFR	70	160	59	72	27	35	3,5
73	Apartments	78	125	60	72	27	35	3,5
74	Apartments	56	185	59	72	27	35	3,5
75	SFR	55	200	38	72	25	35	3,5
77	SFR	52	190	59	72	27	35	3,5
78	SFR	55	150	59	72	27	35	3,5
79	Surgery Center of Santa Monica	56	30	65	75	38	40	3,5
80	Pilgrim Lutheran Church	49	35	68	75	**42**	40	3,5
81	Santa Monica UCLA Medical Center	50	35	65	72	**38**	35	3,5
82	Apartments	48	130	60	72	33	35	3,5
83	Apartments	48	120	60	72	33	35	3,5
84	Apartments	67	130	62	72	31	35	3,5
85	Apartments	68	40	64	72	**38**	35	3,5
87	Apartments	62	30	64	72	**38**	35	3,5
88	Apartments	60	30	64	72	**38**	35	3,5
89	Apartments	55	170	59	72	27	35	3,5
90	Hollywood High	39	90	63	75	37	40	4,5
91	Apartments	31	160	56	72	28	35	4,5
92	SFR	34	160	56	72	28	35	4,5
93	SFR	60	30	64	72	**38**	35	4,5
94	SFR	52	200	38	72	25	35	4,5
95	Apartments	50	30	65	72	**38**	35	4,5

Table 4-30. Predicted Ground-borne Vibration and Ground-borne Noise at Vibration-Sensitive Receivers (continued)

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)	Alternatives, Alignment and Station Options
96	Apartments	52	20	65	72	**38**	35	4,5
97	SFR	52	130	61	72	29	35	4,5
98	Community Center	59	80	62	75	31	40	4,5
99	Apartments	62	150	61	72	30	35	4,5
100	Apartments	60	20	64	72	**38**	35	4,5
101	Fire Station 8	57	20	65	72	**38**	35	4,5
102	SFR	56	150	59	72	27	35	4,5
103	Apartments	56	150	59	72	27	35	4,5
104	SFR	51	130	61	72	29	35	4,5
105	SFR	100	58	54	72	23	35	4,5
106	Apartments	60	150	61	72	30	35	4,5
107	West Hollywood City Hall	62	25	64	75	38	40	4,5
108	SFR	62	100	62	72	31	35	4,5
109	Holloway Motel	62	70	64	72	34	35	4,5
110	Apartments	64	85	63	72	32	35	4,5
111	Ramada	65	120	62	72	31	35	4,5
112	SFR	55	180	59	72	27	35	4,5
113	SFR	56	140	61	72	29	35	4,5
114	Lofts	52	50	63	72	33	35	4,5
115	West Hollywood Library	70	50	63	75	34	40	4,5
116	SFR	66	10	64	72	**38**	35	4,5
117	SFR	66	90	63	72	32	35	4,5
118	SFR	52	80	62	72	31	35	4,5
119	SFR	69	60	64	72	34	35	4,5
120	SFR	70	0	64	72	**37**	35	4,5
121	SFR	70	210	37	72	25	35	4,5
122	SFR	70	110	60	72	30	35	4,5
123	SFR	73	110	60	72	30	35	4,5
124	SFR	74	220	37	72	25	35	4,5
125	Cedars Sinai Medical Center	70	30	64	72	**37**	35	4,5
126	Westbury Terrace (condominiums)	69	30	64	72	**38**	35	4,5
127	Apartments	76	230	37	72	25	35	4,5
128	SLS at Beverly Hills (hotel)	79	0	64	72	**37**	35	4,5
129	SFR	82	0	61	72	32	35	4,5
130	SFR	82	0	61	72	32	35	4,5
131	SFR	77	0	64	72	**37**	35	4,5
132	SFR	72	0	64	72	**37**	35	4,5
133	SFR	72	0	64	72	**37**	35	4,5
134	Apartments	98	0	60	72	31	35	Option 4, Constellation South
135	SFR	97	0	60	72	31	35	Option 4, Constellation South
136	SFR	80	0	61	72	32	35	Option 4, Constellation South

Table 4-30. Predicted Ground-borne Vibration and Ground-borne Noise at Vibration-Sensitive Receivers (continued)

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)	Alternatives, Alignment and Station Options
137	SFR	73	0	64	72	**37**	35	Option 4, Constellation South
138	SFR	61	30	64	72	**38**	35	Option 4, Constellation South
139	Beverly Hills High School (Constellation South)	72	0	64	75	37	40	Option 4, Constellation South
140	Future Residential Hi-Rise	60	40	64	72	**38**	35	Option 4, Constellation North and South
141	Hyatt	200	64	54	72	23	35	Option 4, Constellation North and South
142	Apartments	88	10	61	72	32	35	Option 4, Constellation North
143	Apartments	89	0	61	72	32	35	Option 4, Constellation North
144	Apartments	94	0	60	72	32	35	Option 4, Constellation North
145	SFR	70	0	64	72	**37**	35	Option 4, Constellation North
146	Beverly Hills Unified School District Instructional Center	60	0	64	75	38	40	Option 4, Constellation North
147	Beverly Hills High School (Constellation North)	74	0	64	75	37	40	Option 4, Constellation North
148	SFR	62	55	64	72	34	35	Option 5, Central
149	SFR	102	0	56	72	25	35	Option 5, Central
150	SFR	114	0	56	72	25	35	Option 5, Central
151	SFR	117	0	56	72	25	35	Option 5, Central
152	SFR	82	0	61	72	32	35	Option 5, Central
153	SFR	116	0	56	72	25	35	Option 5, Central
154	SFR	101	0	56	72	25	35	Option 5, Central
155	SFR	116	0	56	72	25	35	Option 5(On-Street), Central
156	SFR	142	0	56	72	25	35	Option 5 (On-Street) Central

