California High-Speed Rail Authority

Los Angeles to Anaheim Project Section

Noise and Vibration Technical Report

October 2025



CALIFORNIA High-Speed Rail Authority

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being or have been carried out by the State of California pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated July 22, 2024, and executed by the Federal Railroad Administration and the State of California.

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ACRONYMS AND ABBREVIATIONS

Term	Definition
Amtrak	National Railroad Passenger Corporation
ARTIC	Anaheim Regional Transportation Intermodal Center
Authority	California High-Speed Rail Authority
BNSF	BNSF Railway
CFR	Code of Federal Regulations
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CNEL	community noise equivalent level
dB	decibel
dBA	A-weighted decibel
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HSR	high-speed rail
I-	Interstate
kHz	1,000 Hertz
LAUS	Los Angeles Union Station
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
$L_{eq}(h)$	hourly equivalent sound level
L_{max}	maximum sound level
LMF	light maintenance facility
mph	miles per hour
NEPA	National Environmental Policy Act
NSA	noise-sensitive area
OCS	overhead contact system
PPV	peak particle velocity
project section	Los Angeles to Anaheim Project Section
RMS	root mean square
RSA	resource study area
SEL	sound exposure level
TPSS	traction power substation

Term	Definition
UPRR	Union Pacific Railroad
US 101	U.S. Highway 101
USEPA	U.S. Environmental Protection Agency
VdB	vibration decibel
VSA	vibration-sensitive area

EXECUTIVE SUMMARY

This Noise and Vibration Technical Report describes the regulatory setting, existing conditions, and potential impacts associated with noise and vibration generated from construction and operation of the proposed Los Angeles to Anaheim Project Section of the California High-Speed Rail (HSR) System. This project section is approximately 30 miles long and travels through the cities of Los Angeles, Vernon, Bell, Commerce, Montebello, Pico Rivera, Santa Fe Springs, Norwalk, La Mirada, Buena Park, Fullerton and Anaheim. This project's alignment would share the existing Los Angeles – San Diego – San Luis Obispo Rail Corridor with existing rail operations, including National Railroad Passenger Corporation (Amtrak) passenger trains, Metrolink commuter trains, and BNSF Railway (BNSF) freight trains. In addition to new tracks for HSR, this project section would include an HSR station in Anaheim, as well as a maintenance of infrastructure siding, a light maintenance facility (LMF) with alternatives at 26th Street or 15th Street, and electric power utility improvements. Intermediate HSR station options for one additional HSR station in Norwalk/Santa Fe Springs or Fullerton are included in the proposed Los Angeles to Anaheim Project Section.

Shared Passenger Track Alternatives A and B for the Los Angeles to Anaheim Project Section include an alternative with the LMF at 26th Street (Shared Passenger Track Alternative A) and an alternative with the LMF at 15th Street (Shared Passenger Track Alternative B). A description of the alternatives and their locations can be found in Chapter 2, Alternatives, of the Draft Environmental Impact Report/Environmental Impact Statement. This technical report focuses on analysis carried out for the Shared Passenger Track Alternatives exclusively within the project section between Los Angeles and Anaheim.

There are a number of federal, state, and local regulations related to noise and vibration. However, the assessment of noise and vibration impacts from HSR construction and operations is largely based on the application of Federal Railroad Administration (FRA) methodology and guidelines (FRA 2012). The FRA guidance includes impact criteria for annoyance to humans, wildlife, and livestock as well as guidelines for identifying noise-sensitive locations where increased annoyance can occur as a result of the sudden increase in noise (the *startle effect*) from the rapid approach of HSR. The FRA guidelines are supplemented by Federal Transit Administration (FTA) guidelines (FTA 2018) for associated fixed facilities, such as storage and maintenance yards, passenger stations and terminals, parking facilities, and electrical substations. In addition, project-related traffic noise impacts are assessed based on Federal Highway Administration (FHWA 2011) and California Department of Transportation (Caltrans 2013) procedures and criteria.

Sources of existing noise along the proposed HSR alignment include passenger and freight trains, roadway traffic, aircraft, and local community sources. To characterize the existing noise conditions at noise-sensitive areas along the project alignment, ambient noise measurements were conducted at 45 sites throughout the noise resource study area for the Los Angeles to Anaheim Project Section. Because the project alignment is within existing rail corridors, the measurement results indicate generally high existing noise levels with measured noise exposure in day-night sound level (L_{dn}) in the range of 60 to 82 A-weighted decibels (dBA). For vibration, the only significant sources of existing ground vibration along the proposed alignment are passenger and freight trains. To characterize the ground vibration transmission conditions at vibration-sensitive locations along the project alignment, vibration propagation measurements were conducted at 11 sites throughout the vibration resource study area. Propagation measurements are used to determine how efficiently vibration travels or is transmitted through the ground over distance. The results were used to predict existing and future ground-borne vibration and noise levels at sensitive locations.

The results of the noise and vibration assessment indicate that no impacts are anticipated for the No Project Alternative. For the Shared Passenger Track Alternatives, the results of the FRA detailed noise analysis and detailed vibration assessment are as follows:

- **U.S Highway 101 to Redondo Junction:** No noise or vibration impacts are projected along this part of the project alignment.
- **Redondo Junction to Fullerton Junction:** Moderate noise impacts are projected at 22 residences and severe noise impacts are projected at 3 residences along this part of the project alignment. In addition, ground-borne vibration impacts are projected at 42 residences.
- **Fullerton Junction to Anaheim Regional Transportation Intermodal Center:** Moderate noise impacts are projected at 421 residences and severe noise impacts are projected at 56 residences along this part of the project alignment. In addition, ground-borne vibration impacts are projected at 475 residences.

Operation of the Shared Passenger Track Alternatives would result in a permanent increase in noise levels resulting from an increase in rail traffic. However, because train horn noise would be eliminated at some locations with implementation of the grade separations that are part of this project, such locations would experience a beneficial noise reduction. In addition, although project-related movement of freight tracks within the right-of-way would result in small changes in noise at two locations near sensitive receptors, the noise impacts of these movements would not be significant.

Based on an FTA screening analysis, no noise or vibration impacts are projected from fixed facilities including stations, maintenance facilities, and electrical substations. In addition, increased annoyance related to startle and noise effects on wildlife are not anticipated.

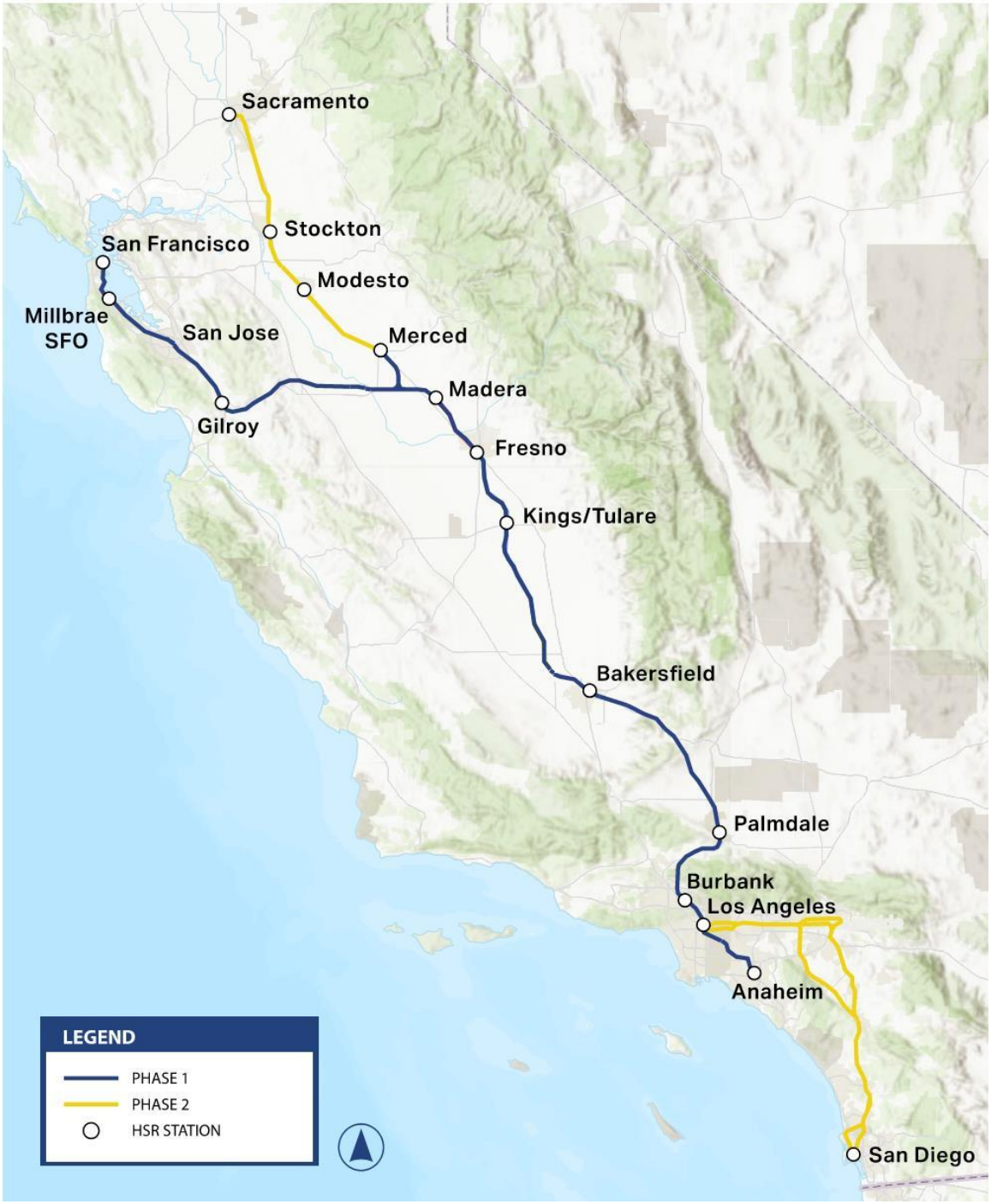
1 INTRODUCTION

1.1 California High-Speed Rail System Background

The California High-Speed Rail Authority (Authority), a state governing board formed in 1996, is responsible for planning, designing, building, and operating the California High-Speed Rail (HSR) System. Its statutory mandate is to develop an HSR system that coordinates with the state's existing transportation network, which includes intercity rail and bus lines, regional commuter rail lines, urban rail and bus transit lines, highways, and airports. The California HSR System will provide intercity, high-speed service on more than 800 miles of tracks throughout California, connecting the major population centers of Sacramento, the San Francisco Bay Area, the southern Central Valley, Los Angeles, the Inland Empire, Orange County, and San Diego, as depicted on Figure 1-1.[1] It will use state-of-the-art, electrically powered, high-speed, steel-wheel-on-steel-rail technology, including contemporary safety, signaling, and automated train control systems, with trains capable of operating up to 220 miles per hour.

The California HSR System is planned to be implemented in two phases. Phase 1 would connect San Francisco to Los Angeles and Anaheim via the Pacheco Pass and the Central Valley. Phase 2 would extend the HSR system from the Central Valley (starting at the Merced Station) to the state's capital in Sacramento and from Los Angeles to San Diego.

[1] The alignments depicted on Figure 1-1 reflect the Authority/Federal Railroad Administration decisions made in the 2005, 2008, and 2012 Programmatic Environmental Impact Report/Environmental Impact Statement documents.



Source: Authority 2023a

Figure 1-1 California High-Speed Rail System

1.2 Los Angeles to Anaheim Project Section Background

The Los Angeles to Anaheim Project Section (project section) of the HSR system would extend approximately 30 miles between Los Angeles Union Station (LAUS) in Los Angeles and Anaheim Regional Transportation Intermodal Center (ARTIC) in Anaheim. This narrow, existing railroad corridor is constrained by the surrounding urban environment and other existing rail operators in

the area, including trains operated by the National Railroad Passenger Corporation (Amtrak), Metrolink (governed by the Southern California Regional Rail Authority), the Union Pacific Railroad (UPRR), and BNSF Railway (BNSF).

The Authority, in cooperation with the Federal Railroad Administration (FRA), completed the *Final Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the Proposed California High-Speed Train System* in November 2005 (Authority and FRA 2005). For the Los Angeles to Anaheim Project Section, the Authority and FRA selected the existing Los Angeles – San Diego – San Luis Obispo Rail Corridor, with the intent of sharing the existing right-of-way as the alignment.

In 2007, the Authority and FRA released the Notice of Preparation/Notice of Intent to inform the public of the beginning of the preparation of a Draft EIR/EIS for the project section.[2] The Authority and FRA engaged in project scoping, completed a Preliminary Alternatives Analysis Report in 2009, and completed Supplemental Alternatives Analysis Reports in 2010 and 2016. The 2016 Supplemental Alternatives Analysis considered two alternatives: Alternative 1 (formerly called the Dedicated High-Speed Track Alternative) and Alternative 2 (formerly called the Consolidated Shared-Track Alternative), and advanced Alternative 2 (HSR Project Alternative) for analysis in the project Draft EIR/EIS.

In 2017 and 2018, BNSF conducted operational modeling that indicated a need for additional capacity during construction and operation of this project section. Consequently, the Authority added BNSF staging tracks in Lenwood (Lenwood Component) and a Colton Intermodal Facility (Colton Component) in San Bernardino County to the project. In 2020, the Authority initiated revised scoping to include the Lenwood and Colton Components in the project section. Stakeholder feedback received during scoping included substantial opposition to the BNSF Components far outside the project corridor.

In response, the Authority prepared a Supplemental Alternatives Analysis (Authority 2023b) to evaluate a new alternative that would eliminate the need for a BNSF Intermodal Facility in San Bernardino County. The 2023 Supplemental Alternatives Analysis examined three new build alternatives that did not include an Intermodal Facility and proposed advancing the Shared Passenger Track Alternative for further consideration in the EIR/EIS, which closely resembled the 2018 HSR Project Alternative without the Lenwood and Colton Components. Operationally, the Shared Passenger Track Alternative would reduce the peak service level for HSR trains to two trains per hour per direction, and up to 10 freight trains per day could operate on the passenger tracks, eliminating the need for the BNSF Intermodal Facility.

Additional design refinements and outreach occurred, and in May 2024, a Preliminary Impacts Assessment Report further defined elements of the Shared Passenger Track Alternative, such as HSR station options, light maintenance facility (LMF) sites, and grade crossings. The Preliminary Impacts Assessment Report recommended the Shared Passenger Track Alternative be split into two build alternatives, Shared Passenger Track Alternative A and Shared Passenger Track Alternative B, which are similar in all aspects, except for the LMF size and location. Shared Passenger Track Alternative A proposes an LMF at 26th Street in Vernon, and Shared Passenger Track Alternative B proposes an LMF at 15th Street in Los Angeles. In May 2024, the Board identified Shared Passenger Track Alternative A as the Preferred Alternative.

1.3 Project Description Purpose

This project description provides a condensed version of the technical information discussed in Chapter 2, Alternatives, of the Draft EIR/EIS and includes references to other documents for additional details and discussion. The basis of this project description is the Draft Los Angeles to Anaheim Preliminary Engineering for Project Definition document. Chapter 2 of the Draft EIR/EIS includes additional details beyond the content discussed herein, including information on the proposed operating plans and scenarios, construction plans, and capital and operating costs.

[2] The Notice of Intent was issued in the *Federal Register* on March 15, 2007 (72 Fed. Reg. 12,250).

1.4 Report Purpose

This technical report has been prepared to analyze the noise and vibration impacts of the project section. This technical report provides support and detailed evaluation of noise and vibration related to the No Project Alternative and the Shared Passenger Track Alternatives. The primary focus of this report is to describe the affected environment (i.e., existing conditions) and to evaluate the range of possible impacts that noise and vibration have during construction and operation of the Shared Passenger Track Alternatives.

2 PROJECT DESCRIPTION

The project section is approximately 30 miles long and travels through the cities of Los Angeles, Vernon, Commerce, Bell, Montebello, Pico Rivera, Santa Fe Springs, Norwalk, La Mirada, Buena Park, Fullerton, and Anaheim. The project's alignment would share a portion of the existing Los Angeles – San Diego – San Luis Obispo Rail Corridor with existing rail operators. The Authority adopted a strategy of sharing the existing corridor and blending HSR with existing rail systems on shared infrastructure (referred to as "blended operations"[3]) to accelerate and broaden benefits, improve efficiency, minimize community impacts, and reduce construction costs.

This section describes the No Project Alternative and Shared Passenger Track Alternatives A and B.

2.1 No Project Alternative

Under the No Project Alternative, the project section would not be built. The No Project Alternative represents the condition of the project section as it currently exists in the base year, and as it would exist without the California HSR System at the planning horizon year of 2040.

In assessing future conditions, it was assumed that all currently known, programmed, and funded improvements to the statewide transportation system (highway, rail, and transit) and reasonably foreseeable local land development projects would be implemented by the year 2040. The No Project Alternative is based on a review of and consultation with several documents and data sources, including, but not limited to, transportation plans such as the 2020 Southern California Association of Governments' Regional Transportation Plan[4]; the Governor's Office of Land Use and Climate Innovation CEQAnet Database; the Federal Aviation Administration's Air Carrier Activity Information System and Airport Improvement Plan grant data; the California State Transportation Commission's State Transportation Improvement Program; airport master plans and interviews with airport officials; intercity passenger rail plans; and city and county general plans and planning officials.

2.2 High-Speed Rail Build Alternatives

The project proposes two build alternatives: Shared Passenger Track Alternative A and Shared Passenger Track Alternative B. Shared Passenger Track Alternative A proposes an LMF at 26th Street, whereas Shared Passenger Track Alternative B proposes an LMF at 15th Street. Both alternatives include an HSR station option in either Norwalk/Santa Fe Springs or Fullerton. The main elements of the build alternatives are summarized in Table 2-1 and depicted on Figure 2-1.

Table 2-1 Summary of Design Features of Shared Passenger Track Alternative A and Shared Passenger Track Alternative B

Feature	Total
Total length (linear miles)	29.7
At-grade profile (linear miles)	23.8
Elevated profile (linear miles)	5
Below-grade/braced trench profile (linear miles)	0.9
Number of straddle bents[1]	16

[3] California High-Speed Rail Business Plans (California High-Speed Rail 2022 Business Plan) suggest blended railroad systems and operations. These terms refer to integrating the HSR system with existing intercity, and commuter and regional rail systems through coordinated infrastructure (blended systems) and scheduling, ticketing, and other means (blended operations).

[4] The No Project Alternative uses the 2020 Southern California Association of Governments Regional Transportation Plan as the basis for analysis, with the exception of the transportation analysis, which uses the 2016 Regional Transportation Plan as the baseline. This is because of the date and availability of traffic counts collected for the project.

Feature	Total
Number of at-grade railroad crossings[2]	8
Number of major water crossings[3]	9
Number of roadway overcrossings and undercrossings	57

[1] A straddle bent is a pier structure that spans (or "straddles") the functional/operational limit of a roadway, highway, or railway.
[2] Railroad crossing means a railroad crossing another railroad.
[3] Features considered major water crossings are Los Angeles River, Rio Hondo (and basins), San Gabriel River, North Fork Coyote Creek, La Mirada Creek, Coyote Creek, Brea Creek, Fullerton Creek, and Carbon Creek.



Source: Authority 2025

Figure 2-1 Los Angeles to Anaheim Project Section Alignment

Currently, two to three mainline tracks occur throughout the corridor, with a variable number of freight siding tracks. The HSR project seeks to maintain existing operations in the corridor while minimizing impacts outside of the existing right-of-way. To accomplish this, the HSR project would add one new mainline track from LAUS to Fullerton Junction and would use existing tracks, where possible, to ensure that, overall, the project section includes two electrified tracks along the corridor for HSR, which would be shared with other passenger rail operators. These two electrified tracks are referred to herein as *shared tracks*. The specific details of Shared Passenger Track Alternative A and Shared Passenger Track Alternative B are discussed further below.

2.2.1 Shared Passenger Track Alternative A

2.2.1.1 Alignment

Table 2-2 summarizes the alignment of Shared Passenger Track Alternative A through the corridor cities. Figure 2-2 depicts the northern project section limit and its relationship with Los Angeles County Metropolitan Transportation Authority's proposed Link Union Station Project. Figure 2-3 through Figure 2-8, as referenced therein, provide cross-sections of various points along the project alignment discussed in Table 2-2. Where applicable, Table 2-2 also provides references to later sections of this project description that provide further details of other project components including, but not limited to, ancillary facilities, HSR and passenger rail stations, and the LMFs.

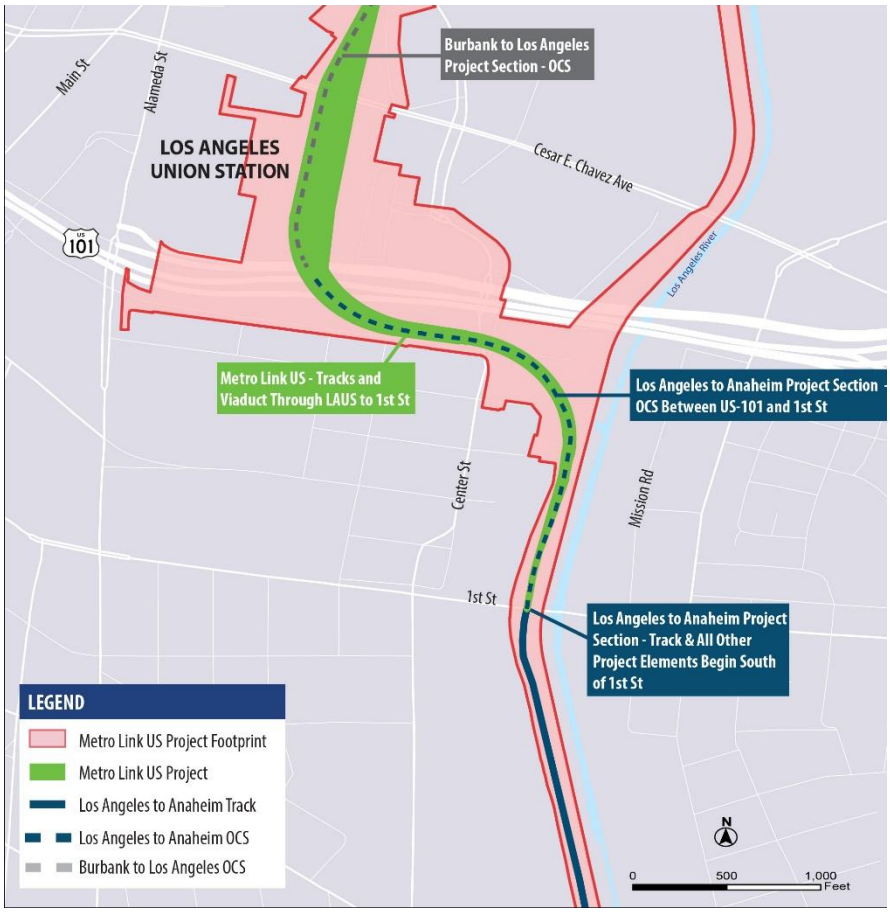
Table 2-2 Shared Passenger Track Alternative A Alignment

Project Section Segment	Segment Alignment Description
Los Angeles and Vernon	▪ The project section would begin immediately south of LAUS, at the northern edge of US 101, where a viaduct built as part of the Link US Project would begin. The installation of the OCS north of US 101 was previously approved as part of the Burbank to Los Angeles Project Section in January 2022. From US 101 to 1st St, the Authority would build the OCS for HSR. At 1st St, Shared Passenger Track Alternative A would include the HSR project tracks and all other project infrastructure south to ARTIC. ▪ Starting at the LAUS platforms, HSR trains would run on tracks built as part of Link US, cross over US 101, Commercial St, and Ducommun St on a viaduct, and come down to grade just before 1st St, joining the existing railroad right-of-way. From this tie-in point south, the HSR trains would use the existing tracks, which would be upgraded with an OCS. Refer to Figure 2-3 for a cross section of the track between 1st St and 4th St. ▪ Between 7th St and I-10, two HSR layover tracks would be added west of the shared tracks; refer to Section 2.2.1.2, Ancillary Facilities, for more information. The shared tracks would cross under the Olympic Blvd roadway overcrossing and rise onto an existing railroad bridge to cross over Washington Blvd and the Los Angeles River. The shared tracks would return to at grade east of Soto St and enter Vernon. ▪ The BNSF and shared tracks would pass by the BNSF Los Angeles Intermodal Facility (referred to as Hobart Yard). The proposed 26th St LMF would be south of Hobart Yard and is described in more detail in Section 2.2.1.4, Light Maintenance Facility.
Commerce, Bell, Montebello, and Pico Rivera	▪ East of Hobart Yard, the tracks would cross at grade under I-710 and enter Commerce. Starting from west of Eastern Ave, the shared tracks would rise onto a new elevated structure, referred to as the *Commerce Flyover*; refer to Section 2.2.1.5, Freight or Passenger Railroad Modifications, and Figure 2-4 for more information on the Commerce Flyover, which is designed to pass by the BNSF Commerce Intermodal Facility (referred to as *Commerce Yard*). ▪ The Commerce Flyover would cross over Eastern Ave and pass by the existing Commerce Metrolink Station. The elevated shared tracks would not connect with the Commerce Metrolink Station's existing location, which would be relocated. Refer to Section 2.2.1.5 for more information on the Commerce Metrolink Station's relocation. The elevated tracks would return to grade before I-5 and would remain so throughout Montebello and Pico Rivera.