Table 4-30. Predicted Ground-borne Vibration and Ground-borne Noise at Vibration-Sensitive Receivers (continued)

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)	Alternatives, Alignment and Station Options
157	High Rise Apartment	131	0	56	72	25	35	Option 5(On-Street), Central
158	Armand Hammer Museum (North Side)	79	50	63	75	34	40	Option 5(On-Street), East and Central
159	SFR	82	40	61	72	32	35	Option 5 West
160	Apartments	72	40	64	72	**37**	35	Option 5 West
161	Apartments	77	100	60	72	30	35	Option 5 West
162	Apartments	77	40	64	72	**37**	35	Option 5 West
163	Mormon Temple	72	300	36	75	25	40	Option 5 West
164	Travel Lodge	74	40	64	72	**37**	35	Option 5 West
165	Royal Santa Monica Motel	69	80	63	72	32	35	Option 5 West
166	SFR	72	40	64	72	**37**	35	Option 5 West
167	Apartments	84	25	61	72	32	35	Option 5 West
168	SFR	100	155	42	72	13	35	Option 5 West
169	SFR	99	0	60	72	31	35	Option 5 West
170	SFR	96	0	60	72	31	35	Option 5 West
171	SFR	89	30	61	72	32	35	Option 5 West
172	SFR	89	25	61	72	32	35	Option 5 West
173	SFR	106	0	56	72	25	35	Option 5 West
174	SFR	80	0	61	72	32	35	Options 4 and 5 East
175	SFR	79	0	64	72	**37**	35	Option 4 and 5 East
176	SFR	62	0	64	72	**38**	35	Option 4 and 5 Central
177	SFR	62	0	64	72	**38**	35	Option 4 and 5 Central
178	Apartments	56	0	65	72	**38**	35	Option 4 and 5 Central
179	Apartments	101	0	56	72	25	35	Option 4 and 5 Central
180	SFR	64	0	64	72	**38**	35	Options 4 and 5 West
181	Apartments	45	0	68	72	**42**	35	Options 4 and 5 West
182	Apartments	97	0	60	72	31	35	Options 4 and 5 West
183	SFR	60	200	38	72	29	35	4,5 Option 3
184	SFR	60	144	62	72	31	35	4,5 Option 3
185	Apartments	55	0	65	72	**38**	35	4,5 Option 3

Notes: 1. Bolded values indicate exceedance of FTA criteria
2. SFR = single-family residence
3. The ID numbers are shown on Figure 4-43 to Figure 4-45.

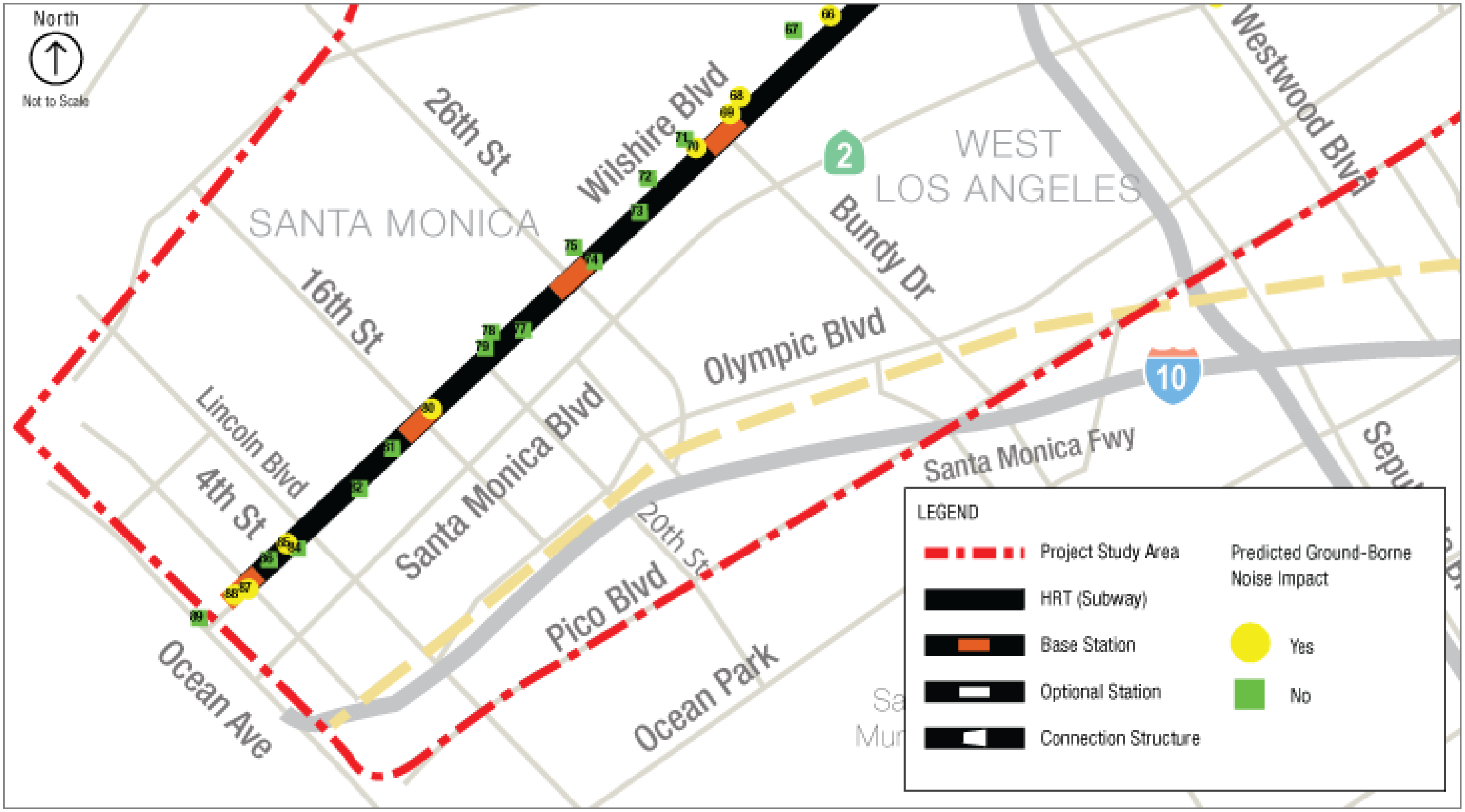


Figure 4-43. Vibration Sensitive Locations—Western Ave/Hollywood Blvd to Robertson Blvd

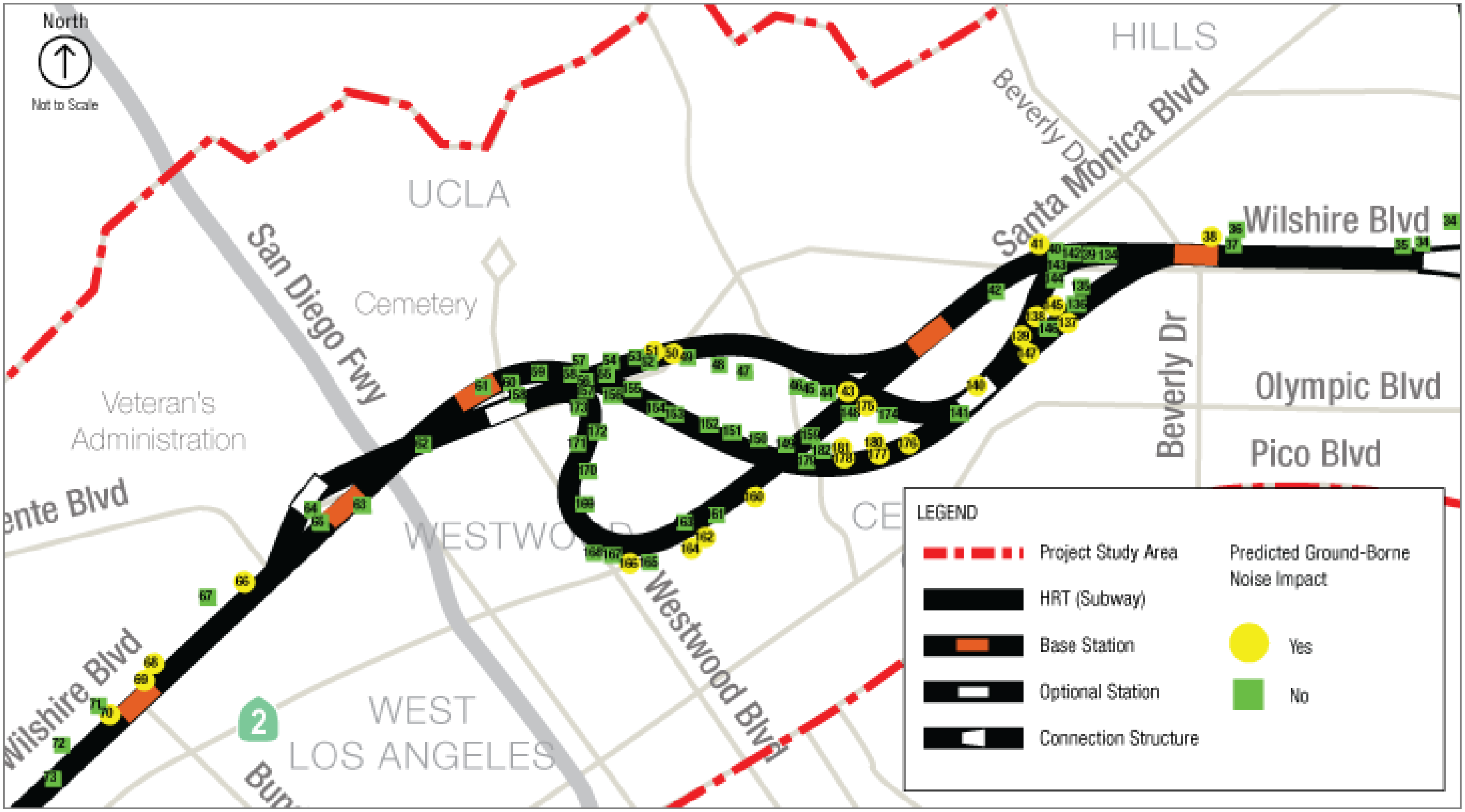


Figure 4-44. Vibration Sensitive Locations—Robertson Blvd to Barrington Ave

Figure 4-45. Vibration Sensitive Locations—Barrington Ave to 2nd Street

Vibration can damage historic structures located very close to operation of rail systems.[1] 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 4-30, would not exceed the FTA criterion of 90 VdB.

Noise Impacts

No Build Alternative

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 RTP (SCAG 2008) and LRTP (Metro 2008). 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 study for the Project (Fehr 2010) suggests 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 increases would be accompanied by vehicle speeds being reduced, thus the net effect on Ldn is neutral with a slight bias toward a non-perceptible (<1dBA) traffic noise increase, if any change at all. The No Build Alternative would not result in a noise impact.

TSM Alternative

Although the frequency of buses and, therefore, the number of buses per day would increase under the TSM Alternative, the relative change in the overall number of buses compared to the large existing and future volumes of automobiles and trucks using the local and regional highways is small. Thus, the effect on the noise environment would also be small and not likely be perceptible (<1 dBA) on an Ldn basis. The TSM Alternative would not result in a noise impact.