Project Section Segment	Segment Alignment Description
Santa Fe Springs and Norwalk	▪ The tracks would continue east into Santa Fe Springs and cross over Pioneer Blvd, Norwalk Blvd, and Los Nietos Rd. All of these would be new grade separations, with the roadway lowered and tracks crossing over on new railroad bridges; refer to Section 2.2.1.6, State Highway or Local Roadway Modifications. ▪ From Slauson Ave to Telegraph Ave, the track configuration would remain at grade with four tracks, as depicted on Figure 2-5. ▪ South of Telegraph Rd, the shared tracks would diverge outside of the existing railroad right-of-way and rise onto retained fill to cross over Florence Ave on a new bridge, while three BNSF mainline tracks would cross Florence Ave on the existing railroad bridge. The shared tracks would transition from retained fill onto an elevated structure that crosses over Lakeland Rd, while the BNSF tracks would remain at grade in their current configuration throughout this segment. The elevated structure would continue south and transition from the west side of the corridor over to the east side. Figure 2-6 depicts the track configuration south of Lakeland Rd. ▪ The elevated structure would veer east out of the existing railroad corridor and cross over Imperial Hwy, necessitating modifications to the existing Norwalk/Santa Fe Springs Metrolink Station, described in Section 2.2.1.3, High-Speed Rail Station Facilities, in more detail. Under Shared Passenger Track Alternative A, HSR trains would not stop at the Norwalk/Santa Fe Springs Metrolink Station. ▪ South of the station, the elevated structure would rejoin the existing railroad corridor and transition back down to at grade just west of Carmenita Rd.
La Mirada and Buena Park	▪ The tracks would continue at grade through La Mirada and Buena Park. In Buena Park, the track design would conflict with the location of the existing Buena Park Metrolink Station platform, necessitating the station's relocation (refer to Section 2.2.1.5 for more information).
Fullerton	▪ East of Dale St, the tracks would enter Fullerton. The Fullerton Municipal Airport is south of the railroad corridor, and the shared tracks would require lowering as they pass by the airport to prevent the HSR project, including the OCS, trains, and all other project components, from conflicting with the airport runway protection zone. The shared tracks on the north side of the corridor would also need to transition to the south side in order to serve the existing Fullerton Metrolink/Amtrak Station farther south. ▪ The shared tracks would transition underneath the BNSF tracks via a short below-grade section, in a braced trench. The trench would start approximately 850 feet east of Dale St and, approaching the eastern end of the Fullerton Airport, would cross under the BNSF tracks to the south side of the corridor, continuing adjacent to the existing BNSF tracks (which would remain at grade). Refer to Figure 2-7 for a cross section of the shared tracks in the trench after they transition to the south side of the corridor. ▪ The shared tracks would return to grade just before Gilbert St. Continuing east, a fourth track would be added to the south side of the corridor at the Fullerton Metrolink/Amtrak Station, which would require modifications, described in more detail in Section 2.2.1.3. Under Shared Passenger Track Alternative A, HSR trains would not stop at the Fullerton Metrolink/Amtrak Station. ▪ East of the station at Fullerton Junction, the three tracks along the north side of the corridor would be dedicated to BNSF trains and would continue east through Fullerton Junction. The tracks along the south side of the corridor would be dedicated to passenger trains and travel south to ARTIC.

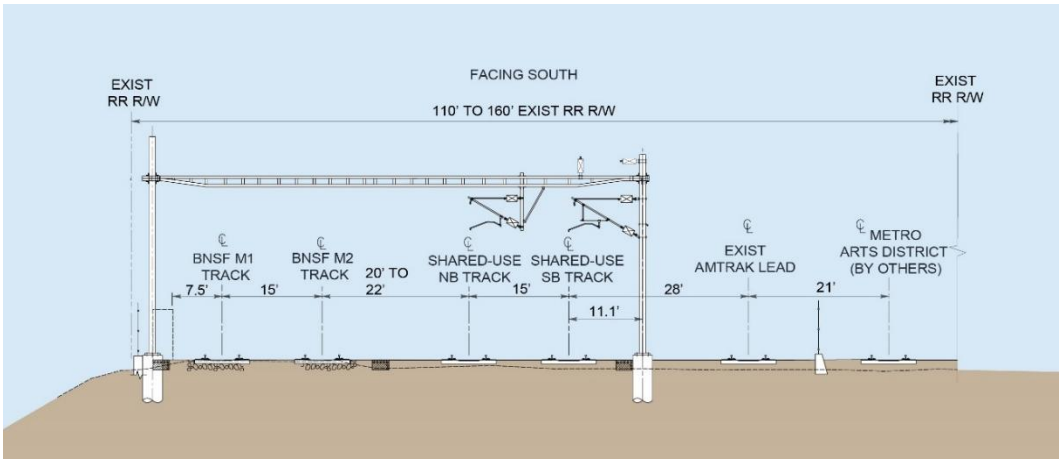
Project Section Segment	Segment Alignment Description
Anaheim	▪ South of Fullerton Junction, the tracks would enter Anaheim. From Fullerton Junction to ARTIC, the two existing tracks would be electrified to allow for shared operations with Metrolink. Several freight trains per day currently run on the existing tracks and would retain operation rights in the future. The two shared tracks would remain at grade through the rest of Anaheim. ▪ The existing at-grade crossings at Orangethorpe Ave, La Palma Ave, Sycamore St, Broadway St, Santa Ana St, South St, Vermont Ave, and Ball Rd would be maintained. Refer to Figure 2-8 for the cross section that is representative of the two-track configuration throughout this segment. ▪ From south of Ball Rd to south of Cerritos Ave, two HSR layover tracks would be added along the west side of the corridor. Cerritos Avenue and State College Blvd would be grade separated, with the roadways lowered and the tracks crossing over the road on new railroad bridges. ▪ The tracks would end at ARTIC, where HSR platforms and station facilities would be added to the existing station, described in more detail in Section 2.2.1.3.

ARTIC = Anaheim Regional Transportation Intermodal Center; Authority = California High-Speed Rail Authority; BNSF = BNSF Railway; HSR = high-speed rail; I = interstate; LAUS = Los Angeles Union Station; Link US = Link Union Station; OCS = overhead contact system; project section = Los Angeles to Anaheim Project Section; US 101 = U.S. Highway 101



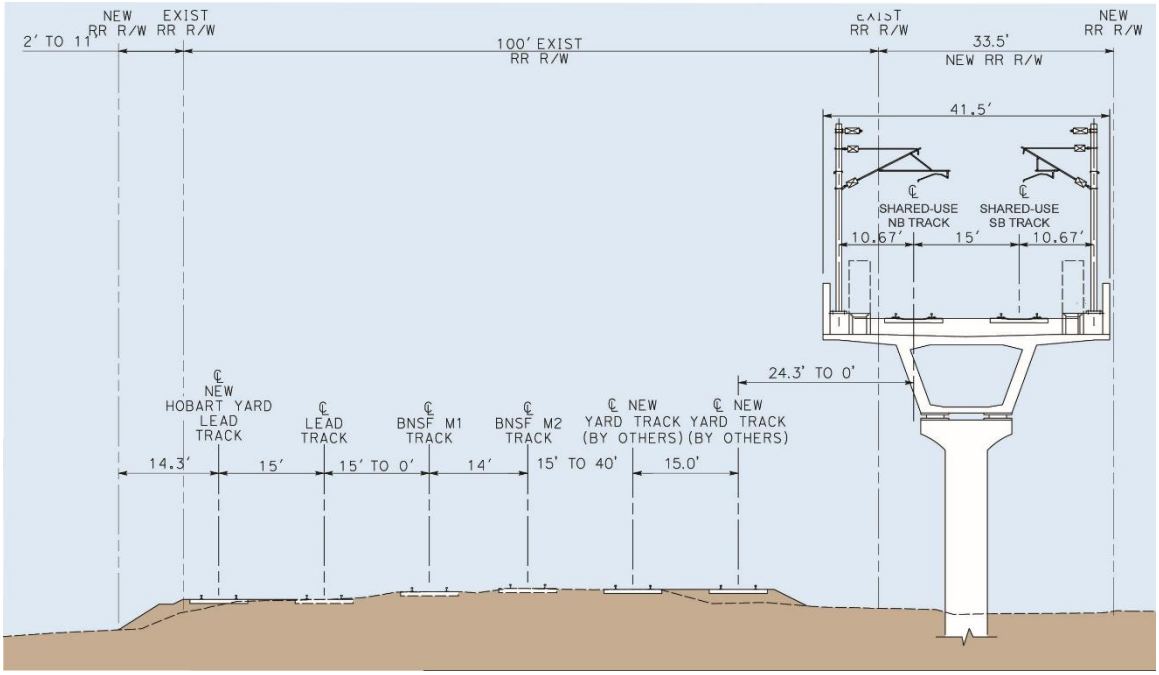
Source: Authority 2025
Link US = Link Union Station; Metro = Los Angeles County Metropolitan Transportation Authority; OCS = overhead contact system

Figure 2-2 High-Speed Rail and Link Union Station Project



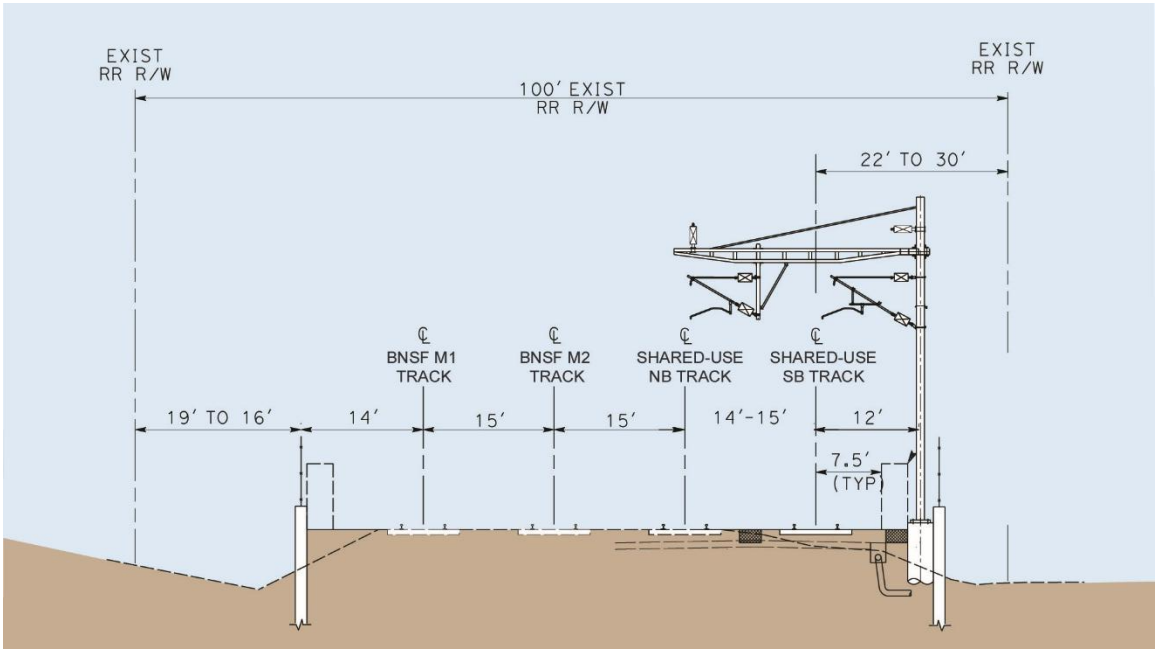
Source: Authority 2025
M = main track; RR = railroad; R/W = right-of-way; NB = northbound; SB = southbound

Figure 2-3 At-Grade Cross Section between 1st Street and 4th Street



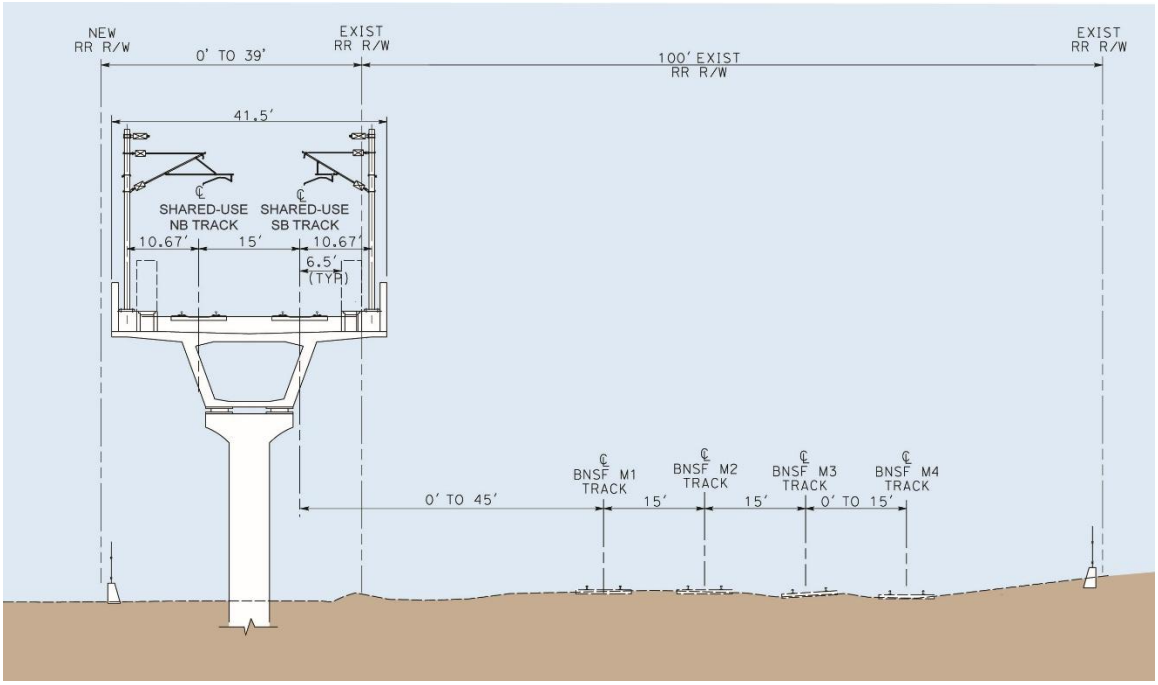
Source: Authority 2025
M = main track; RR = railroad; R/W = right-of-way; NB = northbound; SB = southbound

Figure 2-4 Elevated Cross Section between Atlantic Boulevard and Eastern Avenue (Commerce Flyover)



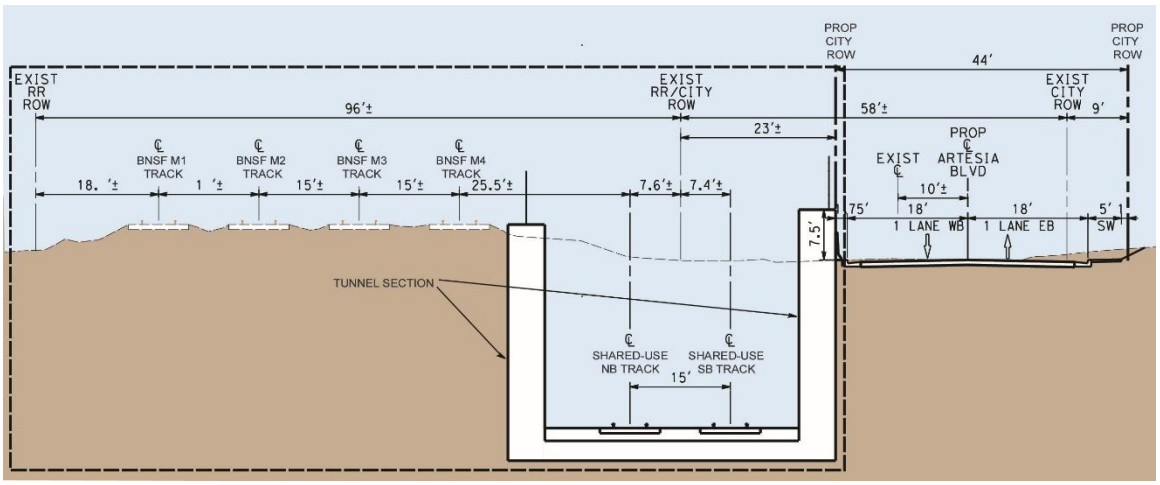
Source: Authority 2025
M = main track; RR = railroad; R/W = right-of-way; NB = northbound; SB = southbound

Figure 2-5 At-Grade Cross Section from Slauson Avenue to Telegraph Road



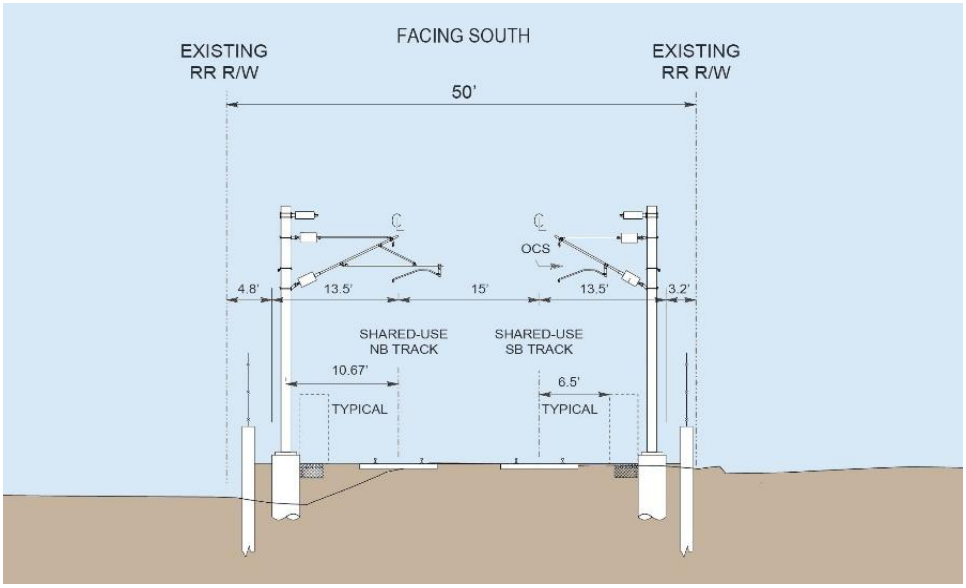
Source: Authority 2025
M = main track; RR = railroad; R/W = right-of-way; NB = northbound; SB = southbound

Figure 2-6 Elevated Cross Section South of Lakeland Road



Source: Authority 2025
Figure not to scale
M = main track; OCS = overhead contact system; RR R/W = railroad right-of-way

Figure 2-7 Braced Trench Cross Section East of Fullerton Airport



Source: Authority 2025
OCS = overhead contact system; RR = railroad; R/W = right-of-way; NB = northbound; SB = southbound

Figure 2-8 At-Grade Cross Section between La Palma Avenue and Ball Road

2.2.1.2 Ancillary Facilities

Systems Facilities

HSR trains would draw power from California's existing electricity grid, with power distributed to the trains via the overhead contact system (OCS). The project would not include construction of a separate power source; rather, the existing grid would supply power to the OCS through the extension of underground or overhead transmission lines to a series of power substations positioned along the railroad corridor. The transformation and distribution of electricity would occur through the following three types of stations:

- Traction power substations (TPSS), which would transform high-voltage electricity supplied by public utilities to the train operating voltage. The project section would include two TPSS sites (Los Angeles and Anaheim), which would both be adjacent to existing utility transmission lines and outside of the existing right-of-way. The TPSS sites would be spaced apart by approximately 30 miles along the project alignment and each include an approximately 450-square-foot control room and two 115/50-kilovolt or 230/50-kilovolt, single-phase transformers that would both be rated at 60 megavolt-amperes. The foregoing components would be installed within an approximately 32,000-square-foot area, and screening of each TPSS would be provided by a wall or fence.
- A switching station to connect and balance the electrical load between tracks and switch OCS power on or off in the event of a power outage or emergency. A switching station would be installed in Santa Fe Springs, generally midway between the two TPSS sites, approximately 15 miles from the nearest TPSS and 0.1 mile northeast of the project alignment. Installation of the station's equipment would require approximately 9,600 square feet.
- Paralleling stations, or autotransformer stations, to provide voltage stabilization and equalize current flow. Two paralleling stations would be installed along the project alignment, with one each along the segments between the Santa Fe Springs switching station and the Los Angeles and Anaheim TPSS sites. Each paralleling station would be adjacent to the HSR right-of-way, include an approximately 450-square-foot control room, and require approximately 8,000 square feet.

Table 2-3 provides the locations of the proposed TPSSs, switching station, and paralleling stations.

Table 2-3 Traction Power, Paralleling, and Switching Station Locations

Traction Power Station Type	Location
Traction power substation (two sites)	**City of Los Angeles:** South of Washington Blvd, and west of Soto St, adjacent to the existing railroad viaduct **City of Anaheim:** On the northeast corner of Lewis St and Cerritos Ave, southwest of the HSR tracks
Paralleling station (two sites)	**City of Montebello:** Southwest corner of Maple Ave and Sycamore St, south of the HSR tracks (co-located with the relocated Commerce Metrolink Station) **City of Fullerton:** Northwest corner of Dale St and Artesia Ave, south of the HSR tracks
Switching station	**City of Santa Fe Springs:** Northeast corner of Los Nietos Rd and Santa Fe Springs Rd, north of BNSF Railway tracks

Source: Authority 2025
HSR = high-speed rail

Signaling and Train-Control Elements

The National Transportation Safety Board, FRA, and other agencies mandate Positive Train Control, a train safety system designed to automatically implement safety protocols and provide communication with other trains to reduce the risk of a potential collision. Because of the lower operating speed of HSR trains in this project section compared to other HSR project sections, this project section would operate using conventional Positive Train Control signaling rather than a specialized HSR signaling system. This project section would use a radio-based communications network, including a fiber optic backbone and communications towers approximately every 2 to 3 miles, depending on the terrain and selected radio frequency. The towers would be in the HSR corridor in a fenced area of approximately 20 feet by 15 feet, including a 10- by 8-foot communications shelter and a 6- to 8-foot diameter, 100-foot-tall communications pole. These

communications facilities could be co-located within the TPSSs. Where communications towers cannot be located with TPSSs or other HSR facilities, they would be within or near the HSR corridor in an approximately 20- by 15-foot fenced area.

Layover Tracks

Layover tracks are used to store and restock trains during the day, in between service runs, and to store trains at night at terminus stations when they are not in service. Layover tracks are required where high-speed trains would end their runs, near LAUS and ARTIC, to support layover functions such as overnight storage, draining of waste tanks, filling of potable water tanks, and cleaning of windows, among others, as well as daily scheduled interior cleaning of passenger areas that would occur prior to the train entering revenue service. The Los Angeles layover tracks would be between Seventh Street and Interstate (I-) 10, and could be accessed for cleaning activities through the Amtrak Eighth Street Yard. The Anaheim layover tracks would be from south of Ball Road to south of Cerritos Avenue, and would have a layover support facility at the northeast corner of Lewis Street and Cerritos Avenue.

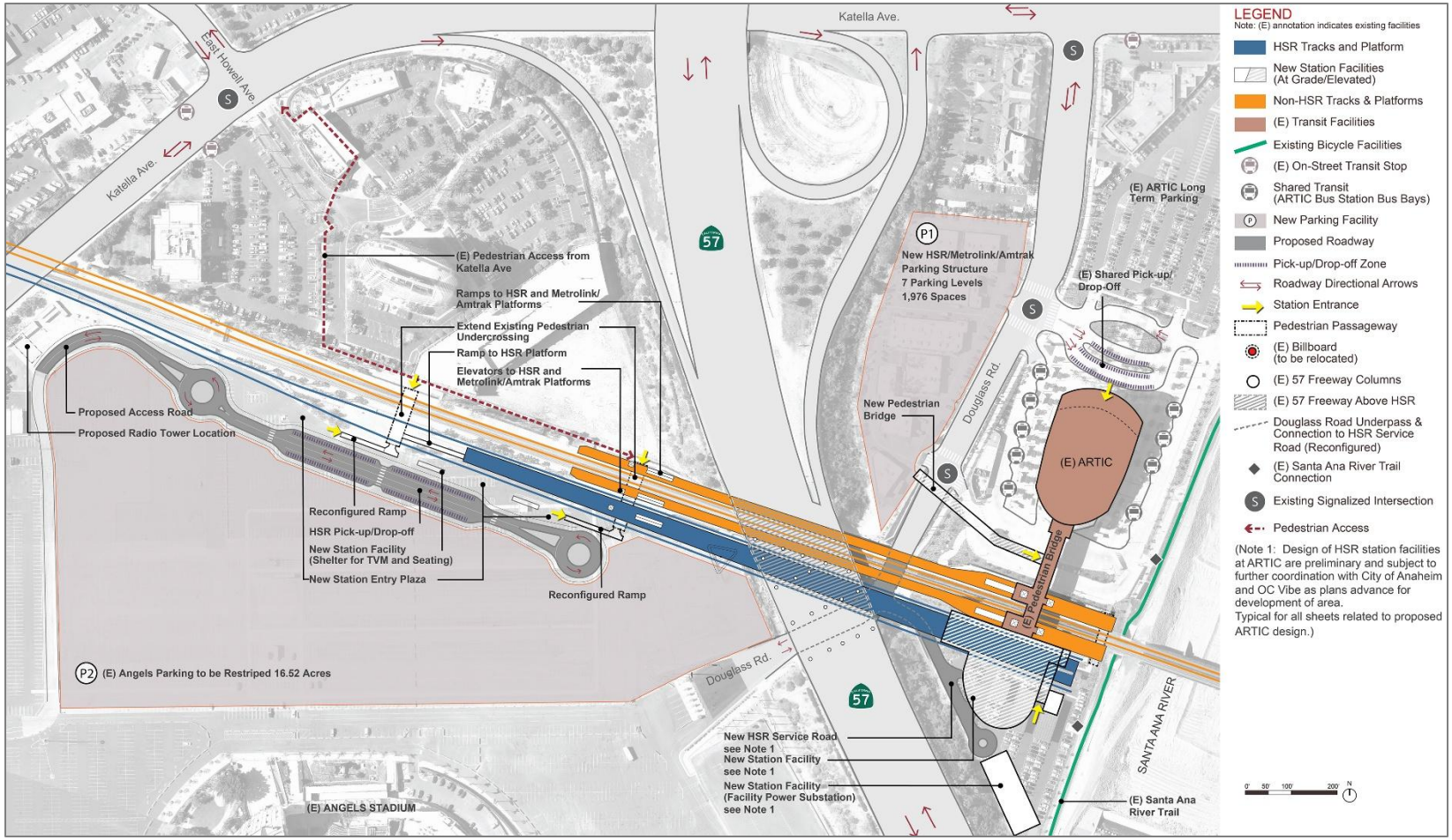
2.2.1.3 High-Speed Rail Station Facilities

Because the project section is within an existing corridor with passenger rail service, Shared Passenger Track Alternative A does not propose new HSR stations but rather modifies existing passenger rail stations to allow for shared operations with HSR. Shared Passenger Track Alternative A would include an HSR station platform and facilities at ARTIC, described below.

ARTIC High-Speed Rail Platform and Station Facilities

The proposed HSR platform and station facilities at the existing ARTIC station would be at grade, with two new HSR tracks and a single 1,410-foot center platform for HSR, south of and parallel to the existing Metrolink/Amtrak tracks and platforms. The HSR platform would be accessed through an extension of ARTIC's existing pedestrian bridge from the northeast and through an extension of two existing pedestrian tunnels on the western end of the existing ARTIC platforms. The Authority would work with the City of Anaheim, as the ARTIC passenger terminal owner, to share the passenger amenities inside ARTIC in the near term. Once ridership increases enough that combined HSR and local-provider passenger volumes exceed the design capacity of the ARTIC passenger terminal building, the Authority would build a separate HSR passenger terminal. This new HSR station building, included within the project footprint and depicted on Figure 2-9, would be at the southern end of the pedestrian bridge, along with a facility power substation to provide electricity to the building. The existing Metrolink/Amtrak parking lot north of Angel Stadium would be reconfigured into a pick-up/drop-off area and connected to the existing access road from Katella Avenue. The project would maintain the two existing access points between the Santa Ana River Trail and ARTIC. Radio towers would be built adjacent to the access road at Katella Avenue.

This project would include a new parking structure adjacent to State Route 57 and Katella Avenue, providing 1,350 HSR parking spaces and 626 replacement parking spaces to account for existing parking spaces at ARTIC that would be displaced by the HSR tracks and platform, for a total of 1,976 parking spaces. Figure 2-9 provides an illustration of the HSR platform and station facilities at ARTIC.



Source: Authority 2025

Figure 2-9 High-Speed Rail Platform and Facilities at ARTIC

2.2.1.4 Light Maintenance Facility

HSR operations in Southern California would require a Level III[5] LMF for fleet storage, cleaning, repair, overnight layover accommodations, and servicing facilities, including the necessary water cistern and power facilities. The 26th Street LMF is designed to follow the Authority's *Requirements for High-Speed Trainset Fleet and Infrastructure Maintenance Facilities Technical Memorandum* (Authority 2024).

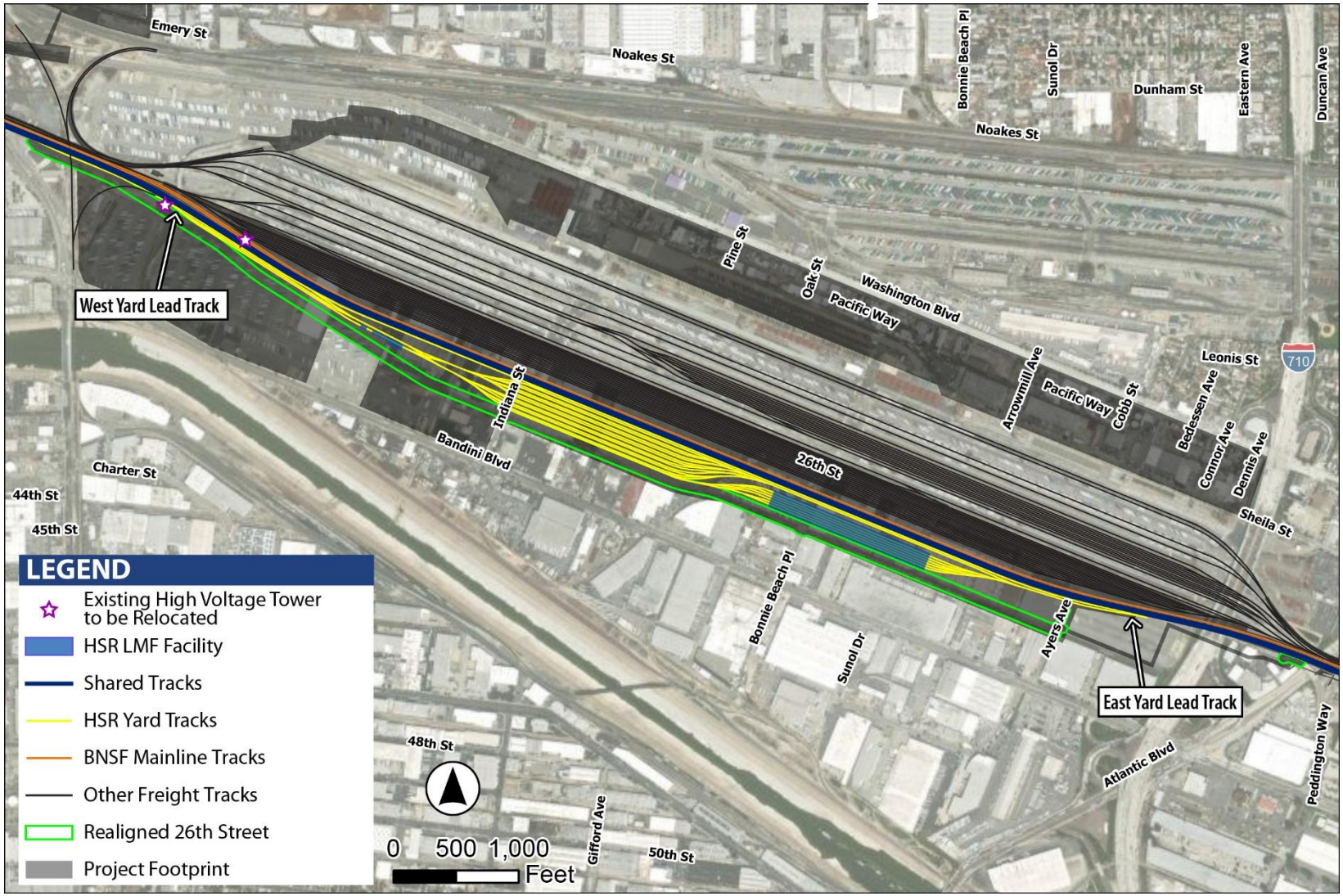
Refer to Figure 2-10 for an overview of the 26th Street LMF, which would have an overall size of 50 acres and be roughly bounded by the realigned mainline tracks on the north, a relocated 26th Street on the south, Downey Road on the west, and I-710 on the east. The changes on the south side of Hobart Yard would require 26th Street to be realigned, which would provide access to the LMF. Two high-voltage utility towers would be relocated to accommodate the 26th Street realignment. Refer to Section 2.2.1.5 for more details on changes adjacent to Hobart Yard.

The LMF would be double-ended, with all tracks having access from the mainline on both the eastern and western sides. HSR trains would access the LMF from the east and west on two new yard lead tracks, which would be south of the mainline tracks. Within the 26th Street LMF, there would be an outdoor train yard with 12 yard tracks to allow for the storage of 24 single trainsets, along with a 1,345-foot-long, six-track shop building, which could accommodate 12 trainsets. The internal LMF access roads would be wide enough to accommodate service vehicles, consolidate commissary functions, and provide more clearance from the OCS poles to the yard tracks.

2.2.1.5 Freight or Passenger Railroad Modifications

Shared Passenger Track Alternative A would modify the existing rail corridor to create a corridor that is primarily four mainline tracks (two electrified and shared with other passenger rail operators) from Los Angeles to Fullerton, and two mainline tracks (electrified and shared with both passenger rail and freight operators) from Fullerton to Anaheim. Freight rail would operate primarily on the nonelectrified tracks, although the electrified tracks could accommodate freight traffic if necessary (up to 10 BNSF freight trains per day would be able to use the two passenger rail tracks), while maintaining service and operation levels for all operators within the corridor. The following sections describe the freight and passenger railroad modifications in more detail, which include modifications to BNSF storage and intermodal facilities as well as modifications to and relocations of existing passenger rail stations.

[5] The Authority defines three levels of maintenance to be conducted at an LMF.



Source: Authority 2025

Figure 2-10 Shared Passenger Track Alternative A: 26th Street Light Maintenance Facility

BNSF Railway Storage and Intermodal Facilities

Adding and electrifying tracks in the existing right-of-way would require the Authority to remove or modify track and right-of-way that is currently used or planned for future use by BNSF for train storage and intermodal operations. This requires modifications to BNSF's plans for expansion at its yards in Vernon and Commerce. In several locations, Shared Passenger Track Alternative A would require removal/relocation of existing BNSF infrastructure. Thus, Shared Passenger Track Alternative A would replace the affected BNSF infrastructure, primarily adjacent to Hobart Yard, to maintain BNSF capacity and avoid disruptions to operations.

Table 2-4 lists the BNSF storage capacity that would be removed from the corridor and relocated to the new consolidated storage yard adjacent to Hobart Yard; refer to Figure 2-11 for an overview of the relocated infrastructure. The new storage yard would provide 101,094 track feet of storage, including 5,850 track feet for a new runaround track,[6] which is slightly more than the amount removed from the corridor (90,940 track feet). This is a result of the layout and overall length of the new consolidated yard. The tracks need to be operational while fitting within the new yard space and maintaining the removed storage capacity, and therefore some replacement tracks would be longer than the ones that are being removed from the corridor. In addition to the relocations described in Table 2-4, some BNSF yard lead and storage tracks throughout the corridor would be relocated and replaced within the same area, with the same level of storage capacity and operational functionality maintained. This includes the Pico Rivera Yard north and south lead tracks, La Mirada Yard lead track and storage track, and Fullerton storage track on the southern side between Commonwealth Avenue and Highland Avenue.

Table 2-4 BNSF Railway Facility or Track to Be Removed or Modified

HSR Project Element Affecting BNSF Infrastructure	BNSF Facility/Track to Be Removed/Relocated/Modified	Length of Removed/ Relocated Tracks (TF)
HSR mainline and layover tracks	BNSF 8th St Yard (BNSF storage tracks between 1st St and I-10 along West Bank)	35,000
Relocated Commerce Metrolink Station	South Vail Support Track (between Vail St and Minson Wy)	3,800
4th mainline track	Pico Rivera Storage Tracks	4,000
4th mainline track	Norwalk Support Track (between Telegraph Rd and Florence Ave)	4,400
4th mainline track	Santa Fe Springs Staging Track (through existing Norwalk/Santa Fe Springs Metrolink Station area)	14,600
Fullerton braced trench	Buena Park/Fullerton Storage Tracks (on north side between Dale St and Gilbert St)	15,840
4th mainline track	Fullerton support track (north of Fullerton Amtrak/Metrolink Station)	4,500
4th mainline track	Fullerton storage track (on north side between Commonwealth Ave and Highland Ave)	8,800
Total		**90,940**

Source: STV 2025
BNSF = BNSF Railway; HSR = high-speed rail; I = interstate; TF = track feet

[6] Runaround tracks allow a locomotive to move around the train and attach to the opposite end, enabling the train to be switched or moved in the desired direction. The runaround track must be as long as the longest set of cars that would be pulled. A runaround track is generally recommended for all modern rail yards to reduce overall freight congestion.



Source: STV 2025

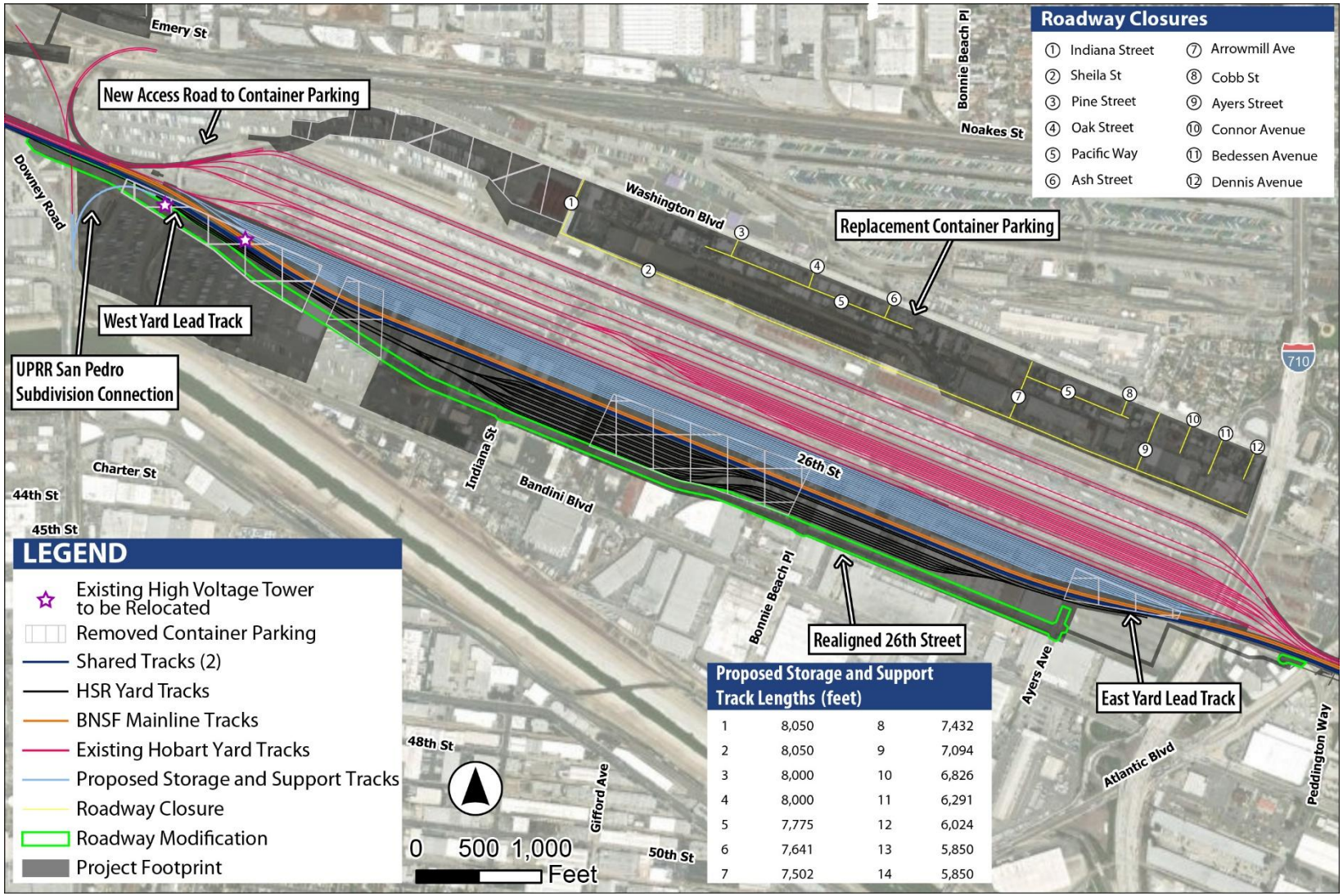
Figure 2-11 BNSF Railway Infrastructure Affected by the Los Angeles to Anaheim Project Section

BNSF Railway Los Angeles Intermodal Facility (Hobart Yard)

Figure 2-12 depicts the proposed changes at Hobart Yard. The consolidated storage yard, BNSF mainline tracks, shared tracks, and new connection to the UPRR San Pedro Subdivision would be up to 250 feet south of the current southern limit at Hobart Yard and into properties south of 26th Street. New second lead tracks into Hobart Yard from the west and east would also be added. These additional lead tracks would allow freight trains to move off the mainline tracks at speed and avoid delays and backups in an already heavily congested corridor. These track changes would require the vacation and realignment of the 26th Street right-of-way from Downey Road to Atlantic Boulevard.

The changes described above, along with LMF yard lead tracks, would displace some existing BNSF container parking south of the railroad corridor. This container parking would be replaced by acquiring properties north of Hobart Yard along the south side of Washington Boulevard, which would require a new access road north of Hobart Yard and the closure of several roads between Washington Boulevard and Sheila Street (refer to Section 2.2.1.6, State Highway or Local Roadway Modifications, for more details on roadway changes related to Hobart Yard). The new access road would also displace some existing container parking that would be replaced in the new container parking area.

Additionally, two high-voltage utility towers would be relocated to accommodate the 26th Street realignment.



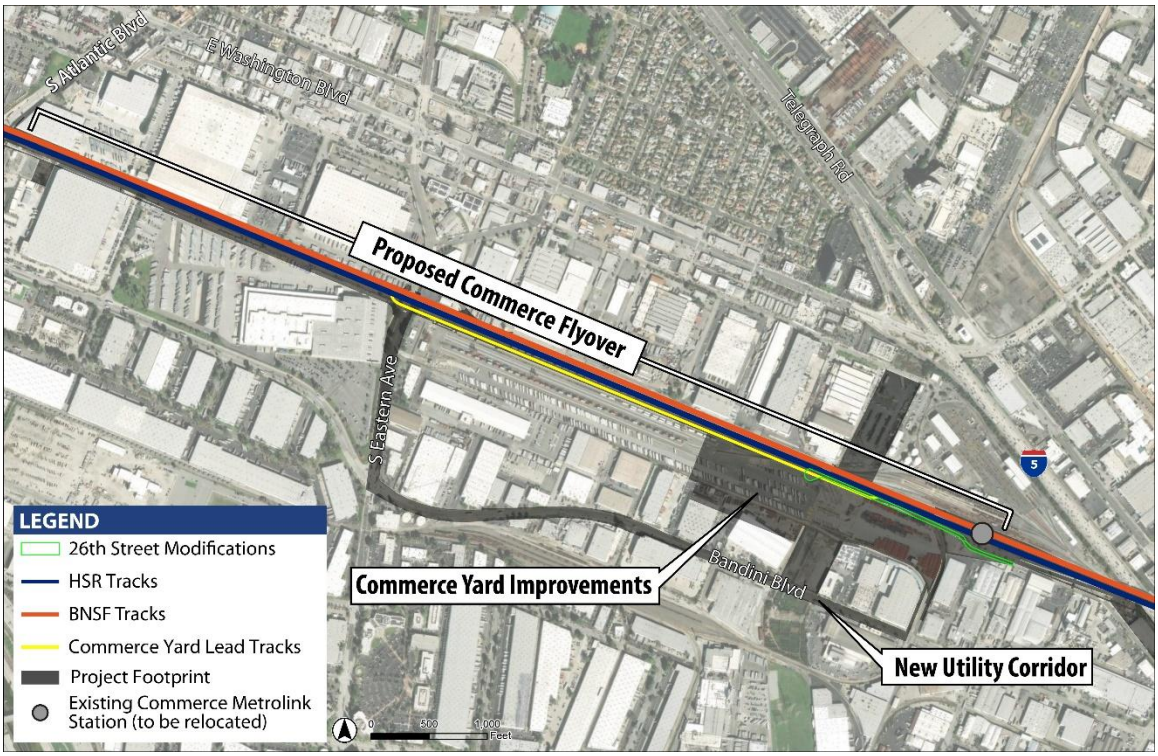
Sources: Authority 2025; ESRI 2020

Figure 2-12 Hobart Yard Modifications (Shared Passenger Track Alternative A)

BNSF Railway Commerce Intermodal Facility (Commerce Yard)

Adjacent to Commerce Yard, the Commerce Flyover would separate passenger trains on an elevated structure from the freight trains running at grade. Figure 2-13 depicts the modifications required throughout the Commerce Yard area to maintain operations. Two new BNSF yard tracks would be added, converging into a new BNSF stub lead track west of I-5, with additional connector tracks. Improvements would include reconstructing several of the lead tracks, relocating the truck entrance gates and internal access road, and adding truck storage parking and a switching tail track. These yard improvements would require a portion of 26th Street to be closed; 26th Street currently provides access to the yard from the east, but the new entrance to the yard would require approximately 1,300 feet of the road to be closed.

Existing utilities along the south side of the railroad corridor would be relocated to the south in a new utility corridor, within Bandini Boulevard. Additionally, the high-voltage power lines currently running south of and parallel to the railroad corridor must be raised to provide the required clearance from the Commerce Flyover structure.