Build Alternatives

The noise-generating components are common to all Build Alternatives. The Build Alternatives would not result in operational noise impacts. Environmental noise impacts from introducing transit system noise generally result from at-grade and elevated operations. The Project is a heavy rail transit (HRT) deep subway. Noise from rail transit operations, including the interaction of wheels on track, motive power, signaling and warning systems, and the traction power substations (TPSS) would be below ground, and noise from these project components would not be audible at ground level and above.

[1] An inventory of historic buildings was conducted, and the results may be found in the *Historic Survey Report* (URS 2010b).

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. None of the Build Alternatives include any station-related parking facilities, so there would not be a noise impact.

Passengers would access underground stations using the existing road and sidewalk network via walking, riding a bicycle, or being dropped off from an automobile. While these activities could generate noise above ground at the stations, they would not be significant noise generators, would be brief and minimal, and would not result in a noise impact.

Stations and Segment Options

Noise from rail transit operations, including the interaction of wheels on track, motive power, signaling, and warning systems, would be well below ground. Noise from these components of the alignment options would be inaudible at ground level and above. Thus, there would be no noise impact from any of the alignment options.

Other Components of the Build Alternatives

The TPSS would be located within a vault in the underground stations, would not generate noise above ground, and would not result in a noise impact. Emergency electrical power generators would be located at the ground surface adjacent to select stations. Noise from routine periodic testing of these generators is considered project-related noise. The periodic testing of these generators could result in a noise impact that violates local noise-control ordinances or disrupts nearby noise-sensitive activities. This impact may be avoided by placing generators within a noise-attenuating building and be appropriately muffled. The Project would also be consistent the Metro Design Criteria for noise emission limits at the property line of the nearest noise-sensitive use. By including these elements into the design, the at-grade emergency power generators would have no noise impact.

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. (See Section 2.7.3). Vent shafts are proposed at:

- Wilshire Boulevard west of Robertson Boulevard
- Federal Avenue/Wilshire Boulevard
- Wilshire Boulevard/Manning Avenue
- Santa Monica Boulevard/Beverly Glen Boulevard
- Santa Monica Boulevard just west of Beverly Glen Boulevard
- Santa Monica Boulevard/Glendon Avenue
- Santa Monica Boulevard between Thayer and Pandora Avenues
- Santa Monica Boulevard just east of Glendon Avenue

The “tunnel vents” that discharge air at the top of the shaft can be a surface noise source during train operations and could also be used for emergency evacuation of passengers. However, excessive noise from tunnel vent discharge points can be readily attenuated by incorporating the features such as acoustic treatment to the vent shaft’s interior surface consistent with specifications from the Metro Design Criteria. Thus, there would be no impact from this component.

Noise associated with an expanded the Rail Operations Center would not materially contribute to the existing noise level. Similarly, the Division 20 Vehicle Storage and Maintenance Facility or the Union Pacific Los Angeles Transportation Center Rail Yard are already used for the same or similar purposes. There are no noise- -sensitive uses near these facilities or the track accessing these facilities. Thus, there would be no noise impacts associated with improvements to these facilities.

Transit Vibration Impact

No Build Alternative

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

TSM Alternative

The additional buses could be considered new vibration sources. Vibration generated by rubber-tired vehicles, such as transit buses, is very small and unlikely to affect adjacent uses. The TSM Alternative would not result in a vibration impact.

Build Alternatives

There are no vibration sensitive receivers that are predicted to exceed the FTA ground-borne vibration criteria.

Exceedance of the FTA ground-borne noise criteria is expected to occur at 42 residential building locations, 3 medical centers, 3 theaters, and 8 hotels/motels. These exceedances are in the range of 1 to 7 db above the 35-dBA ground-borne noise criterion. The majority of the locations are predicted to exceed the FTA criteria by no more than 3 dB with only two locations at 6 to 7 dB above the criterion. As part of the Preliminary Engineering design, transfer mobility tests would be conducted to confirm the predicted impact and the need for mitigation.

Alternative 1—Westwood/UCLA Extension

The FTA ground-borne noise criteria are predicted to be exceeded at 22 locations for Alternative 1. Figure 4-43 and Figure 4-44 show the 22 locations and Table 4-31 provides the cross streets for each of the locations.

Alternative 2—Westwood/VA Hospital Extension

The FTA ground-borne noise criteria are predicted to be exceeded at the same 22 locations for Alternative 2 that were exceeded in Alternative 1. Figure 4-43 and Figure 4-44 show the 22 locations and Table 4-31 provides the cross streets for each of the locations.

Alternative 3—Santa Monica Extension

Ground-borne noise, for Alternative 3, is predicted to exceed the FTA ground-borne noise criteria at 30 locations. 22 of the locations are same as in Alternates 1 and 2 and are shown in Figure 4-43 and Figure 4-44 and listed in Table 4-31. The 8 additional locations are shown in Figure 4-45 and Table 4-32 provides the cross streets for each of the 8 additional locations.

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

The FTA ground-borne noise criteria are predicted to be exceeded at 18 locations for Alternative 4. The 18 locations are shown in Figure 4-43 and Figure 4-44 and Table 4-33 provides the cross streets for each of the 18 locations.

Alternative 5—Santa Monica Extension plus West Hollywood Extension

Alternative 5 would included the same predicted exceeds to the FTA ground-borne at the same 9 locations listed in Table 4-32 and shown in Figure 4-45 for Alternatives 3 and the same 18 locations listed in Table 4-33 and shown in Figure 4-43 and Figure 4-44 for Alternative 4.

MOS 1—Fairfax Extension

The FTA ground-borne noise criteria are predicted to be exceeded at 12 locations for Alternative MOS 1. Table 4-34 provides the Alignment Station Number and cross street for each of the 12 locations.