Sources: Authority 2025; ESRI 2020

Figure 2-13 Commerce Flyover and Commerce Yard Modifications

Modified Metrolink Stations

Norwalk/Santa Fe Springs Metrolink Station Modifications

HSR trains would not stop at the Norwalk/Santa Fe Springs Metrolink Station, but modifications would be required for HSR operations, as depicted on Figure 2-14. The existing platforms at Norwalk/Santa Fe Springs Metrolink Station are in an area that would not be able to accommodate an additional mainline track and shared operations between HSR and Metrolink. Adding the additional mainline track would require shifting the existing platforms to an area with a straight section of track. Therefore, the Metrolink platforms would be moved to be served by the shared tracks on the new elevated structure, approximately 350 feet east of the existing alignment (at their farthest points). The modified station would be elevated, with two 680-foot side

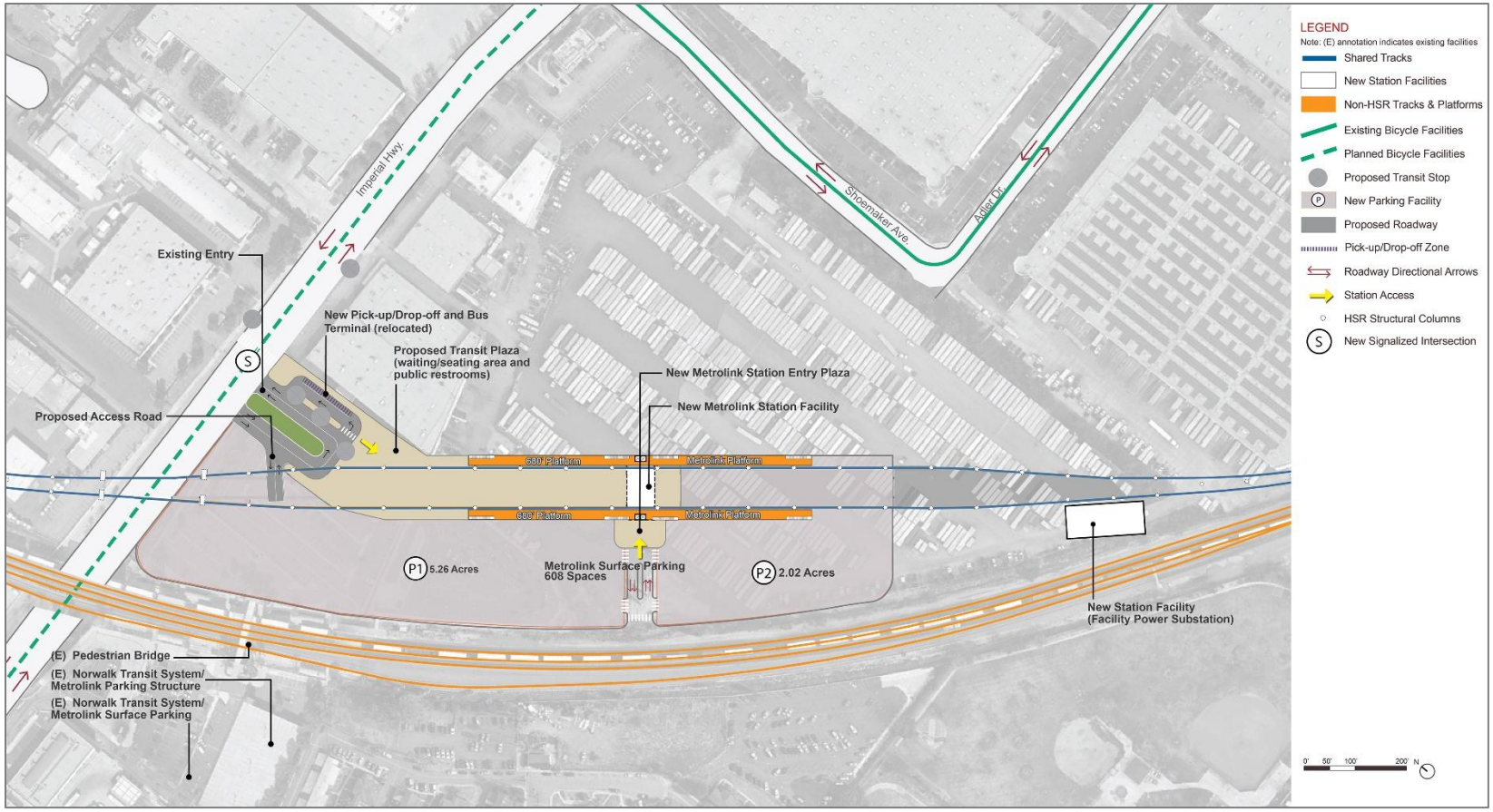
platforms, capable of future extension to 1,000 feet; the space for the future extension is included within the project footprint.

The existing Metrolink parking and bus drop-off west of the railroad corridor would be relocated to the east of the elevated structure to provide better access to the modified Metrolink platforms. Station entry points would be on Imperial Highway to the north and at Shoemaker Avenue and Adler Drive to the east and would require new access roadways. On Imperial Highway, the signalization leading into the parking garage would require modifications, as required by the City of Norwalk. The project would provide 608 surface parking spaces west of the modified platforms to replace the parking spaces at the existing Norwalk/Santa Fe Springs Metrolink Station displaced by the HSR modifications. Parking and pick-up/drop-off for Metrolink passengers would be within surface parking lots.

Fullerton Metrolink/Amtrak Station Modifications

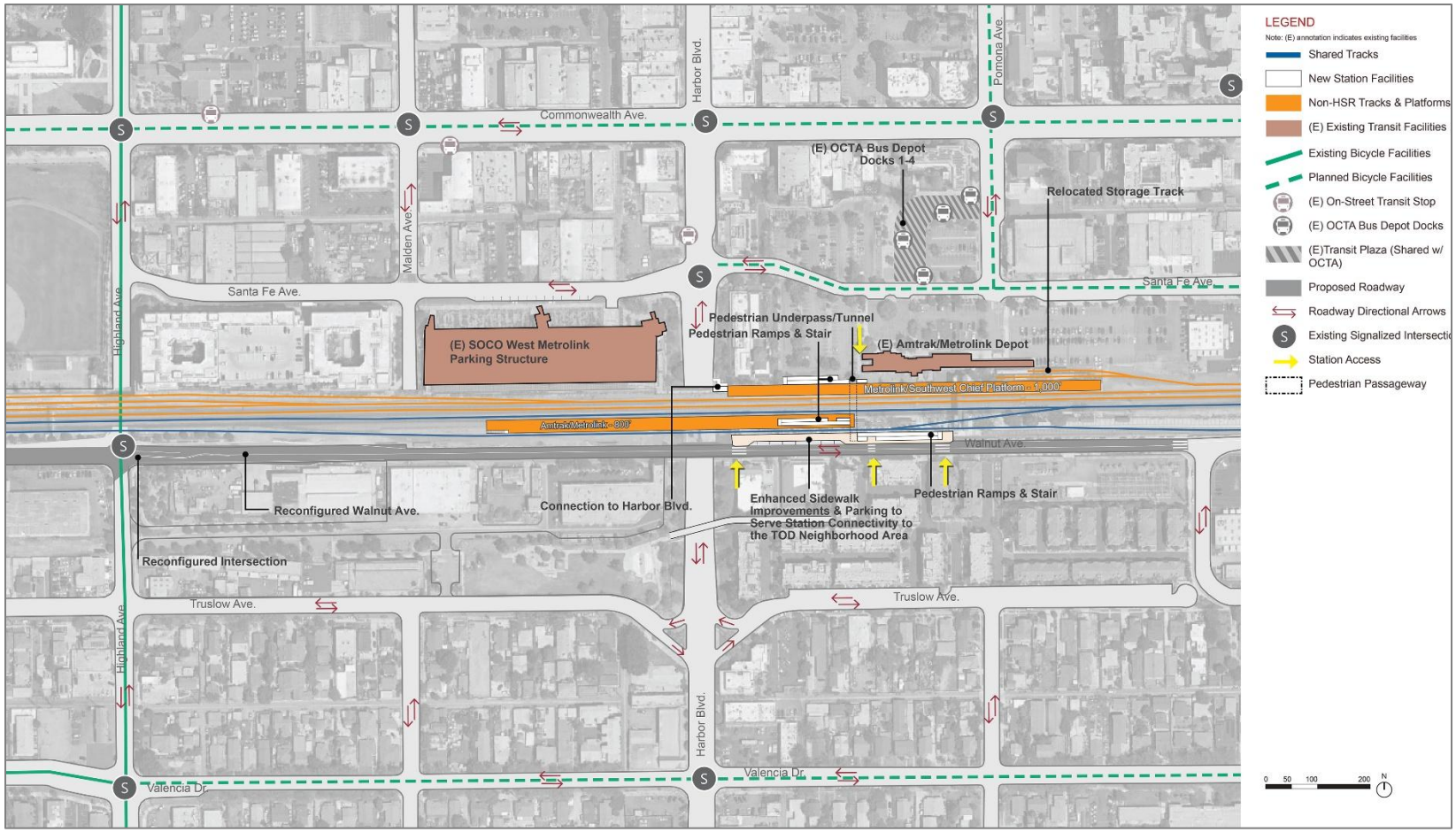
HSR trains would not stop at the Fullerton Metrolink/Amtrak Station, but modifications would be required for HSR operations, as depicted on Figure 2-15. At the Fullerton Metrolink/Amtrak Station, a fourth mainline track would need to be added on the southern side of the corridor, outside of the existing railroad right-of-way, to allow HSR trains to pass through the station. A new railroad bridge would be built over Highland Avenue to accommodate the new shared track, which requires Walnut Avenue to be slightly realigned to the south, and the intersection of Walnut Avenue and Highland Avenue would need to be redesigned.

Several modifications would occur for the Metrolink/Amtrak station platforms. The two existing platforms on the southern side would be removed, and a new 800-foot center platform would be added over Harbor Boulevard. The existing pedestrian bridge east of Harbor Boulevard that connects the two side platforms would be removed and replaced by a new pedestrian underpass that connects the existing northern platform, new center platform, and Walnut Avenue to the south, with ramps and stairs providing access. South of the new Metrolink/Amtrak center platform, Walnut Avenue would be slightly narrowed, and sidewalk improvements and crosswalks would be added east of Harbor Boulevard to improve station connectivity to the neighborhood.



Source: Authority 2025

Figure 2-14 Modified Norwalk/Santa Fe Springs Metrolink Station Site Plan



Source: Authority 2025

Figure 2-15 Modified Fullerton Metrolink/Amtrak Station Site Plan

Relocated Metrolink Stations

Commerce Metrolink Station Relocation

As stated in Section 2.2.1.1, the Commerce Flyover would require the Commerce Metrolink Station to be relocated to an area northeast of the intersection of Telegraph Road and Maple Avenue, which is approximately 0.75 mile to the east of its current location. The relocated Commerce Metrolink Station would be for Metrolink trains only; no HSR trains would stop at this station. An HSR paralleling station would be co-located at the relocated station site. Most of the relocated station would be within Montebello, including the replacement surface parking, plaza, and internal access roads; the platform and nonpublic station facilities north of the railroad corridor would be within Commerce.

The relocated station would have a center platform along the southern side of the rail corridor, accessible from the north via Sycamore Street via a new pedestrian underpass, and from the south via Maple Avenue. The intersection of Sycamore Street and Supply Avenue would be modified with pedestrian crosswalks, and the intersection of Telegraph Road and Maple Avenue would have a new signal and crosswalks to provide safe access to the new station location. All the existing station facilities, such as a transit plaza for buses, bicycle parking, vehicle parking (140 spaces), and a pick-up/drop-off area for motorists, would be replaced south of the corridor, to be accessed via Maple Avenue.

Buena Park Metrolink Station Relocation

As stated in Section 2.2.1.1, the HSR project would add and realign tracks through the existing Buena Park Metrolink Station, necessitating the relocation of the station. The Buena Park Metrolink Station would be relocated to between South Coyote Creek and Beach Boulevard, approximately 0.75 mile northwest of its current location within Buena Park. The proposed relocated Buena Park Metrolink Station would be for Metrolink trains only; no HSR trains would stop at this station.

The relocated station would have a center platform provided along the northern side of the existing rail corridor, accessible from the north via Stage Road and from the east via Beach Boulevard. A new signalized intersection is proposed at the intersection of Coyote Creek and Stage Road. All existing station facilities would be replaced, including a transit plaza for buses, bicycle parking, vehicle parking (313 spaces), and a pick-up/drop-off area for motorists.

2.2.1.6 State Highway or Local Roadway Modifications

Modifications at Roadway Crossings

Shared Passenger Track Alternative A would cross 57 federal, state, and locally controlled roadways, most of which are currently grade separated. A portion of the foregoing roadway crossings would require, in general, one of the following three types of roadway modifications:

- **New grade separations:** There are six roadway crossings where new railroad grade separations (railroad bridge crossings) would be needed. Five of the existing at-grade roadways would be fully grade separated and lowered to cross under the proposed railroad bridges. One roadway (Lakeland Road) would be partially grade separated and would not require vertical realignment, because the shared tracks would cross over the roadway on a new bridge.
- **Modified existing grade separations (roadway vertical realignment):** The alignment would use existing railroad bridges throughout the corridor, most of which would need to be widened or new bridges would need to be added adjacent to the existing bridges to accommodate new tracks. At nine of these existing grade separations, the roadways would require vertical realignments (i.e., be lowered) to provide the required clearances between the road and the railroad bridge.

- **Modified existing grade separations (new piers and abutments):** Thirteen existing grade separations would require modified piers or abutments to accommodate new or widened railroad bridges. No vertical realignment of the roadway would be required.

Eight at-grade crossings at Orangethorpe Avenue, La Palma Avenue, Sycamore Street, Broadway, Santa Ana Street, Sixth Street, Vermont Avenue, Ball Road, and Lewis Street would remain at grade and would be modified only to add OCS to the existing tracks.

Additionally, all existing roadway overcrossings that would span over the shared tracks would be modified to have protective barriers on the top to prevent people or objects from entering the HSR right-of-way from the bridge. Detailed plans of barrier type and installation details will be determined during the Preliminary Engineering for Procurement design phase and coordination with the corridor stakeholders.

Table 2-5 lists all the crossings and any modifications that would be required along the Shared Passenger Track Alternative A alignment.

Table 2-5 Modifications to Roadway Crossings (from northwest to southeast)

Roadway	City	Current Crossing Configuration	Proposed Modification
1st St	Los Angeles	Overcrossing	None
4th St	Los Angeles	Overcrossing	None
6th St/Whittier Blvd	Los Angeles	Overcrossing	None
7th St	Los Angeles	Overcrossing	None
I-10 (Santa Monica freeway)	Los Angeles	Overcrossing	None
Olympic Blvd	Los Angeles	Overcrossing	None
Washington Blvd	Los Angeles	Undercrossing	None
Soto St	Los Angeles	Undercrossing	None
Downey Rd	Vernon	Undercrossing	New pier and abutments within roadway
Private access road	Vernon	Overcrossing	None
I-710 (Long Beach freeway)	Vernon	Overcrossing	None
Atlantic Blvd	Commerce	Undercrossing	New piers and abutments within roadway
Eastern Ave	Commerce	Undercrossing	New piers and abutments within roadway
I-5 (Santa Ana freeway)	Commerce	Undercrossing	None
Telegraph Rd	Commerce	Undercrossing	None
Garfield Ave	Commerce	Undercrossing	None
Greenwood Ave	Montebello	Undercrossing	None
Paramount Blvd	Pico Rivera	Undercrossing	None
SR 19 (Rosemead Blvd)	Pico Rivera	Undercrossing	Road vertical realignment, new abutments within roadway
Passons Blvd	Pico Rivera	Undercrossing	New pier and abutments within roadway
Slauson Ave	Santa Fe Springs	Overcrossing	Pier modifications

Roadway	City	Current Crossing Configuration	Proposed Modification
I-605 (San Gabriel freeway)	Santa Fe Springs	Overcrossing	None
Pioneer Blvd	Santa Fe Springs	At grade	New grade separation; roadway lowered to cross under tracks on a new railroad bridge
Norwalk Blvd	Santa Fe Springs	At grade	New grade separation; roadway lowered to cross under tracks on a new railroad bridge
Los Nietos Rd	Santa Fe Springs	At grade	New grade separation; roadway lowered to cross under tracks on a new railroad bridge
Santa Fe Springs Rd	Santa Fe Springs	Undercrossing	New piers and abutments within roadway
Telegraph Rd	Santa Fe Springs	Undercrossing	New pier and abutments within roadway
Florence Ave	Santa Fe Springs	Undercrossing	New pier and abutments within roadway
Lakeland Rd	Santa Fe Springs	At grade	New grade separation (for HSR only); roadway remains at grade and shared tracks on elevated structure
Imperial Hwy	Santa Fe Springs, Norwalk	Undercrossing	None
Carmenita Rd	Santa Fe Springs	Undercrossing	Roadway vertical realignment, new piers and abutments within roadway
Rosecrans Ave/Marquardt Ave	Santa Fe Springs	Overcrossing	None
Valley View Ave	Santa Fe Springs, La Mirada	Undercrossing	New piers and abutments within roadway
Alondra Blvd	La Mirada	Overcrossing	Bridge replacement, roadway vertical realignment
SR 39 (Beach Blvd)	Buena Park	Undercrossing	New piers and abutments within roadway
Dale St	Buena Park	Undercrossing	Roadway vertical realignment, new piers and abutments within roadway
Gilbert St	Fullerton	Undercrossing	Roadway vertical realignment, new pier and abutments within roadway
Commonwealth Ave	Fullerton	Undercrossing	Roadway vertical realignment, new piers and abutments within roadway
Euclid St	Fullerton	Undercrossing	New pier and abutments within roadway
Highland Ave	Fullerton	Undercrossing	New abutments within roadway
Harbor Blvd	Fullerton	Undercrossing	New piers and abutments within roadway
Lemon St	Fullerton	Undercrossing	None

Roadway	City	Current Crossing Configuration	Proposed Modification
Orangethorpe Ave	Anaheim	At grade	None
SR 91 (Riverside freeway)	Anaheim	Overcrossing	None
La Palma Ave	Anaheim	At grade	None
Sycamore St	Anaheim	At grade	None
Lincoln Ave	Anaheim	Undercrossing	None
Broadway	Anaheim	At grade	None
Santa Ana St	Anaheim	At grade	None
South St	Anaheim	At grade	None
Vermont Ave	Anaheim	At grade	None
Ball Rd	Anaheim	At grade	None
Lewis St	Anaheim	Undercrossing	Roadway vertical realignment, new piers and abutments within roadway
Cerritos Ave	Anaheim	At grade	New grade separation; roadway lowered to cross under tracks on a new railroad bridge
State College Blvd	Anaheim	At grade	New grade separation; roadway lowered to cross under tracks on a new railroad bridge
Katella Ave	Anaheim	Undercrossing	Roadway vertical realignment, roadway widening, new piers and abutments within roadway
SR 57 (Orange freeway)	Anaheim	Overcrossing	None
Douglass Rd	Anaheim	Undercrossing	Roadway vertical realignment, new piers and abutments within roadway

Source: Authority 2025
Authority = California High-Speed Rail Authority; HSR = high-speed rail; I = interstate; overcrossing = road over train tracks; SR = State Route; undercrossing = road under train tracks

New Grade Separations

As indicated in Table 2-5, five existing at-grade roadways would be grade separated for passenger rail and freight, with the roadway lowered to cross under new railroad bridges. These new grade separations are described in detail in Table 2-6, which includes references to the temporary and permanent footprints depicted on Figure 2-16 through Figure 2-19. The temporary project footprint includes areas such as utility easements and construction staging areas while the permanent project footprint includes areas that would be needed permanently for operation of HSR or areas that would permanently lose access from changes in roadway elevation. These grade separations are early action projects, which are described further in Section 2.3.1, Grade Separations.

Lakeland Avenue would be grade separated for HSR and passenger rail on a new elevated structure, but the freight tracks would remain at grade, with a minimal area of temporary and permanent impacts. Therefore, it is not included in Table 2-6.

Table 2-6 New Grade Separations with Roadway Vertical Realignments

Roadway	Grade Separation Description
Pioneer Boulevard (Figure 2-16)	– The existing roadway configuration at the Pioneer Blvd crossing in Santa Fe Springs consists of two northbound and two southbound traffic lanes and left-turn lanes to Rivera Rd (which is immediately adjacent and to the north of the railroad corridor) in both directions, with sidewalks on both sides of the road. – The at-grade crossing would be grade separated as a roadway undercrossing, with the railroad tracks on a bridge structure. Approximately 1,275 feet of Pioneer Blvd would be lowered, with the roadway approximately 20 feet below its current elevation at the lowest point of the undercrossing. Additional excavation depths would be required for bridge footings, utilities, pump station, and roadway subbase. – Direct access to Rivera Rd would be removed and a new roadway that loops west and south just north of the crossing would provide access from Pioneer Blvd to Rivera Rd.
Norwalk Boulevard (Figure 2-17)	– The existing roadway configuration at the Norwalk Blvd crossing in Santa Fe Springs consists of two northbound and two southbound traffic lanes and a southbound left-turn lane to eastbound Los Nietos Rd (which is immediately south of the crossing), with sidewalks on both sides of the roadway. – The at-grade crossing would be grade separated as a roadway undercrossing, with the railroad tracks on a bridge structure. Approximately 1,325 feet of Norwalk Blvd would be lowered by approximately 20 feet below its current elevation at the lowest point. Roadway clearance from bottom of bridge to top of pavement would be approximately 15 to 16.5 feet. Additional excavation depths would be required for bridge footings, utilities, pump station, and roadway subbase. – The intersection of Norwalk Blvd and Los Nietos Rd would also be lowered, as also described below.
Los Nietos Road (Figure 2-17)	– The existing roadway configuration at the Los Nietos Rd crossing in Santa Fe Springs consists of two westbound and two eastbound traffic lanes and a westbound left-turn lane to Norwalk Blvd (which is immediately west of the crossing), with sidewalks on both sides of the roadway. – The at-grade crossing would be grade separated as a roadway undercrossing, with the railroad tracks on a bridge structure. Approximately 1,700 feet of Los Nietos Rd would be lowered, with the roadway elevation approximately 25 feet below its current elevation at the lowest point. Roadway clearance from bottom of bridge to top of pavement would be approximately 15 to 16.5 feet. Additional excavation depths would be required for bridge footings, utilities, pump station, and roadway subbase. – The intersection of Norwalk Blvd and Los Nietos Road would also be lowered as part of this and the Norwalk Blvd grade separation.
Cerritos Avenue (Figure 2-18)	– The existing roadway configuration at the Cerritos Ave crossing in Anaheim consists of two westbound and two eastbound traffic lanes with sidewalks on both sides of the roadway. – The at-grade crossing would be grade separated as a roadway undercrossing, with the railroad tracks on a bridge structure. Approximately 1,850 feet of Cerritos Ave would be lowered by 25 feet below its current elevation at the lowest point. Roadway clearance from bottom of bridge to top of pavement would be approximately 15 to 16.5 feet. Additional excavation depths would be required for bridge footings, utilities, pump station, and roadway subbase. – In order to maintain its intersection with Cerritos Ave, Vernon St would need to be lowered about 5 feet below its existing elevation. Similarly, Lewis St would need to be lowered to maintain the intersection with Cerritos Ave.

Roadway	Grade Separation Description
State College Boulevard (Figure 2-19)	– The existing roadway configuration at the State College Blvd crossing in Anaheim consists of three northbound and three southbound traffic lanes with sidewalks on both sides of the roadway. – The at-grade crossing would be grade separated as a roadway undercrossing, with the railroad tracks on a bridge structure. Approximately 1,660 feet of State College Blvd would be lowered below its current elevation, up to 25 feet at the lowest point. Roadway clearance from bottom of bridge to top of pavement would be approximately 17.5 feet. Additional excavation depths would be required for bridge footings, utilities, pump station, and roadway subbase. – In order to maintain its intersections with State College Blvd, Howell Ave and Wright Circle would also need to be lowered below its existing elevation, along with multiple driveways and access roads along State College Blvd.



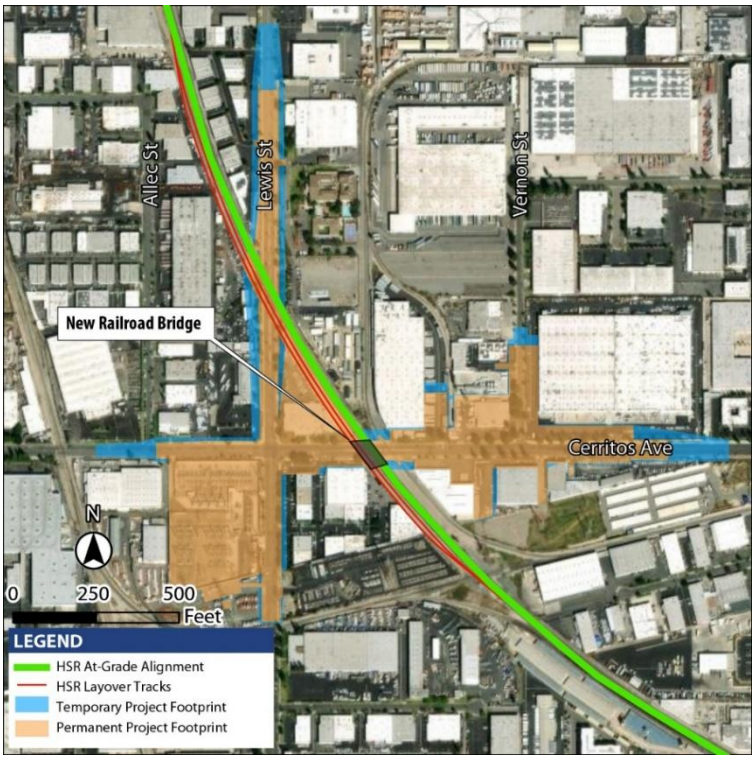
Sources: Authority 2025; ESRI 2020

Figure 2-16 Pioneer Boulevard Grade Separation



Sources: Authority 2025; ESRI 2020

Figure 2-17 Norwalk Boulevard and Los Nietos Road Grade Separations



Sources: Authority 2025; ESRI 2020

Figure 2-18 Cerritos Avenue Grade Separation



Sources: Authority 2025; ESRI 2020

Figure 2-19 State College Boulevard Grade Separation

Modifications to Other Roadways

In addition to modifications to roadway crossings described above for the railway alignment, several other roadways along the alignment would require modifications as a result of other project elements.