MOS 2—Century City Extension

The FTA ground-borne noise criteria are predicted to be exceeded at the same 20 locations for Alternative MOS 2 as are exceeded for Alternative 1. Table 4-31 provides the cross streets for each of the 20 locations.

Station and Segment Options

The FTA ground-borne noise criteria are predicted to be exceeded at four locations with the Constellation South Option, four locations with the Constellation North Option, six locations with the West Option, one location with the East Option, three locations with the Central Option, and one location with Station Option 3. Table 4-35 provides the cross streets for each of these locations.

4.6.4 Mitigation Measures for Project Operations Noise

The FTA provides a selection of practical noise mitigation measures in its manual (FTA 2006) designed to address surface running or elevated transit systems that project sponsors would consider if noise impacts are expected. However, the Westside Subway Extension Project is conceived as an underground subway in a relatively deep and robust tunnel; thus, operational noise originating in the project's tunnels and stations would be inaudible at the ground surface. Other components of the build alternatives, including the expanded vehicle storage and maintenance facility, the expanded ROC, fans, tunnel vents, TPSS, and emergency electrical generators designed in accordance with *Metro Design Criteria* would result in no noise impact; thus, no mitigation measures are required.

4.6.5 Mitigation Measures for Project Operations Vibration

To minimize the potential for ground-borne noise impacts to residential, theater, and hotel uses above the Westside Subway tunnel, high resiliency direct fixation rail fasteners would be incorporated into the design of the trackwork. A high resiliency rail fastener would reduce the ground-borne noise by 7 to 9 dBA. The extent and type of rail fastener would be determined during Preliminary Engineering design.

Table 4-31. Ground-borne Noise Impact Locations—Wilshire/Western Station to Westwood/VA Hospital Station

ID#	Receiver	Cross Street	Cross Street	Alternative
1	Ramada Inn	St Andrews Place	Grammercy Place	1,2,3
3	Apartments	Norton Ave	Bronson Ave	1,2,3
4	Los Altos Hotel	Norton Ave	Bronson Ave	1,2,3
5	Dunnes Inn	Bronson Ave	Crenshaw Blvd	1,2,3
8	Wilshire Fbell Theatre	Luerne Blvd	Adren Blvd	1,2,3
9	Apartments	Luerne Blvd	Adren Blvd	1,2,3
10	Apartments	Adren Blvd	Rossmore Ave	1,2,3
11	Apartments	Rossmore Ave	Murfield Road	1,2,3
14	Apartments	Tremaine Ave	McCadden Place	1,2,3
17	Apartments	Mansfield Ave	Orange Drive	1,2,3
18	Apartments	Detroit Street	Cloverdale Ave	1,2,3
20	Apartments	Ridgely Drive	Hauser Blvd	1,2,3
24	Apartments	Fairfax Ave	Crescent Heights Blvd	1,2,3
29	Saban Theatre	Gale Drive	La Cienega Blvd	1,2,3
30	Fine Arts Theatre	Le Doux Road	Stanley Drive	1,2,3
31	Apartments	Stanley Drive	Carson Drive	1,2,3
32	Specialty Surgical Center	Wilshire Blvd	Robertson Blvd	1,2,3
38	Beverly Wilshire Hotel	El Camino Drive	Rodeo Drive	1,2,3
41	The Beverly Hilton	Wilshire Blvd	Moreno Drive	1,2,3
43	SFR	Wilshire Blvd	Santa Monica Blvd	1,2,3
50	Apartments Hi-Rise	Holme Ave	Selby Ave	1,2,3
51	Apartments Hi-Rise	Holme Ave	Selby Ave	1,2,3

Table 4-32. Ground-borne Noise Impact Locations—Westwood/VA Hospital Station to Wilshire/4th Street Station

ID#	Receiver	Cross Street	Cross Street	Alternative
66	Barrington Plaza	Barry Ave	Barrington Ave	3,5
68	Wilshire Motel	Brockton Ave	Saltair Ave	3,5
69	Condos Hi-Rise	Saltair Ave	Budy Drive	3,5
70	Apartments-Mixed	Amherst Ave	Wellesley Ave	3,5
80	Pilgrim Lutheran Church	18th Street	17th Street	3,5
85	Apartments	9th Street	Lincoln Blvd	3,5
87	Apartments	6th Street	5th Street	3,5
88	Apartments	6th Street	5th Street	3,5

Table 4-33. Ground-borne Noise Impact Locations—Hollywood/Highland Station to Wilshire/La Cienega Station

ID#	Receiver	Cross Street	Cross Street	Alternative
90	Hollywood High School	Hollywood Blvd	Sunset Blvd	4,5
93	SFR	Highland Ave	Lexington Ave	4,5
95	Apartments	Poinsettia Place	Fuller Ave	4,5
96	Apartments	Poinsettia Place	Fuller Ave	4,5
100	Apartments	Curson Ave	Stanley Ave	4,5
101	Fire Station 8	Stanley Ave	Spaulding Ave	4,5
116	SFR	Melrose Ave	Rangely Ave	4,5
120	SFR	Rangely Ave	Rosewood Ave	4,5
125	Cedars Sinai Medical Center	Beverly Blvd	San Vincente Blvd	4,5
126	Westbury Terrace	Third Street	Burton Way	4,5
128	SLS at Beverly Hills (hotel)	La Cienega Blvd	San Vincente Blvd	4,5
131	SFR	Carson Road	Willaman Drive	4,5
132	SFR	Willaman Drive	Hamel Drive	4,5
133	SFR	Hamel Drive	Robertson Blvd	4,5
38	Beverly Wilshire Hotel	El Camino Drive	Rodeo Drive	1,2,3,4,5
41	The Beverly Hilton	Wilshire	Moreno Drive	1,2,3,4,5
50	Apartments Hi-Rise	Holme Ave	Selby Ave	1,2,3,4,5
51	Apartments Hi-Rise	Holme Ave	Selby Ave	1,2,3,4,5