Roadway Modifications by Hobart Yard

The addition of new storage tracks and realignment of existing tracks throughout the Hobart Yard area would require 26th Street to be realigned. The roadway currently forms the southern boundary of Hobart Yard. At the eastern end of the yard, at Atlantic Boulevard, 26th Street connects to Pennington Way. From the UPRR San Pedro Subdivision track to Atlantic Boulevard, 26th Street would be realigned about 500 feet south from its existing location, at the farthest point. The realigned 26th Street would provide access to the 26th Street LMF, just north of the street. Currently, 26th Street intersects with Indiana Avenue, Bonnie Beach Place, and Ayers Avenue. Indiana Avenue and Bonnie Beach Place would connect with the realigned 26th Street, and the segments north of the realigned 26th Street would be closed. The realigned 26th Street would not connect to Pennington Way; it would end at Ayers Avenue, and Pennington Way would end in a cul-de-sac west of Atlantic Boulevard, accessible only from Bandini Boulevard. The existing segment of 26th Street between Ayers Avenue and Pennington Way would be closed.

Several roads between Sheila Street and Washington Boulevard are proposed to be closed because of the relocated BNSF truck parking. These roadway closures include the following, and are depicted on Figure 2-12 in yellow:

- Indiana Street
- S Pine Street
- Pacific Way
- Oak Street

- Ash Street
- Arrowmill Avenue
- Ayers Avenue
- Bedessen Avenue
- Connor Avenue
- Dennis Avenue

Roadway Modifications by Commerce Yard

Access is provided by 26th Street to BNSF's Commerce Yard from the east, but the yard improvements would require the entrance to the yard to be relocated approximately 1,300 feet to the east. This segment of 26th Street, within BNSF property, would be closed, and a new cul-de-sac would be provided at the end of the road.

Roadway Modifications by the Fullerton Braced Trench

The braced trench in Fullerton would be located partially outside the existing railroad right-of-way along the south side of the corridor, within the existing Artesia Boulevard right-of-way. Artesia Boulevard would be realigned slightly south, from approximately Pritchard Avenue to Gilbert Street. The intersection of Artesia Avenue and Gilbert Street would be reconfigured.

Roadway Modifications by Fullerton Metrolink/Amtrak Station

The changes at the Fullerton Metrolink/Amtrak Station would require Walnut Avenue to be realigned. Walnut Avenue currently runs east to west from Richman Avenue to Lawrence Avenue, south of and adjacent to the existing railroad corridor. With the addition of a fourth mainline track, Walnut Street would be slightly realigned south, from Richman Avenue to Lemon Street. All existing lanes and sidewalks would be maintained. At Highland Avenue, Walnut Street would be lowered slightly to meet the new, lowered grade of Highland Avenue, and the intersection would be reconfigured.

2.2.2 Shared Passenger Track Alternative B

Shared Passenger Track Alternative B would follow the same alignment and share the same project features and operational assumptions as Shared Passenger Track Alternative A, except for the location of the LMF as discussed below.

2.2.2.1 Alignment

The BNSF mainline and shared tracks for Shared Passenger Track Alternative B would be the same as those discussed for Shared Passenger Track Alternative A, as described in Section 2.2.1.1, because the LMF location would not affect the BNSF mainline and shared tracks.

2.2.2.2 Ancillary Facilities

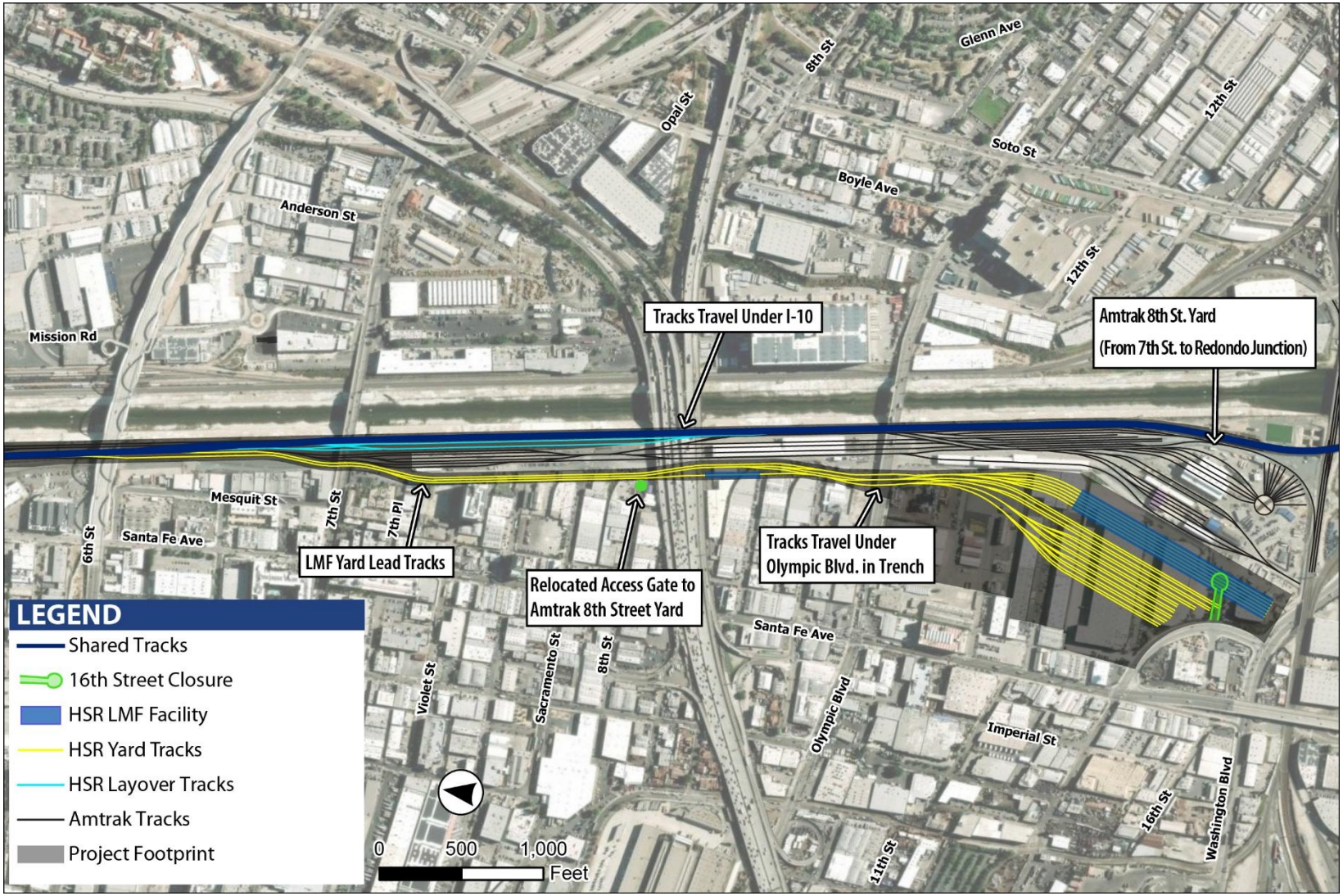
The proposed ancillary facilities for Shared Passenger Track Alternative B would be the same as those discussed for Shared Passenger Track Alternative A. Refer to Section 2.2.1.2 for more information on proposed ancillary facilities.

2.2.2.3 High-Speed Rail Station Facilities

Under Shared Passenger Track Alternative B, the proposed HSR station facilities at ARTIC would be the same as for Shared Passenger Track Alternative A. Refer to Section 2.2.1.3 for more information on proposed station sites.

2.2.2.4 Light Maintenance Facility

Shared Passenger Track Alternative B proposes an LMF between Olympic Boulevard and 15th Street, immediately adjacent to the existing Amtrak Eighth Street Yard. The 15th Street LMF would include the same maintenance operation facilities as the 26th Street LMF under Shared Passenger Track Alternative A, described in Section 2.2.1.4. Refer to Figure 2-20 for an overview of the 15th Street LMF.



Source: Authority 2025

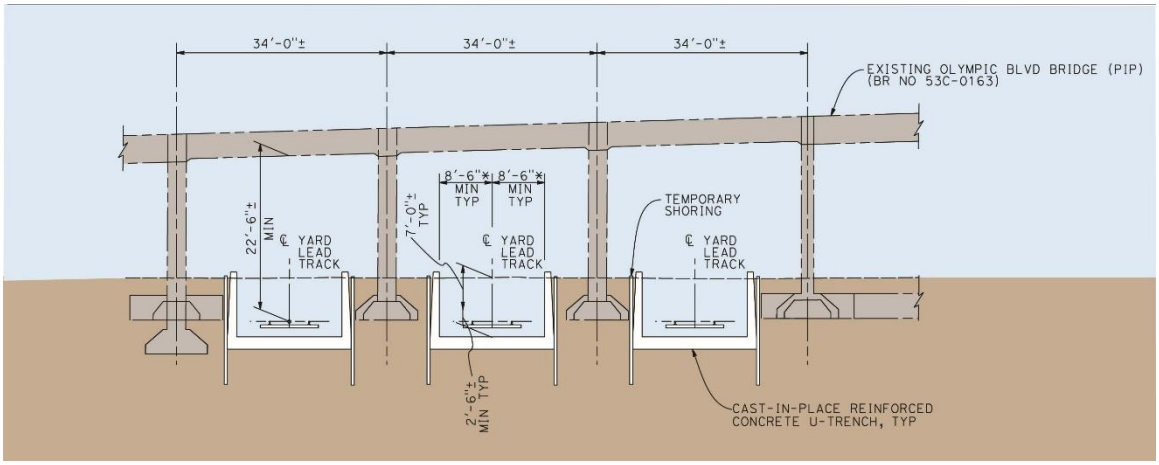
Figure 2-20 Shared Passenger Track Alternative B: 15th Street Light Maintenance Facility

The 15th Street LMF would have an overall size of 52 acres and would include a six-track shop building able to accommodate 12 trainsets, along with an outdoor train yard with a storage capacity of 20 HSR trainsets. The 15th Street LMF would be a single-ended yard, with access to and from the mainline tracks provided only from one side, at the northern end.

Primary roadway access to the 15th Street LMF would be from Washington Boulevard and 15th Street. HSR trains would access the yard via new yard lead tracks, which would start north of Seventh Street; the HSR project has been designed in coordination with the Los Angeles County Metropolitan Transportation Authority so that it would not conflict with the planned Metro Arts District Station, proposed north of Seventh Street. Two yard lead tracks would diverge from the mainline tracks out of the existing railroad right-of-way, cross under Seventh Street, and then branch into three tracks. Continuing south, the tracks would cross through part of Amtrak's existing primary access road to its Eighth Street Yard, which is currently gated at Eighth Street; these gates would need to be relocated to the west, but Amtrak would still be able to use the road to access its Eighth Street Yard. The three 15th Street LMF yard lead tracks would continue south to cross under I-10.

Approaching Olympic Boulevard, the tracks would descend to provide the minimum required 24-foot clearance between the OCS and the historic Olympic Boulevard overpass. Only one track would fit between each of the Olympic Boulevard overpass' four piers. As depicted on Figure 2-21, each track would pass through the piers within a separate trench at a finished depth of 7 feet. The Olympic Boulevard piers would not be altered during construction and would remain in place during HSR operations.

South of Olympic Boulevard, the 15th Street LMF yard lead tracks would connect to the yard on a curve, which requires special trackwork (turnout tracks). To make this connection, the LMF site would be lowered to meet the yard lead tracks. This is because the yard lead tracks would still be below grade as they come out of the Olympic Boulevard trenches, and there would not be enough room to transition the tracks back up to the existing elevation of the LMF site. Additionally, the special trackwork to connect the yard leads to the LMF tracks needs to be located on flat sections of track, not on a slope. Therefore, to make the connection between the below-grade yard lead tracks and the yard tracks, the northern portion of the LMF site (approximately 25 acres) would be excavated up to an approximate depth of 8 feet and regraded at a finished depth of approximately 5 feet to match the grade of the yard lead tracks.



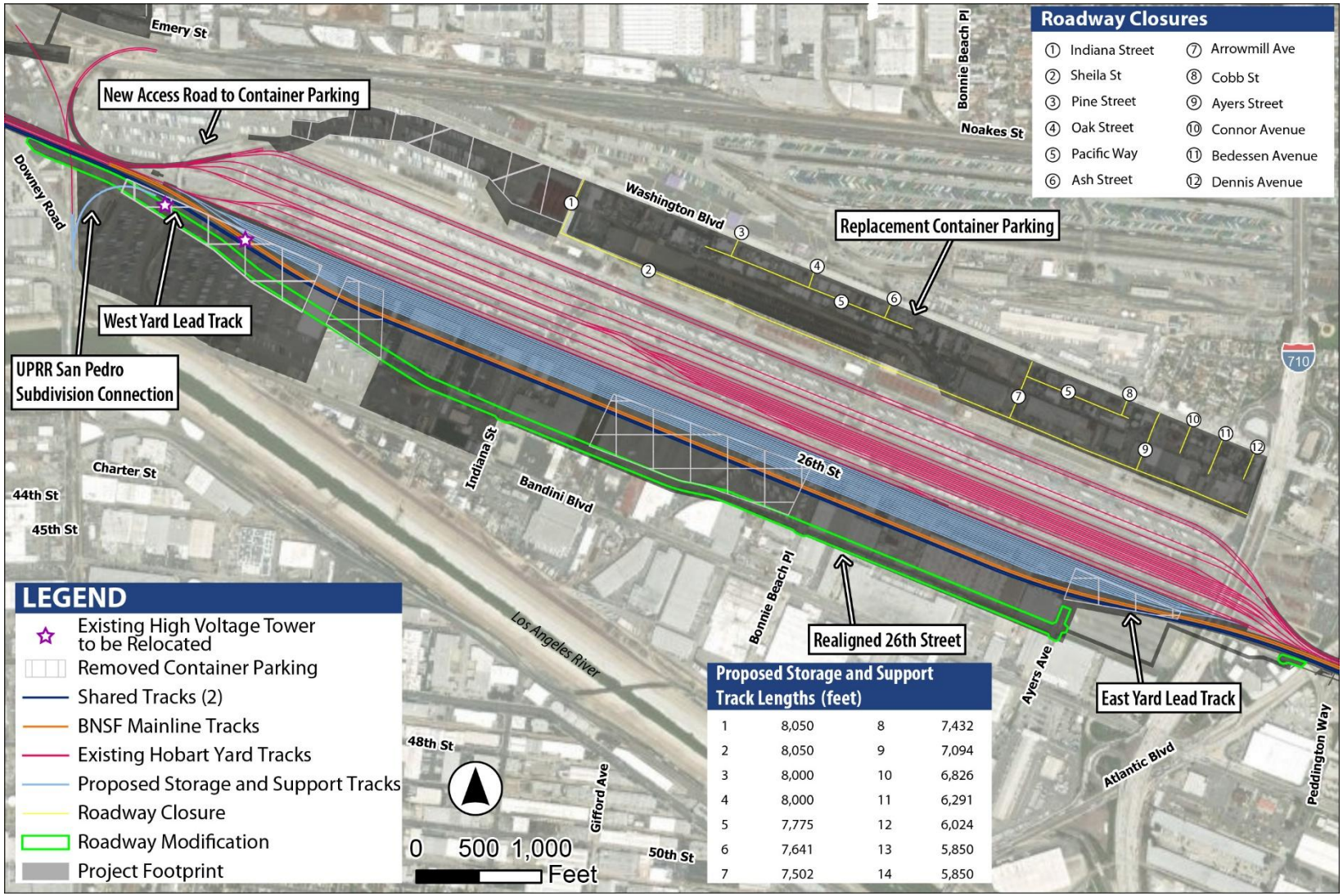
Source: Authority 2025

Figure 2-21 Trenches for 15th Street Light Maintenance Facility Yard Lead Tracks Under Olympic Boulevard

2.2.2.5 Freight or Passenger Railroad Modifications

Freight and passenger railroad modifications for Shared Passenger Track Alternative B would be the same as for Shared Passenger Track Alternative A, except for one difference at Hobart Yard. Figure 2-22 illustrates Hobart Yard without the 26th Street LMF. Because there would not be LMF lead tracks or yard tracks running through BNSF's existing container parking areas, Shared Passenger Track Alternative B would displace slightly less container parking compared to Shared Passenger Track Alternative A.

The two passenger rail station modifications (Norwalk/Santa Fe Springs and Fullerton) and two Metrolink station relocations (Buena Park and Commerce) would be the same for Shared Passenger Track Alternative B as described for Shared Passenger Track Alternative A.



Sources: Authority 2025; ESRI 2020

Figure 2-22 Shared Passenger Track Alternative B: Hobart Yard

2.2.2.6 State Highway or Local Roadway Modifications

The proposed modifications to roadways for Shared Passenger Track Alternative B would be the same as for Shared Passenger Track Alternative A, described in Section 2.2.1.6, except for the area around the 15th Street LMF site. Note that although the 26th Street LMF would not be included under Shared Passenger Track Alternative B, the realignment of 26th Street would still occur.

At the 15th Street LMF, Shared Passenger Track Alternative B would cross through part of Amtrak's access road to its Eighth Street Yard and through its existing access gate at Eighth Street. The access gate would be shifted to the west, and Amtrak would still be able to use its access road, but it would have to cross the three HSR yard lead tracks at grade to reach the road. The 15th Street LMF would also require the closure of a small portion of 16th Street, and the intersection of 15th Street and 16th Street would be reconfigured as a T-intersection. This portion of 16th Street, which is an existing cul-de-sac, serves the properties that would be acquired for construction of the 15th Street LMF. Refer to Figure 2-20, which depicts the portion of 16th Street that would be closed in green.

2.3 Early Action Projects

As described in the 2023 Project Update Report, the Authority has committed to investing in regionally important early action projects to provide early benefits to transit riders and local communities in Southern California, while laying a solid foundation for implementation of the HSR system. These early investments would be made by the Authority in collaboration with local and regional agencies. The types of projects include grade separations, track enhancements, and improvements at passenger rail stations, which would increase capacity, improve safety and air quality, and provide immediate mobility and reliability benefits for existing freight and passenger rail operations. The potential temporary construction and permanent operational environmental effects associated with these early action projects are included in the total evaluation of the Shared Passenger Track Alternatives. These early action projects may be implemented as standalone projects by other local agencies relying on the environmental analyses and conclusions of the Los Angeles to Anaheim Project Section in advance of the HSR system. The early action projects described below would be the same for both Shared Passenger Track Alternatives.

2.3.1 Grade Separations

The following five new railroad/roadway grade separations would be built as part of buildout of the project section and are identified as early action projects:

- Pioneer Boulevard
- Norwalk Boulevard and Los Nietos Road (considered a single early action project because of the adjacency of the two crossings)
- Cerritos Avenue
- State College Boulevard

The potential temporary construction and permanent operational environmental effects associated with these early action projects are analyzed in site-specific detail and included in the total evaluation of the project. Refer to Section 2.2.1.6 for more information.

2.3.2 Metrolink Station Relocations

Passenger rail currently operates within the Los Angeles – San Diego – San Luis Obispo Rail Corridor and would continue to do so with the introduction of HSR service. The relocations of the existing Commerce and Buena Park Metrolink Stations are necessary for implementation of either of the Shared Passenger Track Alternatives for reasons described in more detail in Section 2.2.1.5.

Existing transit service to the current Metrolink station locations would need to be modified to serve the relocated Metrolink station locations. Future coordination with Metrolink, Amtrak, and transit service providers would be necessary to determine bus routes and schedules for the

relocated Metrolink station locations and to inform final design of bus facilities at and near the station. Access roads, curb space, and passenger and operations facilities for buses have been included in the footprint in anticipation of this reconfigured service.

2.3.3 Fullerton Metrolink/Amtrak Modifications (Fullerton Interlocker)

The Shared Passenger Track Alternatives would modify the tracks and platforms throughout the Fullerton Metrolink/Amtrak Station, as well as the tracks east to Fullerton Junction, as described in Section 2.2.1.1. However, some of these proposed HSR modifications could be completed as an early action project to support the Metrolink Fullerton Interlocker Project, which is being planned by BNSF in coordination with Metrolink and the Authority. This project is critical to Metrolink's Southern California Optimized Rail Expansion Program and will allow for more frequent and regular service in Southern California. The Authority has incorporated the Fullerton Interlocker Project design as part of HSR's Fullerton/Metrolink Amtrak modifications, based on coordination with BNSF and Metrolink and on the anticipated timelines of the two projects.

If the Fullerton Interlocker Project occurs prior to HSR implementation, the early action project would consist of the same modifications described in Section 2.2.1.3 to the Fullerton Metrolink/Amtrak Station, with one exception. The fourth mainline track on the southern side of the corridor would only extend from east of Highland Avenue to Fullerton Junction because, in the absence of HSR, a fourth mainline track would not be added throughout the entire segment between LAUS and Fullerton Junction. All other modifications would be included: the removal of the southern side platforms, addition of a new center platform over Harbor Boulevard, new pedestrian underpass, and realignment and modifications to Walnut Avenue. If the HSR project is implemented later, the southern track would be extended west past Highland Avenue to connect to the fourth mainline track of the HSR alternatives.

2.3.4 Reconfiguration of Freight Rail Facilities

As discussed in Section 2.2.1.5, the project requires new or modified BNSF facilities to add and electrify tracks in the existing BNSF right-of-way between Los Angeles and Fullerton. The Hobart Yard modifications and Commerce Yard modifications (including the Commerce Flyover) could be implemented as early action projects to allow for improvements to existing Amtrak and Metrolink service in the Los Angeles – San Diego – San Luis Obispo Rail Corridor.

2.4 Optional High-Speed Rail Station

HSR trains would not stop at the Norwalk/Santa Fe Springs Metrolink Station or Fullerton Metrolink/Amtrak Station under either Shared Passenger Track Alternative A or Shared Passenger Track Alternative B. However, an option for a full-stop HSR station is considered, at either Norwalk/Santa Fe Springs or Fullerton. The inclusion of the HSR station option would require additional elements to support full-stop HSR service, in addition to the modifications described in Section 2.2.1.5. These HSR station elements are described in detail below.

2.4.1 High-Speed Rail Station Option: Norwalk/Santa Fe Springs

If the Norwalk/Santa Fe Springs Metrolink Station HSR Station Option is included, several additional elements would be included along with the station modifications described above for Shared Passenger Track Alternative A. An overview of the HSR station option elements is depicted on Figure 2-23, with the additional HSR station elements highlighted in green. The other elements depicted on Figure 2-23 would be completed as part of Shared Passenger Track Alternative A.

The Norwalk/Santa Fe Springs HSR Station Option would add two more electrified passenger rail tracks, for a total of four tracks through the station. The two tracks described under Section 2.2.1.1, Alignment, would serve the modified Metrolink side platforms; the two tracks added as part of the HSR station option would serve an HSR center platform in between the modified Metrolink side platforms. The HSR platform would be 1,000 feet long and capable of future extension to 1,410 feet.

The HSR station option would also require more parking to be added to serve HSR passengers. Parking and pick-up/drop-off for HSR and Norwalk/Santa Fe Springs Metrolink passengers would be combined within new surface parking lots. The HSR station option at Norwalk/Santa Fe Springs would provide 640 more parking spaces compared to what Shared Passenger Track Alternative A would otherwise provide, for a total of 1,248 parking spaces. A new access road would be provided from Imperial Highway, along the east side of the site, to the Shoemaker Avenue/Adler Drive intersection, with new signalized intersections.