Table 4-34. Ground-borne Noise Impact Locations—MOS 1

ID#	Receiver	Cross Street	Cross Street	Alternative
1	Ramada Inn	St Andrews Place	Gramercy Place	1,2,3
3	Apartments	Norton Ave	Bronson Ave	1,2,3
4	Los Altos Hotel	Norton Ave	Bronson Ave	1,2,3
5	Dunnes Inn	Bronson Ave	Crenshaw Blvd	1,2,3
8	Wilshire Ebell Theatre	Lucerne Blvd	Arden Blvd	1,2,3
9	Apartments	Lucerne Blvd	Arden Blvd	1,2,3
10	Apartments	Arden Blvd	Rossmore Ave	1,2,3
11	Apartments	Rossmore Ave	Murfield Road	1,2,3
14	Apartments	Tremaine Ave	McCadden Place	1,2,3
17	Apartments	Mansfield Ave	Orange Drive	1,2,3
18	Apartments	Detroit Street	Cloverdale Ave	1,2,3
20	Apartments	Ridgely Drive	Hauser Blvd	1,2,3

Table 4-35. Ground-borne Noise Impact Locations—Alignment Options

ID#	Receiver	Cross Street	Cross Street	Alternative
137	SFR	Lasky Drive	Moreno Drive	Option 4, Constellation South
138	SFR	Lasky Drive	Moreno Drive	Option 4, Constellation South
139	Beverly Hill High School	Moreno Drive	Century Park East	Option 4, Constellation South
140	Future Residential	Century Park East	Ave of the Stars	Option 4, Constellation North and South
143	Apartments	Santa Monica Blvd	Wilshire Blvd	Option 4, Constellation North
145	SFR	Lasky Drive	Moreno Drive	Option 4, Constellation North
147	Beverly Hill High School	Moreno Drive	Century Park East	Option 4, Constellation North
160	Apartments	Holme Ave	Prosser Ave	Option 5 West
162	Apartments	Pelham Ave	Overland Ave	Option 5 West
164	Travel Lodge	Overland Ave	Selby Ave	Option 5 West
166	SFR	Glendon Ave	Westwood Blvd	Option 5 West
175	SFR	Missouri Ave	Santa Monica Blvd	Option 4 and 5 East
176	SFR	Century Park West	Fox Hill Drive	Option 4 and 5 Central
177	SFR	La Grange Ave	Beverly Glen Blvd	Option 4 and 5 Central
178	Apartments	Beverly Glen Blvd	Pandora Ave	Option 4 and 5 Central
180	SFR	La Grange Ave	Beverly Glen Blvd	Options 4 and 5 West
181	Apartments	Beverly Glen Blvd	Pandora Ave	Options 4 and 5 West
185	Apartments	San Vicente Blvd	Hamilton Drive	4,5 Option 3

4.6.6 California Environmental Quality Act Determination

Applying CEQA guidelines, any vibration or noise impacts must be mitigated or identified as a significant impact for which no abatement measures are available, due to economic, social, environmental, legal, or technological conditions. CEQA does not provide specific thresholds for significant noise or vibration impact. 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 the Project would result in:

- 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 project's operational noise and operational vibration were evaluated to determine if the project would cause significant noise or vibration impacts to the environment. The project's impact analyses concluded that the project as described, including resilient rail fasteners and noise control features as identified and discussed above for tunnel vent discharge locations and emergency power generators:

- Would 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
- Would not expose persons to or generate excessive ground-borne vibration but will exceed thresholds of significance for ground-borne noise levels
- Would not result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project
- Would not result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project
- Although portions of the project are located within 1.9 miles of the Santa Monica Municipal Airport boundary, the project would not expose people residing or working in the project area to excessive noise levels
- The project is not located within the vicinity of a private airstrip.

No operational noise impacts for any of the alternatives are anticipated and no mitigation is required in accordance with CEQA.

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

Impacts Remaining after Mitigation

The ground-borne noise impacts would be mitigated to a level below the threshold of significance. No operational noise impacts for any of the alternatives are anticipated, thus no impacts remain.

4.7 Energy

The information in this section was taken from the *Westside Subway Extension Energy Technical Report*. This section quantitatively discusses the energy consumption characteristics associated with each of the Project's alternatives.

4.7.1 Regulatory Setting

State

The California Energy Commission is the State's primary energy policy and planning agency. Created by the Legislature in 1974, the commission has five major responsibilities: (1) forecasting future energy needs and keeping historical energy data, (2) licensing thermal power plants 50 megawatts or larger, (3) promoting energy efficiency through appliance and building standards, (4) developing energy technologies and supporting renewable energy, and (5) planning for and directing the State's response to energy emergencies.

The commission published the *2007 Integrated Energy Policy Report* 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 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 SCAB 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 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. 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 Existing Conditions/Affected Environment

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 all be converted into equivalent BTU units and thus, the BTU is used as the basis for comparing energy consumption associated with different resources.

Table 4-36 compares various types of energy and their equivalent BTUs.

Table 4-36. 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

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 second largest consumer of transportation fuels in the world (behind the United States as a whole); more than 16 billion gallons of gasoline and four billion gallons of diesel fuels are consumed each year. 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 proposed alternatives is expected to result in changing the dynamics of all vehicle classes with regard to VMT. Changes in VMT, in turn, would affect energy consumption. VMT is also an important indicator of demand for infrastructure improvements. Urban growth patterns have caused California's VMT to increase over 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 would lower energy needs and reduce pollutant emissions.

4.7.3 Environmental Impacts/Environmental Consequences

The Westside Subway Extension would be expected to remove passenger cars from the regional roadway network, easing the increase in VMT and the usage of fuels. The Westside Subway Extension may also reduce regional energy consumption depending on ridership forecasts for the various modes of transportation.