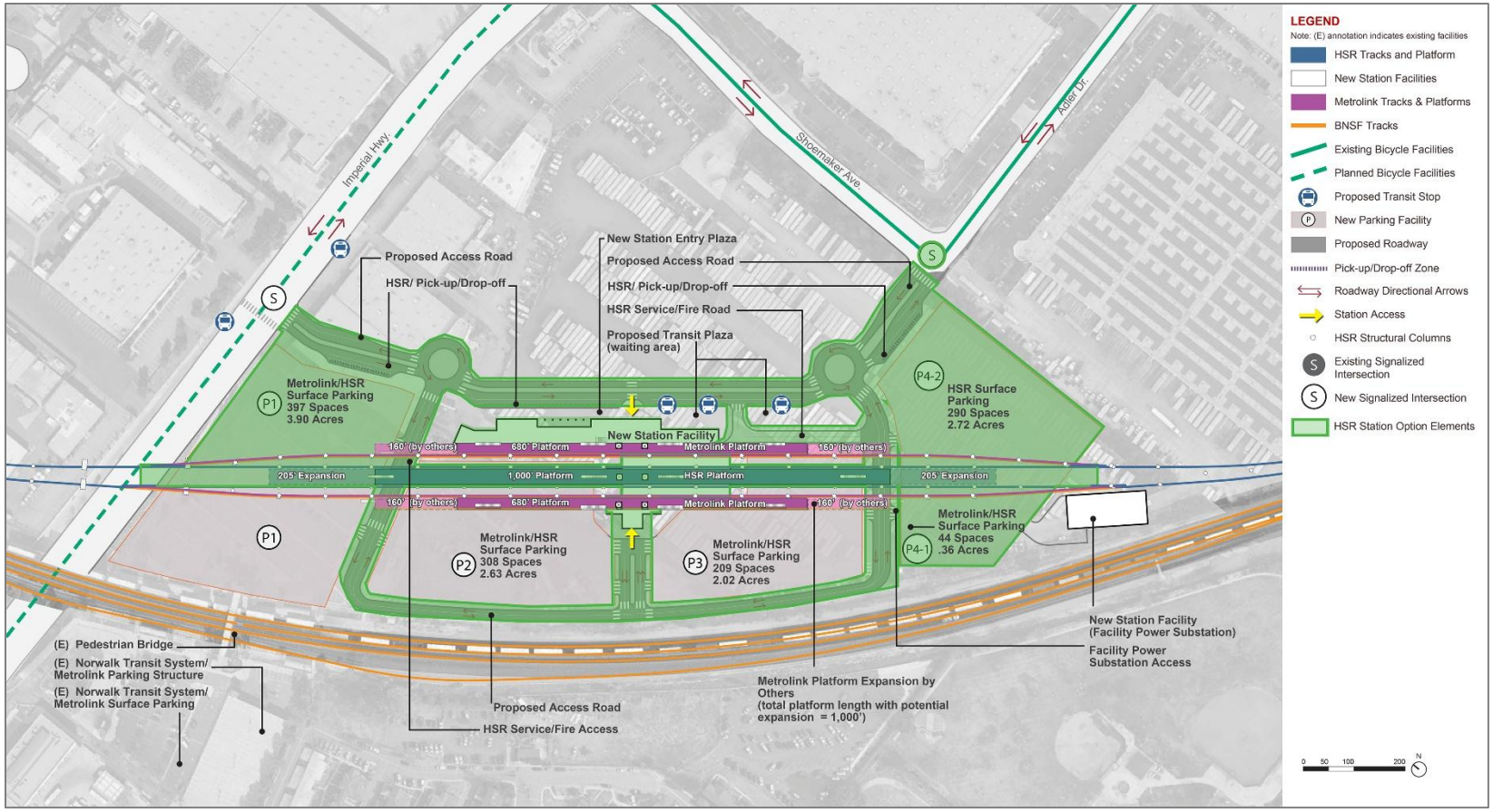
2.4.2 High-Speed Rail Station Option: Fullerton

If the Fullerton HSR Station Option is included, several additional elements would be included along with the station modifications described above for Shared Passenger Track Alternative A. An overview of the HSR station option elements is depicted on Figure 2-24, with the additional HSR station elements highlighted in green. The other elements depicted on Figure 2-24 would be completed as part of Shared Passenger Track Alternative A.

The overall track configuration would be the same as described in Section 2.2.1.1, but the southernmost shared track would be shifted south to accommodate a 1,000-foot HSR platform extending over Highland Avenue. The platform would be 48 inches above the rail on retained fill, at 10 feet at the highest point. A pedestrian ramp would connect the HSR platform to the Metrolink/Amtrak platform.

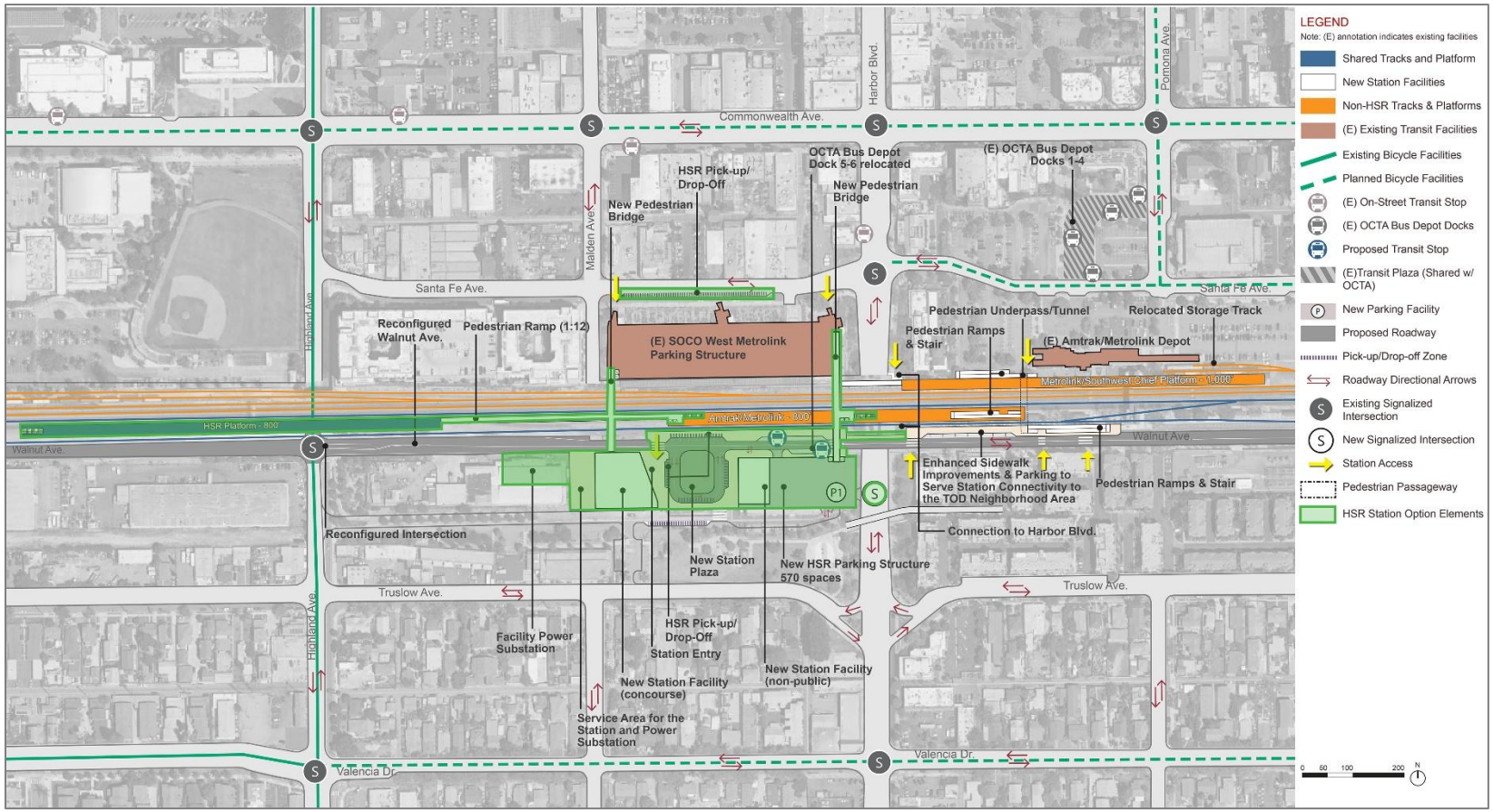
South of Walnut Avenue, the HSR station option would add HSR station buildings, a facility power substation, and a new multilevel parking structure that would provide a total of 570 new HSR parking spaces. The intersection of Highland Avenue and Walnut Avenue would be reconfigured to accommodate the new track and the Highland Avenue railroad bridge, along with improvements for transit stops and pedestrian crossings.

The HSR station option would add two pedestrian bridges: one west of Harbor Boulevard to connect the existing Metrolink parking structure to the HSR parking structure, and another east of Malden Avenue to connect the existing Metrolink parking structure to the HSR station building. A new signalized intersection on Harbor Boulevard would also be required to provide access to the HSR parking garage.



Source: Authority 2025
Future platform extension not included in project definition for the environmental impact report/environmental impact statement.

Figure 2-23 Norwalk/Santa Fe Springs High-Speed Rail Station Option



Source: Authority 2025

Figure 2-24 Fullerton High-Speed Rail Station Option

2.5 Project Construction

For the Los Angeles to Anaheim Project Section of the California HSR System, specific construction elements would include surface and elevated track; track work; grade-separated roadway crossings; and installation of a Positive Train Control system, as summarized in Table 2-7. Construction would take approximately 7.5 to 8 years.

Surface track sections would be built using conventional railroad construction techniques. A typical construction sequence includes clearing, grubbing, grading, and compacting the railbed; applying crushed rock ballast; laying track; and installing electrical and communications systems.

Elevated track sections would use the precast, segmented construction method. In this construction method, large concrete bridge segments are mass-produced at an on-site, temporary casting yard. Precast segments are then elevated atop the already completed portions of the elevated viaduct or embankment, and installed using a special gantry crane positioned on the aerial structure. Although the precast segmental method is the favored technique for aerial structure construction, other methods may be used, including cast-in-place, box girder, or precast, span-by-span techniques.

Preconstruction activities would occur during final design and would include geotechnical investigations, identification of staging areas, initiation of site preparation and demolition, relocation of utilities, and implementation of temporary, long-term, and permanent road closures. Additional studies and investigations to develop construction requirements and worksite traffic control plans would occur as needed.

Major construction activities for the project section would include earthwork and excavation support, systems construction, bridge and aerial structure construction, and railway systems construction (including trackwork, traction electrification, signaling, and communications).

During peak construction periods, work would be under way at several locations along the route simultaneously, with overlapping construction of various project elements. Working hours and the number of workers present at any time would vary depending on the activities being performed.

Table 2-7 Los Angeles to Anaheim Project Section Construction Schedule

Activity	Tasks	Schedule[7]
Right-of-way acquisition	Commencement of right-of-way acquisitions once State Legislature appropriates funds in annual budget, environmental due diligence	Prior to construction
Survey and preconstruction	Location of utilities, establishment of right-of-way and project control points and centerlines, establishment/relocation of survey monuments	Prior to construction
Mobilization	Safety devices and special construction equipment mobilization	Prior to construction
Site preparation	Utilities relocation; clearing/grubbing right-of-way; establishment of detours and haul routes; preparation of construction equipment yards, stockpile materials, and precast concrete segment casting yard	January 2031–January 2034
Earth moving	Excavation and earth support structures	April 2031–October 2036
Construction of road crossings	Surface street modifications, grade separations	July 2031–July 2037

[7] Schedule as of September 2023.

Activity	Tasks	Schedule[7]
Construction of aerial structures	Aerial structure and bridge foundations, substructure, and superstructure	July 2032–July 2036
Construction of underground structures	Straddle bent trench	October 2032–April 2036
Track laying	Includes backfilling operations and drainage facilities	July 2033–December 2037
Systems	Train control systems, OCS, communication system, signaling equipment	October 2035–October 2037
Demobilization	Includes site cleanup	At completion of construction
HSR stations and station relocations	Demolition, site preparation, foundations, structural frame, electrical and mechanical systems, finishes	Commerce Metrolink Station relocation: January 2031–January 2032
		Buena Park Metrolink Station Relocation: January 2034–March 2035
		Norwalk/Santa Fe Springs HSR/Metrolink Station: July 2033–July 2036[1]
		Fullerton HSR/Metrolink Station: January 2033–June 2035[1]
		Anaheim HSR platform and facilities: November October 2034–September 2037

Source: Authority 2024
[1] Construction schedule for Norwalk/Santa Fe Springs and Fullerton Station dependent on station selection.
OCS = overhead contact system; HSR = high-speed rail

2.6 Independent Utility of the Los Angeles to Anaheim Project Section

The Authority and FRA divided the HSR system they established with Tier 1 process into individual project sections for Tier 2 planning, environmental review, and decision making. The FRA, consistent with regulations issued by the Federal Highway Administration, considers three criteria when determining the scope of a project to be considered in an EIS: (1) whether it connects "logical termini" and has "sufficient length to address environmental matters on a broad scope"; (2) whether it has "independent utility or independent significance," meaning that it will "be usable and be a reasonable expenditure even if no additional transportation improvements in the area are made"; and (3) whether it will "restrict consideration of alternatives for other reasonably foreseeable transportation improvements" (23 Code of Federal Regulations Part 771.111(f)). *Logical termini* is defined by the Federal Highway Administration as the rational starting and ending points for a transportation improvement project and for review of the environmental impacts of the project (FHWA 1993).[8] The project section connects logical termini at planned passenger stations where HSR service would be provided, at LAUS to the north and at ARTIC to the south. If other sections of the HSR system are not completed, the infrastructure

[8] The Federal Highway Administration criteria for determining project scope, as established in 23 Code of Federal Regulations Part 771.11(f), do not specifically address the scope of individual projects considered in the second tier of a tiered National Environmental Policy Act process. With the tiered National Environmental Policy Act process, the same general principles apply, but they are applied in the context of the decisions made in Tier 1—in this case, the decision to build the HSR system as a whole. Therefore, in determining the scope of individual project sections for Tier 2 studies, the Authority and FRA focused primarily on determining whether each project section could serve a useful transportation purpose on its own, and ensuring that a decision in one project section does not limit consideration of reasonable alternatives for completing the HSR system in an adjacent section for which the National Environmental Policy Act process has not yet been completed.

could be used by regional and intercity services to improve their capacity, reliability, and performance (Authority 2009).

2.7 Operation of the Los Angeles to Anaheim Project Section

The conceptual HSR service plan for Phase 1 begins with service between Los Angeles/Anaheim running through the Central Valley from Bakersfield to Merced, and traveling northwest into the Bay Area. Subsequent sections in Phase 2 of the HSR system include a southern extension from Los Angeles to San Diego and an extension from Merced to Sacramento, which do not have an anticipated implementation date.

The Shared Passenger Track Alternatives would be within an active passenger and freight rail corridor, which would require a change in operational patterns and frequency for users. Because the project proposes new and realigned tracks throughout the corridor shared by other passenger rail and freight operators, implementation would change the tracks on which the various users operate. Currently, the Metrolink Orange County line and 91 line, Amtrak Pacific Surfliner, BNSF, and UPRR freight trains operate within the project section. The introduction of HSR service between Los Angeles and Anaheim would not conflict with the California State Rail Plan (Caltrans 2023).

Under the Shared Passenger Track Alternatives, there would be up to two HSR passenger trains per hour (peak) in each direction. Up to 10 freight trains per day could operate on the passenger tracks. The Shared Passenger Track Alternatives would maintain current and projected freight train volume within the corridor.

3 LAWS, REGULATIONS, ORDERS

This section describes the federal, state, and local laws, regulations, orders, and plans that are relevant to noise and vibration.

3.1 Noise

3.1.1 Federal

3.1.1.1 Federal Railroad Administration, Procedures for Considering Environmental Impacts (64 Federal Register 28545)

On May 26, 1999, the FRA released Procedures for Considering Environmental Impacts (FRA 1999). These FRA procedures describe the FRA's process for assessing the environmental impacts of actions and legislation proposed by the agency and for the preparation of associated documents (U.S. Code Title 42, Section 4321 et seq.). The FRA Procedures for Considering Environmental Impacts states that "the EIS should identify any significant changes likely to occur in the natural landscape and in the developed environment. The EIS should also discuss the consideration given to design quality, art, and architecture in project planning and development as required by U.S. Department of Transportation Order 5610.4." These FRA procedures state that an EIS should consider possible impacts on noise and vibration.

3.1.1.2 Noise Control Act of 1972 (49 U.S. Code 4910)

The Noise Control Act of 1972 (42 U.S. Code 4910) was the first comprehensive statement of national noise policy. It declared, "it is the policy of the United States to promote an environment for all Americans free from noise that jeopardizes their health or welfare." Although the act, as a funded program, was ultimately abandoned at the federal level, it served as the catalyst for comprehensive noise studies and the generation of noise assessment and mitigation policies, regulations, ordinances, standards, and guidance for many states, counties and municipal governments. For example, the noise elements of community general plans and local noise ordinances studied as part of this analysis were largely created in response to passage of the act.

3.1.1.3 Occupational Health and Safety Administration Occupational Noise Exposure (29 Code of Federal Regulations [CFR] Part 1910.95)

The Occupational Safety and Health Administration (29 CFR Part 1910.95) has regulated worker noise exposure to a time-weighted-average of 90 A-weighted decibels (dBA) over an 8-hour work shift. Areas where levels exceed 85 dBA must be designated and labeled as high-noise-level areas where hearing protection is required. This noise exposure criterion for workers would apply to project construction activities. Noise from construction activities might also elevate noise levels at nearby construction sites to levels that exceed 85 dBA and thus trigger the need for administrative or engineering controls and hearing conservation programs for worker safety, as detailed by the Occupational Safety and Health Administration.

3.1.1.4 U.S. Environmental Protection Agency Railroad Noise Emission Standards (40 CFR Part 201)

The U.S. Environmental Protection Agency (USEPA) has issued noise emission standards (40 CFR Part 201), which set maximum measured noise levels for locomotives manufactured after 1979, as follows:

- One hundred feet from the geometric center of a stationary locomotive, connected to a load cell and operating at any throttle setting except idle: 87 dBA (at idle setting, 70 dBA)
- One hundred feet from the geometric center of a mobile locomotive: 90 dBA
- One hundred feet from the geometric center of mobile railcars, at speeds up to 45 miles per hour (mph): 88 dBA (at speeds greater than 45 mph, 93 dBA)

Federal regulations exist, issued in the early 1980s by USEPA, that generally limit the strength or loudness of noise a locomotive or railcar may generate (40 CFR Part 201.12/13). Whether or not this regulation applies to high-speed trainsets, the analysis in the EIR/EIS does not assume that Authority trainsets will comply with the noise generation standard of this regulation because the Authority is not aware of any high-speed trainsets manufactured in the world today that meet this standard at all speeds. A noise-generation standard specific to high-speed trains does exist in Europe (European Technical Specification for Interoperability Standard), and a trainset manufactured to those standards complies with the USEPA standard (if applicable) generally at speeds below 190 to 200 mph. Above that speed, airflow over the trainset and its pantograph and related apparatus is the main source of noise, which presently known technology cannot resolve to comply with the USEPA standard (if applicable). The analysis in the EIR/EIS—both prior to and after mitigation—assumes a trainset generating noise in compliance with the European Technical Specification for Interoperability Standard, because trainsets currently in manufacture and operation in Europe can meet this standard; the analysis does not assume a trainset that meets the USEPA standard.

3.1.1.5 Federal Railroad Administration Noise and Vibration Impact Assessment Guidelines

The FRA guidelines for assessing noise impacts from HSR operations (FRA 2012) are adapted from the same sources used to develop the Federal Transit Administration (FTA) guidelines for rail projects and their associated stationary facilities (FTA 2018). These criteria are discussed in Section 3.1.1.8, Federal Transit Administration Guidelines.

Noise impacts on wildlife and livestock are not found in the FTA guidance document, but are addressed in the FRA guidelines. Similarly, the FRA provides guidelines for identifying noise-sensitive locations where increased annoyance can occur because of the sudden increase in noise (the startle effect) from the rapid approach of HSR. Criteria for these effects are presented in Chapter 4, Methods for Evaluating Impacts. In addition, the FRA provides guideline criteria for assessing the impact of project construction noise. These criteria, presented in Chapter 4, are similar to FTA criteria.

3.1.1.6 Railroad Noise Emission Compliance Regulations (49 CFR Part 210)

The FRA's Railroad Noise Emission Compliance Regulation (49 CFR Part 210) prescribes minimum compliance regulations for enforcement of Noise Emission Standards for Transportation Equipment; Interstate Rail Carriers (40 CFR Part 201) adopted by USEPA. New locomotives must meet the following noise standards: 70 dBA at 100 feet while stationary at idle throttle setting, 87 dBA at 100 feet while stationary at all other throttle settings, and 90 dBA at 100 feet while moving. Rail cars must meet the following noise standards: 88 dBA while moving at speeds of 45 mph or less, and 93 dBA at 100 feet while moving at speeds faster than 45 mph.

Whether or not the USEPA standard applies to high-speed trainsets, the analysis in the EIR/EIS does not assume that Authority trainsets would comply with it because the Authority is not aware of any high-speed trainsets manufactured in the world today that meet this standard at all speeds. A noise-generation standard specific to high-speed trains does exist in Europe (European Technical Specification for Interoperability Standard), and a trainset manufactured to that standard complies with the USEPA standard (if applicable) generally at speeds below 190 to 200 mph. Above 200 mph, airflow over the trainset and its pantograph and related apparatus is the main source of noise, which presently known technology cannot resolve to comply with the USEPA standard (if applicable). The analysis in the EIR/EIS—both prior to mitigation and after mitigation—assumes a trainset generating noise in compliance with the European Technical Specification for Interoperability Standard. Because trainsets currently in manufacture and operation in Europe can meet this standard; the analysis does not assume a trainset that meets the USEPA standard. In this project section, the maximum HSR speeds would be 220 mph although the train speed would vary along the corridor, depending on design and land use constraints, from 45 to 90 miles per hour.

3.1.1.7 Locomotive Horn Rule (49 CFR Part 222 and Part 229)

FRA regulations require that engineers sound their locomotive horns while approaching public grade crossings until the lead locomotive fully occupies the crossing. In general, the regulations require locomotive engineers to begin to sound the train horn for a minimum of 15 seconds, and a maximum of 20 seconds, in advance of public grade crossings. Engineers must also sound the train horn in a standardized pattern of two long, one short, and one long blast and the horn must continue to sound until the lead locomotive or train car occupies the grade crossing. Additionally, the minimum sound level for the locomotive horn is 96 dBA, while the maximum sound level is 110 dBA, both measured at 100 feet forward of the locomotive. The FRA allows public authorities to establish a quiet zone, which is a segment of a rail line within which is situated one or a number of consecutive public road-rail crossings at which locomotive horns are not routinely sounded, provided sufficient safety measures are implemented at the crossing to prevent/ minimize the potential for accidents to occur. Railroad authorities, including Caltrain, the Authority, and railroad companies (such as UPRR), cannot establish quiet zones; only local cities and counties can establish them by applying to the FRA.

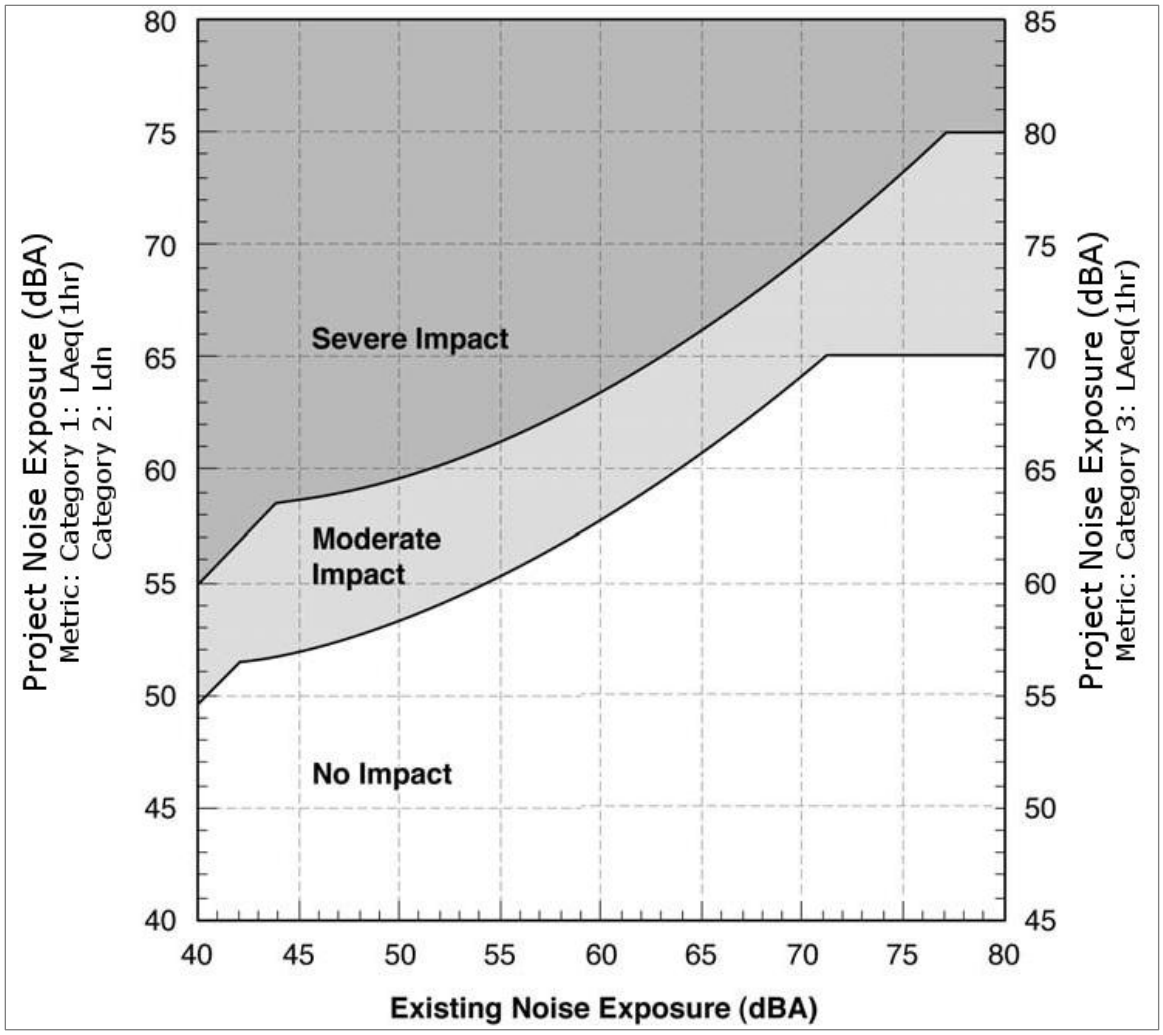
At a minimum, new quiet zones must be at least 0.5 mile in length and contain at least one public grade crossing (i.e., a location where a public highway, road, or street crosses one or more railroad tracks at grade). Every public grade crossing in a quiet zone must be equipped at a minimum with active grade crossing warning devices consisting of flashing lights and gates. If a public authority wants to establish a new quiet zone, it must conduct an assessment of hazards related to the crossings in the proposed zone and implement sufficient safety measures to reduce the proposed quiet zone's risk level to an acceptable level. Improvements may include roadway medians or channelization devices to discourage motorists from driving around a lowered crossing gate, a four-quadrant gate system to block all lanes of highway traffic, converting a two-way street into a one-way street and installing crossing gates, and permanent or temporary (nighttime) closure of the crossing to highway traffic. As an alternative, communities may also choose to silence routine locomotive horn sounding through the installation of wayside horns at public grade crossings. Wayside horns are train-activated stationary acoustic devices at grade crossings that are directed at highway traffic as a one-for-one substitute for train horns.

3.1.1.8 Federal Transit Administration Guidelines

The noise impact criteria for rail projects and their associated fixed facilities, such as storage and maintenance yards, passenger stations and terminals, parking facilities, and substations are depicted graphically on Figure 3-1. The land use categories (1, 2, 3) depicted on Figure 3-1 are defined in Table 3-1.

For noise exposures below the lower of the two curves on Figure 3-1, a proposed project is considered to have no noise impact because, on average, the introduction of the project would result in an insignificant increase in the number of people highly annoyed by the new noise. The curve defining the onset of noise impact stops increasing at 65 dBA for Category 1 and Category 2 land uses, a standard limit for an acceptable living environment defined by a number of federal, state, and local agencies. Project noise above the upper curve is considered to cause a severe impact because a substantial percentage of people would be highly annoyed by the new noise.

The upper curve on Figure 3-1 flattens out at 75 dBA for Category 1 and Category 2 land uses, a level associated with an unacceptable living environment. As indicated by the right-hand scale on Figure 3-1, the project noise criteria are 5 decibels (dB) higher for Category 3 land uses because these types of land uses are considered to be slightly less sensitive to noise than the types of land uses in Category 1 and Category 2.



Source: FTA 2018; FRA 2012

Figure 3-1 Noise Impact Criteria for Transit and High-Speed Rail Projects

Table 3-1 Land Use Categories and Metrics for Transit Noise Impact Criteria

Land Use Category	Noise Metric (dBA)	Land Use Category
1	Outdoor $L_{eq}(h)$[1]	Land where quiet is an essential element of its intended purpose. Example land uses include preserved land for serenity and quiet, outdoor amphitheaters and concert pavilions, and national historic landmarks with considerable outdoor use. Recording studios and concert halls are also included in this category.
2	Outdoor L_{dn}	This category is applicable to residential land use and buildings where people normally sleep, such as hotels and hospitals.

Land Use Category	Noise Metric (dBA)	Land Use Category
3	Outdoor $L_{eq}(h)$[1]	This category is applicable to institutional land uses with primarily daytime and evening use. Example land uses include schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds and recreational facilities are also included in this category.

Source: FTA 2018

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

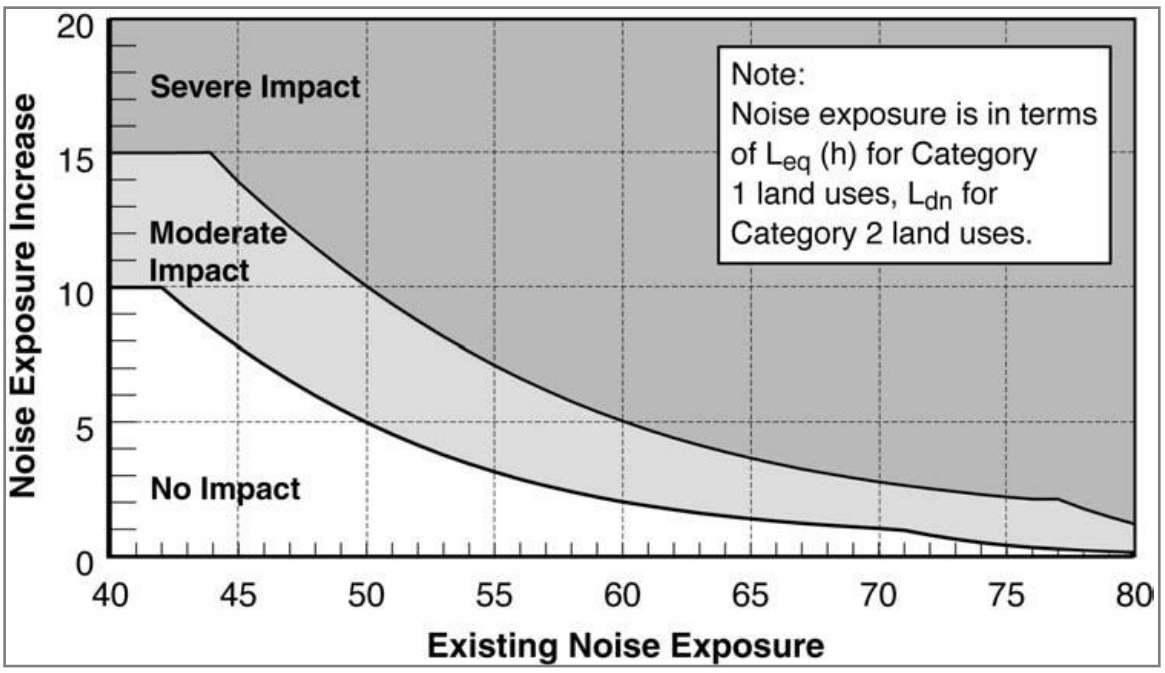
dBA = A-weighted decibels; L_{dn} = day-night sound level; L_{eq} = equivalent sound level; $L_{eq}(h)$ = hourly equivalent sound level

Between the two curves, a project is judged to have a moderate impact. The change in the cumulative noise level is noticeable to most people, but may not be sufficient to cause strong, adverse reactions from the community. In this transitional area, other project-specific factors must be considered to determine the magnitude of the impact and the need for mitigation, such as the existing noise level, predicted level of increase over existing noise levels, and the types and numbers of noise-sensitive land uses affected.

Although the curves on Figure 3-1 are defined in terms of the project noise exposure and the existing noise exposure, the increase in the cumulative noise—when project-generated noise is added to existing noise levels—is the basis for the criteria. To illustrate this point, Figure 3-2 depicts the noise impact criteria for Category 1 and Category 2 land uses in terms of the allowable increase in the cumulative noise exposure. Because day-night sound level (L_{dn}) and equivalent sound level (L_{eq}) are measures of total acoustic energy, a new noise source in a community will cause an increase, even if the new source level is lower than the existing level. On Figure 3-2, the criterion for a moderate impact allows a noise exposure increase of 10 dBA if the existing noise exposure is 42 dBA or less, but only a 1 dBA increase when the existing noise exposure is 70 dBA.

As the existing level of ambient noise increases, the allowable level of transit noise increases, but the total amount that community noise exposure is allowed to increase is reduced. This accounts for the unexpected result that a project noise exposure that is lower than the existing noise exposure can still cause an impact. This is clearer from the examples given in Table 3-2, which indicate the level of transit noise allowed for different existing levels of exposure.

With respect to construction noise, no standard criteria apply at the federal level. However, Section 12.1.3 of the FTA guidelines does offer suggested threshold values for two levels of analysis (general and detailed) that can help identify potential noise impacts from construction equipment (FTA 2018).



Source: FTA 2018; FRA 2012

Figure 3-2 Allowable Increase in Cumulative Noise Levels (Categories 1 and 2)

Table 3-2 Noise Impact Criteria: Effect on Cumulative Noise Exposure

L_{dn} or L_{eq} in dBA (rounded to nearest whole decibel)			
Existing Noise Exposure	Allowable Project Noise Exposure	Allowable Combined Total Noise Exposure	Allowable Noise Exposure Increase
45	51	52	7
50	53	55	5
55	55	58	3
60	57	62	2
65	60	66	1
70	64	71	1
75	65	75	0

Source: FTA 2018
dBA = A-weighted decibels; L_{dn} = day-night sound level; L_{eq} = equivalent sound level

3.1.1.9 Federal Highway Administration Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 CFR Part 772)

The Federal Highway Administration (FHWA) stipulates procedures and criteria for noise assessment studies of highway projects (23 CFR Part 772). The FHWA requires that noise abatement measures be considered on federal-aid highway projects if the project would cause a substantial increase in noise levels, or if projected noise levels approach or exceed the noise abatement criteria level for activities occurring on adjacent lands. These FHWA regulations apply to projects funded or approved by FHWA, and thus would not apply to this project (because FHWA funds are not expected to be used); however, the criteria in these regulations have been considered in assessing noise impacts associated with motor vehicles.

FHWA noise abatement criteria for various land use activity categories are presented in Table 3-3. These noise criteria are assigned to exterior and interior activities. Noise attenuation provided by most residential structures leads to compliance with the interior design noise level if the exterior criterion is attained (FHWA 2011).

For projects subject to these regulations, noise abatement measures must be considered and, if found to be reasonable and feasible, they must be incorporated as part of the project if these noise abatement criteria are predicted to be approached or exceeded during the noisiest 1-hour period of a day, Consistent with FHWA guidelines, the California Department of Transportation (Caltrans) defines "approach" as a worst-hour noise level/sound level that is within 1 dB of a noise abatement criterion. As an example, 66 dBA L_{eq} approaches the 67 dB L_{eq} activity category B criterion, whereas 65 dB L_{eq} does not. While the regulations do not apply to this project, the Authority will consider these criteria in assessing noise impacts and determining appropriate mitigation.

These criteria are used in Section 6.4, Operational Traffic Noise, where a detailed analysis is conducted for the change in peak hour noise from increased traffic related to the project.

Table 3-3 Federal Highway Administration Noise Abatement Criteria in A-Weighted Decibels

Activity Category	Activity Criteria[1] $L_{eq}(h)$	Evaluation Location	Activity Description
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B[2]	67	Exterior	Residential
C[2]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trails crossings
D	52	Interior	Auditoriums, daycare centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E[2]	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in activity categories A through D or F.
F	--	--	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	--	--	Undeveloped lands that are not permitted

Source: FHWA 2011

[1] The $L_{eq}(h)$ Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.

[2] Includes undeveloped lands permitted for this activity category.

dBA = A-weighted decibels; $L_{eq}(h)$ = hourly sound equivalent level

3.1.2 State

3.1.2.1 California Noise Control Act (California Health and Safety Code Section 46010 et seq.)

At the state level, the California Noise Control Act of 1973 (Cal. Health and Safety Code, Section 46010 et seq.) provides for the Office of Noise Control in the Department of Health Services to assist communities in developing local noise control programs and to work with the Office of Planning and Research to provide guidance for the preparation of the required noise elements in city and county general plans, pursuant to California Government Code, Section 65302(f). In preparing the noise element, a city or county must identify local noise sources and analyze and quantify, to the extent practicable, current and projected noise levels for various sources, including highways and freeways, passenger and freight railroad operations, ground rapid transit systems, commercial, general, and military aviation and airport operations, and other ground stationary noise sources (these would include HSR alignments). Noise-level contours must be mapped for these sources, using both community noise equivalent level and day-night average level, and are to be used as a guide in land use decisions to minimize the exposure of community residents to excessive noise.

3.1.2.2 General Plan Guidelines (California Government Code Section 65302(f)), Appendix C, Noise Element Guidelines

The noise element of a community's general plan provides a basis for a comprehensive local program to control and abate environmental noise and to protect citizens from excessive exposure. The California Governor's Office of Planning and Research General Plan Guidelines 2017 (OPR 2017) outlines the development of the noise element for local agencies. City and county agencies often adopt the guidelines for land use planning purposes for acoustical compatibility based on existing ambient noise levels in the community. For example, commercial land uses are considered appropriate where existing noise levels might be considered too high for residential development.

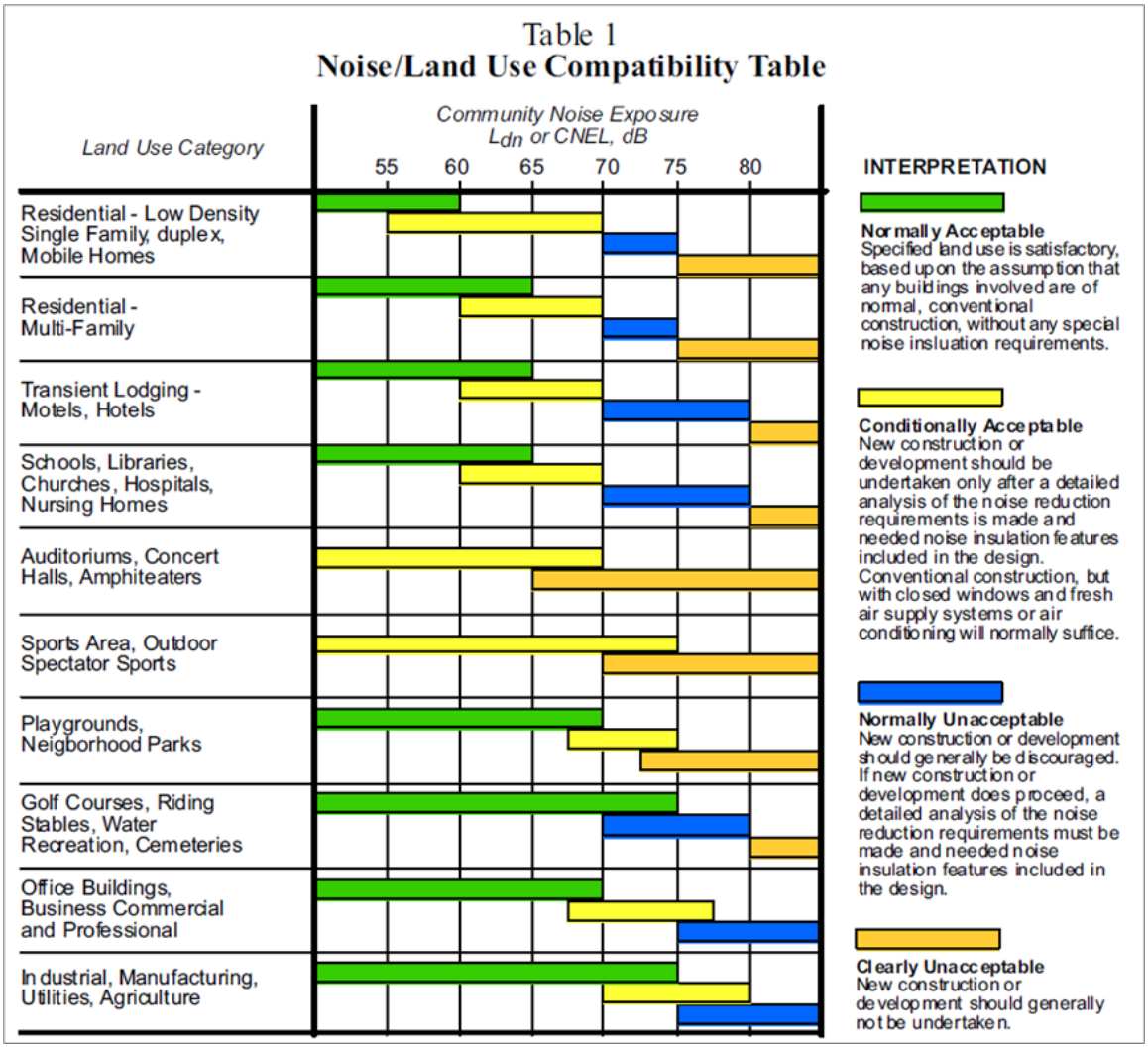
3.1.2.3 California Department of Transportation Traffic Noise Analysis Protocol

The Caltrans Traffic Noise Analysis Protocol (Caltrans 2011) establishes guidelines for evaluating traffic noise impacts along highways where frequent outdoor use areas are located and for determining reasonable and feasible noise abatement measures. These criteria are relevant to the extent that the project could result in reconstruction or reconfiguration of an existing highway or traffic lanes, or could affect traffic patterns. Under FHWA and Caltrans policies, noise abatement should be considered for transportation improvement projects when various traffic noise abatement criteria are exceeded.

3.1.2.4 Title 24, Part 2, California Code of Regulations

The California Noise Insulation Standard (California Code of Regulations Title 24, Part 2, Chapter 35, Section 3501) limits interior noise exposure levels within multifamily (not single-family detached houses) residential developments to 45 dBA community noise equivalent level (CNEL) or 45 dBA L_{dn}.

The standard is often adopted by city and county agencies for land use planning purposes. The California Department of Health Land Use Compatibility Criteria feature guidelines for acoustical compatibility. These standards, expressed as ranges, are presented on Figure 3-3.



Source: OPR 2017

Figure 3-3 State of California Land Use Compatibility Guidelines

3.1.2.5 California Environmental Quality Act (CEQA) (California Code of Regulations, Title 14, 15000 et seq.)

Environmental concerns (e.g., clean air, noise) and thresholds of significance (e.g., parts per million of particulate matter, decibel level of noise) are not legislated under CEQA (Cal. Code Regs., tit. 14, 15000 et seq.) at the state level but are left to the local jurisdictions to determine. For example, if a local authority believes that pedestrian safety is an environmentally significant concern, then pedestrian safety can be added to the list of significance thresholds evaluated in the environmental review, as long as the local legislation establishes a meaningful measure and threshold of significance, and substantial evidence of the environmental concern can be developed and cataloged.

With respect to noise and vibration, the questions in Table 3-4 must be answered and a reasonable and sufficient justification must be provided for each answer.

Table 3-4 CEQA Noise Impact Assessment

XI. NOISE – Would the project result in:	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	❒	❒	❒	❒
b) Generation of excessive ground-borne vibration or ground-borne noise levels?	❒	❒	❒	❒
c) For a project located within the vicinity of a private airstrip or 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, would the project expose people residing or working in the project area to excessive noise levels?	❒	❒	❒	❒

Source: OPR 2018
CEQA = California Environmental Quality Act

3.1.2.6 California Streets and Highway Code

The State of California establishes noise limits for vehicles licensed to operate on public roads. For heavy trucks, the State pass-by standard is consistent with the federal limit of 80 dB. The State pass-by standard for light trucks and passenger cars (less than 4.5 tons gross vehicle rating) is also 80 dB at 15 meters from the centerline. For new roadway projects, Caltrans employs the noise abatement criteria, promulgated by 40 CFR, as administered by the FHWA (California Vehicle Code, Sections 23130, 23130.5, 27150 et seq., 27204, and 27206).

3.1.3 Regional and Local

Counties and cities in California prepare general plans with noise policies and ordinances (outlined above in the discussion of state regulations). These noise elements often incorporate specific allowable noise levels to achieve a quality environment. Where airports exist, the general plans often include a section on airport land use compatibility with respect to noise so that new, noise-sensitive uses are not located near or do not encroach on areas surrounding airports. General plans usually do not address ground-borne vibration. The HSR project is not subject to local general plan policies and ordinances related to noise limits on construction or to locally based criteria for determining the impacts and significance of a noise increase from a project.

At the local level, two counties and several municipal jurisdictions overlay the project and they each have ordinances with requirements pertaining to noise level compliance. Table 3-5 presents a summary of the local noise standards for each of these jurisdictions. As stated previously, there are no regional applicable standards related to noise and vibration that would be regulated by regional entities such as the Southern California Association of Governments. Pursuant to United States Code Title 23 Section 327, under the National Environmental Policy Act (NEPA) Assignment Memorandum of Understanding between the FRA and the State of California, effective July 23, 2019, the Authority is the federal lead agency for environmental reviews and approvals for Authority Phase 1 and Phase 2 California HSR System projects. The Authority, as the lead agency proposing to build and operate the HSR system, is required to comply with federal and state laws and to secure applicable federal and state permits prior to initiating construction of the project. Therefore, there would be no inconsistencies between the Shared Passenger Track Alternatives and these federal and state laws and regulations.

Table 3-5 Summary of Local Noise Criteria for Affected Communities

Jurisdiction	Average Noise Level (dBA)					
	Residential		Commercial		Industrial	
	Day	Night	Day	Night	Day	Night
County of Los Angeles[1, 2]	50	45	60	55	70	
City of Los Angeles[1]	50	40	60	55	70	
City of Vernon[1]	65	60	75		75	
City of Commerce[1]	55	45	65	55	70	
City of Montebello[1]	65	60	70		75	
City of Pico Rivera[4]	65[1]	45[3]	70[1]	45[3]	75	
City of Santa Fe Springs[4]	65[1]	45[3]	55[3]		65[3]	
City of La Mirada[4, 5]	50–60		50–65		50–70	
City of Buena Park	55[1] (50[3])	50[1] (45[3])	--		--	
City of Fullerton	55[1] (55[3])	50[1] (45[3])	--		--	
City of Anaheim[1]	60		60		60	
County of Orange[1]	55	50	--		--	

Source: Appendix B
[1] Exterior levels depicted.
[2] 45 dBA required anytime for designated areas requiring "exceptional quiet."
[3] Interior levels depicted.
[4] Levels depicted are L_{dn}/CNEL metrics.
[5] Range of levels depicted meets the "Normally Acceptable" CNEL limits in the local noise element.
CNEL = community noise equivalent level; dBA = A-weighted decibels; L_{dn} = day-night sound level

The communities associated with these local jurisdictions also have general plans, in which ambient noise levels have been measured or predicted, often as a part of a distinct "noise element" of the planning documentation, in order to assess potential incompatibilities with respect to land use and support development or refinement of noise ordinances. The details of these noise ordinances and general plans are included in Appendix B, Local Regulations.

In many cases, these general plan noise elements (or similarly prepared EIR/EIS documents) illustrate existing community noise levels as contours presented in terms of CNEL. CNEL values are typically within 1 dBA of the L_{dn}, which is used to evaluate rail noise for residential land uses.

In addition to the quantities presented in Table 3-5, and to cover noise sources not specifically addressed in other code portions, local noise ordinances for many of the indicated jurisdictions tend to feature a section that usually lists 11 or 12 sample considerations that the jurisdiction may use to determine a noise violation. For illustrative purposes, these standards resemble the following from Section 9-3-223 of the city of Burbank noise ordinance (City of Burbank 1987):

- The sound pressure level of the noise
- The octave band sound pressure level of the noise
- Whether the nature of the noise is usual or unusual
- Whether the origin of the noise is natural or unnatural
- The sound pressure level and octave band sound pressure level of the background noise, if any
- The proximity of the noise to residential sleeping facilities
- The nature and zoning of the area within which the noise emanates
- The density of the inhabitation of the area within which the noise emanates

- The time of the day or night when the noise occurs
- The duration of the noise
- Whether the noise is recurrent, intermittent, or constant
- Whether the noise is produced by a commercial or noncommercial activity

Local noise ordinances also exhibit other comparable sections and language, including but not limited to the following:

- Glossaries of legal terms and acoustical terminology, such as noise descriptors and noise-sensitive receivers/receptors
- Sound measurement settings (e.g., “fast” or “slow” meter response, minimum measurement duration)
- Injunctions and remedies
- Waivers
- Exemptions or exclusions for emergency work
- Maximum noise levels or allowable time periods for construction work

Table 3-6 provides a summary of the noise-related plans, policies, and ordinances adopted by cities and counties in the project section, and detailed descriptions are included in Appendix B. These local general plan objectives, policies, and goals and municipal code ordinances were considered in the preparation of this analysis. Plans and policies have been adopted unless otherwise noted. The Authority is not subject to local general plan policies and ordinances related to noise limits on construction or to locally based criteria for determining the significance of a noise increase from a project.