Operational energy use for each alternative was calculated based on the BTU per passenger-mile rate. Energy required for train travel would be the primary source of energy use during operation of the Build Alternatives. Table 4-37 displays the energy requirements for various modes of transportation including automobile, bus, and rail transit.

Table 4-37. Transportation Energy Intensity

Transport Mode	BTU/Passenger-Mile	BTU/VMT
Automobile	3,514	5,517
Transit Bus (all vehicle types)	4,315	39,048
Commuter Rail	2,638	90,328
Urban Rail	2,577	62,833

Source: Oak Ridge National Laboratory, Transportation Energy Data Book: Edition 28-2009, 2009

Table 4-38 summarizes passenger miles that would be either added or subtracted from the region when compared to the No Build Alternative, the baseline condition without the Project. For example, Alternative 5 would add 37,078 urban rail passenger miles to the region while removing 369,744 automobile passenger miles compared to the No Build Alternative. All of the Build Alternatives, not including MOS 1 and MOS 2, would reduce bus passenger miles by 8,390.

Table 4-38. 2035 Regional Passenger Miles by Transportation Mode

Alternative	Automobile	Rail	Bus
TSM	(28,770)	0	1,472
1	(357,083)	14,950	(8,390)
2	(360,000)	15,714	(8,390)
3	(365,868)	21,059	(8,390)
4	(362,887)	27,457	(8,390)
5	(369,744)	37,078	(8,390)
MOS 1	(343,337)	6,872	0
MOS 2	(352,205)	12,218	(3,410)

Passenger miles are shown compared to the No Build Alternative. Numbers in parentheses indicate a reduction in passenger miles.

The summary of operational impacts is based on the BTU consumption information presented in Table 4-39. The analysis of station energy was based on an FTA annual rate of 175 million BTUs per station (*FTA's Technical Guidance on Section 5309 New Starts Criteria, July 1999*).

No Build Alternative

The No Build Alternative would not include any physical changes to the corridor, aside from the projects currently underway or planned under the RTP and LRTP. This alternative would not result in new activity and would 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 1,383,126 billion BTU in 2035 under the No Build Alternative.

Table 4-39. Estimated Mobile Source Energy Consumption

Alternative	Change in Energy Consumption (Million BTUs/Year)
TSM	(36,761)
1	(496,877)
2	(485,229)
3	(374,463)
4	(221,728)
5	(14,888)
MOS 1	(533,777)
MOS 2	(478,078)

Source: Terry A. Hayes Associates LLC, 2010

The changes in energy are shown in comparison with the No Build Alternative. Numbers in parentheses indicate a reduction in passenger miles.

Transportation System Management Alternative

The TSM Alternative would not include any physical changes to the Study Area. This alternative would not result in new construction activity and would not have an adverse energy impact.

The TSM Alternative would decrease automobile VMT by roughly 28, 770 passenger miles and increase bus passenger miles by 1,472. Table 4-39 shows that mobile source BTU consumption from the TSM Alternative would decrease by roughly 36.7 billion BTU per year compared to the No Build Alternative. The TSM Alternative would result in less energy consumption than the No Build Alternative and would result in a beneficial energy impact.

Alternative 1—Westwood/UCLA Extension

Alternative 1 would increase rail VMT by approximately 14,950 passenger miles and decrease automobile and bus VMT by 375,083 and 8,390 passenger miles, respectively. As shown on Table 4-39, the mobile source energy consumption for Alternative 1 would decrease by approximately nearly 500 billion BTU per year compared to the No Build Alternative due to the net decrease in system-wide passenger miles.

Alternative 1 would also consume energy to operate seven stations. This energy would be used to provide lighting and to power electronic equipment. Each of the seven stations would use approximately 175 million BTUs per year during operational activity (e.g., lighting). The total energy consumption associated with all seven stations would be approximately 1.2 billion BTUs per year.

The net energy consumption of Alternative 1 would be less than the No Build Alternative. Therefore, Alternative 1 would result in a beneficial energy impact.

Alternative 2—Westwood/VA Hospital Extension

Alternative 2 includes decreased system-wide passenger miles, which results in less energy consumption than the No Build Alternative. Alternative 2 would decrease automobile passenger miles by 360,000 and bus passenger miles by 8,390. Rail passenger miles are expected to increase by 15,714.

Alternative 2 would include eight stations and associated stationary energy consumption. Each of the eight stations would use approximately 175 million BTUs per year during operational activity. The total energy consumption associated with all eight stations would be approximately 1.4 billion BTUs per year. Mobile source BTU consumption would decrease by approximately 485 billion BTU per year compared to the No Build Alternative. As such, Alternative 2 would result in a beneficial energy impact.

Alternative 3—Santa Monica Extension

Alternative 3 includes decreased system-wide passenger miles, which results in less energy consumption than the No Build Alternative. In addition, Alternative 3 would increase rail passenger miles by 21,059 and decrease automobile and bus passenger miles by 365,868 and 8,390, respectively. The decrease in automobile and bus passenger miles would decrease regional energy consumption associated with automobiles and buses. The mobile source BTU consumption for Alternative 3 would be approximately 374 billion BTU per year lower than the No Build.

Alternative 3 would include 12 stations and associated stationary energy consumption. Each of the 12 stations would use approximately 175 million BTUs per year during operational activity. The total energy consumption associated with all 12 stations would be approximately 2.1 billion BTUs per year. Alternative 3 would result in less energy consumption than baseline conditions and would result in a beneficial energy impact.

Alternative 4—Westwood/VA Hospital Extension Plus West Hollywood Extension

Alternative 4 would increase rail passenger miles by 27,475 and decrease automobile and bus passenger miles by 362,887 and 8,390, respectively. Mobile source BTU consumption would decrease by about 222 billion BTU per year because of decreased system-wide passenger miles. Furthermore, Alternative 4 would include 13 stations and associated stationary energy consumption. Each of the 13 stations would use approximately 175 million BTUs per year during operational activity (e.g., lighting). The total energy consumption associated with all 13 stations would be approximately 2.1 billion BTUs per year. Alternative 4 would result in lower net energy consumption than the No Build Alternative and would result in a beneficial energy impact.

Alternative 5—Santa Monica Extension Plus West Hollywood Extension

Alternative 5 would increase rail passenger miles by 37,078 and decrease automobile and bus passenger miles by 362,744 and 8,390, respectively. Mobile source BTU consumption would decrease by approximately 15 billion BTU per year compared to the No Build Alternative due to the decreased system-wide passenger-miles. The decrease in energy consumption is much lower compared to the other Build Alternatives. For example, Alternative 4 shows a decrease of 222 billion BTU, which is 207 billion BTU greater than Alternative 5. However, Alternative 5 has many more rail miles than the other alternatives. Alternative 5 has 10,000 more miles than Alternative 4. The drop in auto and the bus passenger miles are similar for Alternatives 4 and 5. The additional 10,000 rail miles results in more energy use and therefore, less energy savings for Alternative 5 versus the other alternatives.

Alternative 5 would include 17 stations and associated stationary energy consumption. Each of the 17 stations would use approximately 175 million BTUs per year during operational activity (e.g., lighting). The total energy consumption associated with all 17 stations would be approximately 3 billion BTUs per year. Alternative 5 would result in less energy consumption than baseline conditions and would result in a beneficial energy impact.

MOS 1—Fairfax Station Terminus

MOS 1 extends the Metro Purple Line a short distance (approximately 3.10 miles) west from the existing Wilshire/Western terminus and compared to current operations, bus passenger miles would be not be substantially different than the No Build Alternative. MOS 1 would increase rail passenger miles by 6,872 and decrease automobile passenger miles by 343,337. Table 4-39 shows that mobile source BTU consumption from MOS 1 would decrease by approximately 534 billion BTUs per year in comparison to the other alternative.

MOS 1 includes three stations and associated stationary energy consumption. Each of the three stations would use approximately 175 million BTUs per year during operational activity (e.g., lighting). The total energy consumption associated with all three stations would be approximately 525 million BTUs per year.

MOS 2—Century City Station Terminus

MOS 2 would increase rail passenger miles by 12,218, which is twice as much as MOS 1. MOS 2 would decrease automobile and bus passenger miles by 352,205 and 3,410, respectively. The mobile source BTU consumption would decrease by approximately 478 billion BTU per year. Since MOS 2 has a greater decrease in bus passenger miles and double the rail passenger miles compared to MOS 1, MOS 2 has a greater decrease in estimated mobile source energy consumption than MOS 1.

MOS 2 would include six stations and associated stationary energy consumption. Each of the six stations would use approximately 175 million BTUs per year during operational activity (e.g., lighting). The total energy consumption associated with all six stations would be approximately 1.0 billion BTUs per year.

Station and Alignment Options

Option 1

Since each station is estimated to consume 175 million BTUs per year, removing the Wilshire/Crenshaw Station, Option A would reduce the annual energy consumption for each alternative by approximately 175 million BTUs. All of the alternatives would still result in beneficial energy impacts.

Options 2, 3, 4, 5, and 6

These options involve alternate station locations. The options would not increase or decrease the total number of stations for any alternative. The alternate alignment option associated with Option 4 would marginally affect the VMT, which is the basis of the mobile source energy analysis. Therefore, alignment changes associated with Option 4 would not substantially alter the operational energy consumption of the alternatives. Options 2, 3, 4, 5, and 6, therefore, would not overall increase or decrease operational energy consumption of the alternatives. Regardless of the option selected, all of the alternatives would still result in beneficial energy impacts.

Maintenance and Operation Facility Sites

The proposed maintenance and operations functions at the Division 20 yard and the Union Pacific Transportation Center Rail Yard are generally the same. Therefore, energy would be used for lighting, repair activity, cleaning, etc. would be approximately the same regardless of which maintenance facility site is selected.

The California Department of Transportation has estimated that operation of the maintenance and storage facilities would result in the use of approximately 8.7 billion BTUs per year. The Division 20 yard and the Union Pacific Transportation Center Rail Yard combined would consume approximately 17.4 billion BTUs per year. This represents a small percentage of operational energy consumption, compared to each Build Alternative. Energy use associated with the maintenance yards would not substantially affect overall regional energy use.

4.7.4 Mitigation Measures

Operational activity associated with each alternative would decrease regional energy consumption. Operational activity would result in beneficial energy impacts, and mitigation measures are not required.

- **EN-1**—Metro would require the construction contractor to implement energy conserving best management practices (BMP) in accordance with Metro's Energy and Sustainability Policy. BMPs would include, but would not be limited to, implementing a construction energy conservation plan; using energy-efficient equipment; consolidating material delivery to ensure efficient vehicle use; scheduling delivery of materials during non-rush hours to maximize vehicle fuel efficiency; encouraging construction workers to carpool; and maintaining equipment and machinery in good working condition. With the implementation of these measures, the Build Alternatives would not lead to a wasteful, inefficient, or unnecessary usage of fuel or energy.

4.7.5 California Environmental Quality Act Determination

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.

All of the alternatives would decrease regional energy consumption and would result in beneficial energy impacts. Metro would require the construction contractor to implement energy-conserving BMPs in accordance with Metro's Energy and Sustainability Policy. None of the alternatives would lead to wasteful, inefficient, or unnecessary usage of fuel or energy with implementation of these measures. Operational activity from the alternatives would also not result in significant energy impacts.