Table 3-6 Noise-Related Local General Plan Objectives, Policies, and Goals and Municipal Code Ordinances

Policy Title	Summary
Los Angeles County	
Los Angeles County 2035 General Plan, Noise Element (2025)	▪ Goal N 1: The reduction of excessive noise impacts. – Policy N 1.1: Utilize land uses to buffer noise-sensitive uses from sources of adverse noise impacts. – Policy N 1.2: Reduce exposure to noise impacts by promoting land use compatibility. – Policy N 1.3: Minimize impacts to noise-sensitive land uses by ensuring adequate site design, acoustical construction, and use of barriers, berms, or additional engineering controls through Best Available Technologies (BAT). – Policy N 1.4: Enhance and promote noise abatement programs in an effort to maintain acceptable levels of noise as defined by the Los Angeles County Exterior Noise Standards and other applicable noise standards. – Policy N 1.5: Ensure compliance with the jurisdictions of State Noise Insulation Standards (Title 24, California Code of Regulations and Chapter 35 of the Uniform Building Code), such as noise insulation of new multifamily dwellings constructed within the 60 dB (CNEL or L_{dn}) noise exposure contours. – Policy N 1.6: Ensure cumulative impacts related to noise do not exceed health-based safety margins. – Policy N 1.7: Utilize traffic management and noise suppression techniques to minimize noise from traffic and transportation systems. – Policy N 1.8: Minimize noise impacts to pedestrians and transit-riders in the design of transportation facilities and mobility networks. – Policy N 1.9: Require construction of suitable noise attenuation barriers on noise-sensitive uses that would be exposed to exterior noise levels of 65 dBA CNEL and above, when unavoidable impacts are identified. – Policy N 1.10: Orient residential units away from major noise sources (in conjunction with applicable building codes). – Policy N 1.11: Maximize buffer distances and design and orient sensitive receptor structures (hospitals, residential, etc.) to prevent noise and vibration transfer from commercial/light industrial uses. – Policy N 1.12: Decisions on land adjacent to transportation facilities, such as the airports, freeways and other major highways, must consider both existing and future noise levels of these transportation facilities to assure the compatibility of proposed uses.
Los Angeles County Airport Land Use Commission Comprehensive Land Use Plan (2004)	▪ Policy N-1: Use community Noise Equivalent Level (CNEL) method for measuring noise impacts near airports in determining suitability for various types of lands uses. ▪ Policy N-3: Utilize the Table Listing Land Use Compatibility for Airport Noise Environments in evaluating projects within the planning boundaries.

Policy Title	Summary
Los Angeles County Code of Ordinances (2025)	▪ Section 12.08.010 of the County Code aims "to control unnecessary, excessive, and annoying noise and vibration…." It declares that the purpose of the County policy is to "…maintain quiet in those areas which exhibit low noise levels and to implement programs aimed at reducing noise in those areas within the county where noise levels are above acceptable values." ▪ Table 11.2 of the Noise General Element overviews Los Angeles County Community Noise Criteria and additional information on noise barrier strategies can be found in Appendix G. ▪ Section 12.08.350 states, "operating or permitting the operation of any device that creates vibration that is above the vibration perception threshold of any individual at or beyond the property boundary of the source if on private property, or at 150 feet (46 meters) from the source if on a public space or public right-of-way is prohibited. The perception threshold shall be a motion velocity of 0.01 in/sec [inch per second] over the range of 1 to 100 Hertz"
City of Los Angeles General Plan, Noise Element (2024)	▪ Objective 2 (Nonairport): Reduce or eliminate nonairport related intrusive noise, especially relative to noise-sensitive uses. – Policy 2.2: Enforce and/or implement applicable city, state and federal regulations intended to mitigate proposed noise producing activities, reduce intrusive noise and alleviate noise that is deemed a public nuisance. ▪ Objective 3 (Land Use Development): Reduce or eliminate noise impacts associated with proposed development of land and changes in land use. – Policy 3.1 Develop land use policies and programs that will reduce or eliminate potential and existing noise impacts.
Downtown Community Plan (2024)	▪ Program: Implement appropriate provisions of the City's Noise Element.
Los Angeles Municipal Code (2025)	▪ Chapter XI Section 111.02, Sound Level Measurement Procedure and Criteria sets forth how to measure sound. ▪ Chapter XI Article 2 covers special noise sources including construction noise, power equipment intended for repetitive use in residential areas, other machinery, equipment and devices, and maximum noise level of powered equipment or power hand tools. ▪ Chapter IV, Public Welfare, Section 41.40, Noise due to Construction, Excavation Work – When Prohibited, stipulates prohibitions and restrictions for construction noise in Los Angeles.

Policy Title	Summary
City of Vernon General Plan, Noise Element (2023)	▪ Goal N-1: Reduce impacts from transportation noise sources to the extent they may affect industrial businesses. – Policy N-1.1: Encourage the effective enforcement of local, state, and federal noise levels by all appropriate City divisions. – Policy N-1.2: Review noise impacts when rail corridors are consolidated, and review ways to reduce impacts on adjacent businesses. – Policy N-1.3: Minimize adverse noise effects on new residential developments through carefully planned site design and construction approaches that limit noise intrusion, wherever practical. ▪ Goal N-2: Incorporate noise and vibration considerations into land use planning decisions. – Policy N-2.1: Consider the noise levels likely to be produced by any new businesses or substantially expanded business activities locating near existing noise-sensitive uses such as schools, community facilities, and residences, as well as adjacent to established businesses involving vibration-sensitive activities. – Policy N-2.2: Encourage acoustical design in all new construction. – Policy N-2.3: Prohibit the establishment of new noise-sensitive land uses in Vernon, including but not limited to schools, day-care facilities, and community facilities. Permit new residential uses only within the Housing Overlay District, and require new developments to incorporate appropriate noise attenuation to achieve City noise standards. ▪ Goal N-3: Develop measures to control non-transportation noise and similar impacts. – Policy N-3.1: Continue to enforce the noise and vibration performance standards in the City Code to mitigate conflicts among neighboring uses. – Policy N-3.2: Establish and maintain coordination among City agencies involved in noise abatement. – Policy N-3.3: City departments will comply with all state and federal OSHA noise standards, and all new City equipment purchases shall comply with state and federal noise standards.
The Code of the City of Vernon (2024)	Table 17.22.070 outlines noise standards for the City of Vernon.

Policy Title	Summary
City of Bell 2030 General Plan, Health and Safety Element (2022)	▪ Policy 20: The City of Bell shall encourage the reduction of noise throughout the City in the review of new development. New development projects will undergo review to ensure that noise impacts from such developments are reduced as much as possible. ▪ Policy 21: the City of Bell shall promote the development of a compatible noise environment throughout the City. The City shall consider noise and land use compatibility in the review of new development projects. ▪ Policy 22: The City shall implement noise regulations that will lower excessive and intrusive noise levels that conform to acceptable standards. The City shall ensure Code Enforcement and the Police Department will continue to enforce noise control regulations. ▪ Policy 23: The City of Bell shall cooperate with all public agencies so as to minimize transportation related noise. Applicable City, State, and Federal noise control regulations shall be enforced. ▪ Policy 25: The City of Bell shall ensure that the design and improvement of future master planned roadway links in the City is accomplished in a manner that minimizes noise impacts on adjacent noise sensitive land uses. These measures may involve the use of sound walls and other architectural features that promote noise reduction. ▪ Policy 26: The City of Bell shall continue to require noise attenuation in new residential developments that are exposed to significant noise levels from freeway and arterial roadway traffic. The City shall make every effort to inform developers, businesses, and residents of noise control measures. Noise studies must be performed new noise sensitive projects that are located near arterial roadways and freeways.
City of Bell Municipal Code (2024)	Chapter 8.28 of the Bell Municipal Code covers noise for the city of Bell.

Policy Title	Summary
City of Commerce 2020 General Plan (2008)	▪ Safety Policy 6.1: The City of Commerce will ensure that residents are protected from harmful and irritating noise sources to the greatest extent possible. ▪ Safety Policy 6.2: The City of Commerce will work with businesses in the city and other public agencies to identify ways to reduce noise impacts throughout the city. ▪ Safety Policy 6.3: The City of Commerce will continue to enforce the existing city's noise control ordinance. ▪ Safety Policy 6.4: The City of Commerce will incorporate noise considerations into land use planning decisions. ▪ Safety Policy 6.5: The City of Commerce will prohibit noise-intensive land uses adjacent to or near residential areas, schools, convalescent homes, and other noise-sensitive receptors. ▪ Safety Policy 6.6: The City of Commerce will encourage acoustical design in all new construction. ▪ Safety Policy 6.7: The City of Commerce will require additional landscaping in industrial and commercial projects to help reduce noise impacts through increased setbacks. ▪ Safety Policy 6.10: The City of Commerce will establish and maintain coordination among the city agencies involved in noise abatement. ▪ Safety Policy 7.1: The City of Commerce will strive to reduce railroad noise impacts in the vicinity of Astor Avenue. ▪ Safety Policy 7.2: The City of Commerce will work with Union Pacific Railroad to reduce noise impacts from railroad operations in the vicinity of Washington Boulevard. ▪ Safety Policy 7.3: The City of Commerce will provide for measures to reduce noise impacts from transportation-related noise sources. ▪ Safety Policy 7.4: The City of Commerce will evaluate the feasibility of constructing sound barriers to mitigate transportation-related noise from railroads and the freeways. ▪ Safety Policy 7.5: The City of Commerce, together with the railroads, will consider the feasibility of constructing sound walls wherever residential uses abut railroad rights-of-way.
Commerce Municipal Code (2024)	The noise ordinance of the City of Commerce Municipal Code is Section 19.19.160 and the vibration ordinance is Section 19.19.180.
City of Montebello General Plan (2024)	▪ Goal CSS-5: Minimize the exposure of residents to unhealthful noise conditions. – Policy 5.4: Enforce the use truck routes to minimize traffic noise impacts on residential neighborhoods. – Policy 5.5: Work with railroad operators to ensure that the timing, length of idleness, and number of trains through the City limits noise impacts.
Montebello Municipal Code (2024)	The noise ordinance of the City of Montebello Municipal Code is Section 17.22.110 and the vibration ordinance is Section 17.32.170.

Policy Title	Summary
City of Pico Rivera General Plan (2014)	▪ Goal 11.1: An acceptable noise environment for existing and future residents that also meets the business needs of the community. – Policy 11.1-1 Land Use Compatibility: Strive to achieve and maintain land use patterns that are consistent with the noise compatibility guidelines set forth in Table 11-1. – Policy 11.1-2 Existing Noise Incompatibilities: Within areas where existing or future noise levels exceed the guidelines set forth in Table 11-1, encourage establishment of noise buffers and barriers, modifications to noise-generating operations, and/or retrofitting of buildings housing noise-sensitive uses, where feasible and appropriate. ▪ Goal 11.2: Minimize disruptions to residential neighborhoods and businesses caused by transportation-related noise. – Policy 11.2-1 New High Noise-Generating Uses: Locate future transit stations, rail projects such as the potential Metro Gold Line light rail and High Speed Rail, or other high noise-generating uses away from noise-sensitive land uses to the extent feasible. – Policy 11.2-5 Development along Major Roadways and Rail Lines: Require that noise attenuation measures be incorporated into all new development and remodels of noise-sensitive uses in close proximity to major roadways and existing or known planned rail lines where railroad-generated noise levels exceed the guidelines set forth in Table 11-1. – Policy 11.2-6 Railroad Noise: Work with the railroad lines operating in Pico Rivera to minimize noise levels produced by trains and whistle noise by continuing to construct additional grade separations at busy intersections, reducing nighttime operations, and maintaining consistency with the noise levels shown in Table 11-1. ▪ Goal 11.3: Minimize disruptions to residential neighborhoods and businesses caused by construction-related noise. – Policy 11.3-1 Construction Noise: Minimize construction-related noise and vibration by limiting construction activities within 500 feet of noise-sensitive uses from 7:00 A.M. to 7:00 P.M. seven days a week; after hour permission shall be granted by City staff, Planning Commission, or the City Council. – Policy 11.3-2 Vibration Standards: Require construction projects and new development anticipated to generate a significant amount of vibration to ensure acceptable interior vibration levels at nearby noise-sensitive uses based on Federal Transit Administration criteria as shown in Table 11-2.
Pico Rivera Municipal Code (2025)	The noise ordinance of the City of Pico Rivera Municipal Code is Chapter 8.40.

Policy Title	Summary
Re-Imagine Santa Fe Springs 2040 General Plan, Noise Element (2022)	▪ Transportation Noise Goal N-1: Reduced Traffic and Train Noise. – Policy N-1.2: Residential Noise Impacts. Update truck routes and redesignate routes to reduce noise exposure in residential neighborhoods and on sensitive community noise receptors that are within noise zones of 70 CNEL or higher. – Policy N-1.5: Rail Noise and Vibrations. Consult with rail companies that operate lines through the City to include noise and vibration reduction strategies— signal noise, at-grade crossing noise, and vibration levels produced by heavy and light rail traffic—to minimize train noise impacts on residential neighborhoods. ▪ Noise and Land Use Planning Integration Goal N-2: Land Use Decisions that Minimize Noise Exposure. – Policy N-2.1: Noise Standards. Review and update as necessary noise standards in the Municipal Code to ensure they sufficiently address community noise. – Policy N-2.2: Land Use Compatibility. Include the noise/land use compatibility standards of Table N-1 and compliance with the Municipal Code noise regulations as part of development review. – Policy N-2.3: Noise Studies. Require developers of projects that are considered potential sources of noise, or when the projects are proposed next to existing or planned noise-sensitive land uses to prepare an acoustical study that describes the existing and future noise environments and defines noise-reducing design incorporated into the project that will achieve a noise environment consistent with City standards and guidelines.
Code of Santa Fe Springs (2025)	The noise ordinance of the City of Santa Fe Springs Municipal Code is Section 155.424 and the vibration ordinance is Section 155.428.
Vision Norwalk – The City of Norwalk General Plan, Noise Element (2023)	▪ Objective: To have noise levels in all areas of the City meet the minimum standards of land use compatibility established in the Noise Element, especially adjacent to noise-sensitive uses. ▪ Objective: To promote the reduction of noise impacts from existing transportation to a new level of compatibility with adjoining land uses. – Policy: Encourage compliance with state and federal legislation designed to abate and control noise pollution. – Policy: Existing noise sources that exceed the appropriate maximum standard shall be encouraged to reduce their noise level to at least the land use compatibility standards of the noise element. – Policy: Discourage truck traffic from using local residential streets. – Policy: Encourage railroads to institute noise reduction techniques to reduce impacts on adjoining land uses. – Policy: Ensure that proposed noise sources are reduced below a level of significance and properly muffled to prevent noise impacts on neighboring properties.
Norwalk Municipal Code (2024)	The noise ordinance is in the City of Norwalk Municipal Code Section 9.04 Article 3, Noise.
City of La Mirada General Plan (2003)	– Policy 4.1: Work with railroad companies to install a grade separation at Valley View Avenue to reduce congestion and noise caused by trains. ▪ Goal 5.0: Shield residents from undesirable traffic noise to the extents possible. ▪ Goal 6.0: Reduce noise originating from the regional transportation system. – Policy 6.2: Work with railroad operators to ensure that the timing and number of trains passing through the City limits noise impacts. – Policy 6.3: Pursue completion of a grade separation of the line rail line at Valley View Boulevard and Stage Road.

Policy Title	Summary
La Mirada Code of Ordinances (2024)	The noise and vibration ordinance of the La Mirada Code of Ordinances is Section 21.70.080.
Orange County	
County of Orange General Plan (2025)	▪ Policy 1: To cooperate with other County agencies and levels of government to bring about a comprehensive and coordinated effort to reduce noise levels. ▪ Policy 1.2: To cooperate in effects to develop mechanisms to assure coordination of all government jurisdictions in the field of noise control. ▪ Policy 3: To encourage the control of noise from transportation systems as the most efficient and effective means of reducing noise at the source. ▪ Policy 3.4: To study commercial truck movements and operations in the County and establish truck routes away from noise-sensitive areas where feasible. ▪ Policy 3.5: To encourage development of a mass multi-modal transit system with reduced noise emission characteristics. ▪ Policy 3.6: To review the Federal Railroad Noise Standards of 1974 for possible adoption by Orange County. ▪ Policy 4.0: To monitor noise levels, and adopt and enforce noise abatement programs. ▪ Policy 4.1: To enforce the County's Noise Ordinance to prohibit or mitigate harmful and unnecessary noise within the County. ▪ Policy 4.2: To encourage Orange County cities to adopt the County's model noise ordinance. ▪ Policy 4.3: To develop and enforce standards in addition to those presently included in the Noise Ordinance to regulate noise from construction and maintenance activities and commercial and public and industrial land uses. ▪ Policy 5.0: To fully integrate noise considerations in land use planning to prevent new noise/land use conflicts. ▪ Policy 5.1: To utilize the criteria of acceptable noise levels for various types of land uses as depicted on Tables VIII-2 and VIII-3 in the review of development proposal. ▪ Policy 5.3: To limit new non-residential noise-sensitive land uses that are within a 65-decibel CNEL area from any sources. ▪ Policy 5.4: To stress the importance of building and design techniques in future site planning for noise reduction. ▪ Policy 6.4: To require that all new residential units have an interior noise level in habitable rooms that does not exceed acceptable levels as caused by aircraft fly-overs or as caused by individual passing railroad trains.
Codified Ordinances of the County of Orange (2024)	Title 4, Division 6, Noise Control, of the Orange County Code of Ordinances contains ordinances related to noise which stipulates noise standards, procedures for sound measurement, and special provisions.
Buena Park 2035 General Plan (2022)	▪ Goal N-1: Appropriate Federal, State, and City standards, guidelines, and ordinances for noise control implemented and enforced throughout the City. – Policy N-1-1: Continue to monitor noise throughout Buena Park and enforce the standards and regulations of the City's Noise Ordinance. – Policy N-1.2: Continue to enforce noise standards consistent with health and quality of life goals and employ effective techniques of noise abatement through such means as a noise ordinance, building codes, and subdivision and zoning regulations.

Policy Title	Summary
	– Policy N-1.5: Coordinate with California Occupational Safety and Health Administration (Cal-OSHA) to provide information on occupational noise requirements within the City. – Policy N-1.6: Conform to the noise attenuation standards sets forth in the Airport Environs Land Use Plan (AELUP) for residential, commercial, and industrial development within the Fullerton Municipal Airport and Los Alamitos Joint Forces Training Center planning areas. ▪ Goal N-2: Minimized noise levels from construction and maintenance equipment, vehicles, and activities. – Policy N-2.1: Regulate construction activities to ensure all noise associated with construction activities comply with the City's Noise Ordinance. – Policy N-2.2: Employ construction noise reduction methods to the maximum extent feasible. These measures may include, but not limited to, shutting off idling equipment, installing temporary acoustic barriers around stationary construction noise sources, maximizing the distance between construction equipment staging areas and occupied sensitive receptor areas, and use of electric air compressors and similar power tools, rather than diesel equipment. – Policy N-2.4: Exceedance of noise standards may occur on a case-by-case basis for special circumstances including emergency situations, special events, and expedited development projects. – Policy N-2.5: Ensure acceptable noise levels are maintained near schools, hospitals, convalescent homes, churches, and other noise-sensitive areas. ▪ Goal N-3: Consideration of noise effects in the land use planning process. – Policy N-3.1: Fully integrate noise considerations into land use planning decisions to prevent new noise/land use conflicts. – Policy N-3.2: Consider the compatibility of proposed land uses with the noise environment when preparing, revising, or reviewing development proposals. – Policy N-3.4: Permit only those new development or redevelopment projects that have incorporated appropriate mitigation measures, so that standards contained in the Noise Element or adopted ordinance are met. – Policy N-3.5: Encourage proper site planning and architecture to reduce noise impacts. – Policy N-3.6: Discourage the development of sensitive uses in areas in excess of 65 dBA CNEL without appropriate mitigation. – Policy N-3.9: Incorporate noise reduction features for items such as but not limited to parking and loading areas, ingress/egress point, HVAC units, and refuse collection areas, during site planning to mitigate anticipated noise impacts on affected noise-sensitive land uses. – Policy N-3.10: Require the design of mixed-use structures to incorporate techniques to prevent the transfer of noise and vibration from the commercial to residential use. – Policy N-3.14: Conform to the noise attenuation standards set forth in the Airport Environs Land Use Plan (AELUP) for residential, commercial, and industrial development, within the Orange County Airport Land Use Commissions planning area boundaries for the Fullerton Municipal Airport and Los Alamitos Joint Forces Training Base. ▪ Goal N-4: Ambient noise conditions in sensitive land use areas maintained and/or improved. – Policy N-4.1: Identify and reduce or eliminate unnecessary noise near noise-sensitive areas (such as parks, residential areas, hospitals, libraries, convalescent homes, etc.) to meet established regulations outlined in the City's Municipal Code.

Policy Title	Summary
	– Policy N-4.2: Encourage the use of noise absorbing materials in existing and new development to reduce interior noise impacts to sensitive land uses. – Policy N-4.3: Encourage existing noise-sensitive uses, including schools, libraries, health care facilities, and residential uses in areas where existing or future noise levels exceed 65 dBA CNEL to incorporate fences, walls, and/or other noise buffers and barriers, where appropriate and feasible. – Policy N-4.4: Discourage new projects located in commercial or entertainment areas from exceeding stationary-source noise standards at the property line of proximate residential or commercial uses, as appropriate. – Policy N-4.5: For sensitive land uses located near to or adjacent to industrial land uses, evaluate the ambient noise condition and, as appropriate, reduce noise affects upon the sensitive land use (such as erecting noise barriers, restricting hours of operation, investing in noise canceling technologies, etc.). – Policy N-4.6: Ensure new industrial uses comply with the City's Noise Ordinance. – Policy N-4.7: Encourage school districts or other educational facilities to locate outdoor activity areas, such as play grounds and sport fields, away from residential areas. ▪ Goal N-5: Reduction of noise from circulation-related sources such as motor vehicles, trains, and airplanes. Policy N-5.1: Encourage the construction of noise barriers and maintenance of existing noise barriers for residential uses along the Artesia (SR-91) and Santa Ana (I-5) Freeways. – Policy N-5.1: Encourage the construction of noise barriers and maintenance of existing noise barriers for residential uses along the Artesia (SR 91) and Santa Ana (I-5) Freeways. – Policy N-5.2: Continue to encourage the enforcement of regulations such as the State Vehicle Code Noise Standards for automobiles, trucks, and motorcycles operating within the City. – Policy N-5.3: Enforce established hours and routes for delivery trucks and through truck traffic. – Policy N-5.4: Discourage through traffic on residential local streets to reduce noise. – Policy N-5.5: Employ noise mitigation practices, as necessary, when designing future streets and highways, and when improvements occur along existing road segments. Mitigation measures should emphasize the establishment of buffers or setbacks between the arterial roadways and adjoining noise-sensitive areas. – Policy N-5.6: Continue to encourage all active railroads within the City to reduce the level of noise produced by train movements within the City. – Policy N-5.7: Encourage all active railroads within the City to schedule trains during daylight hours when possible. – Policy N-5.8: Encourage the Public Utilities Commission, Southern California Regional Rail Authority, Union Pacific, Burlington Northern & Santa Fe, Amtrak, and Metrolink to minimize the level of noise produced by train movements and whistle noise within the City by reducing the number of nighttime operations, improving vehicle system technology, and developing improved sound barriers where residences exist next to the track. – Policy N-5.9: Coordinate with the Fullerton Municipal Airport and the Los Alamitos Joint Forces Training Base to continue the implementation of noise control procedures for the airport and create new procedures and policies to reduce noise impacts to the City. – Policy N-5.10: Encourage Caltrans to meet the State standard of 65 dBA CNEL for exterior noise levels for the Artesia Freeway (SR-91) and Santa Ana Freeway (I-5).

Policy Title	Summary
	Policy N-5.11: Encourage Caltrans to keep the interior residential noise levels below the State standard of 45 dBA CNEL, where appropriate and feasible. – Policy N-5.12: Continue to work with Caltrans to ensure that soundwalls or other appropriate mitigations are provided where the Artesia Freeway (SR-91) and Santa Ana Freeway (I-5) abuts residential areas or areas with sensitive receptors within the City. – Policy N-5.13: Encourage Caltrans to develop a range of sound attenuation alternatives to mitigate noise impacts from the Artesia Freeway (SR-91) and Santa Ana Freeway (I-5). Goal N-6: Noise levels created by the Union Pacific, Southern Pacific, Metrolink, and any other future rail systems located in close proximity to residential and other noise-sensitive land uses will be minimized or reduced. ▪ Goal N-6: Noise levels created by the Union Pacific, Southern Pacific, Metrolink, and any other future rail systems located in close proximity to residential and other noise-sensitive land uses will be minimized or reduced. – Policy N-6.1: Work with rail operators to ensure noise impacts are considered and mitigated through proper design, siting, and construction. – Policy N-6.2: Work with rail operators to install and maintain noise mitigation features where operations adversely impact existing or planned residential and other noise-sensitive land uses. – Policy N-6.3: Encourage noise attenuation measures be incorporated into all new development, renovations, and remodels of residential, health care facilities, schools, libraries, senior facilities, and churches in close proximity to existing or known planned rail lines. – Policy N-6.4: Require future rail projects under the City's control to analyze noise impacts and to identify and incorporate noise reducing features into the project design.
Buena Park Municipal Code (2025)	▪ Section 8.28.020 contains city amendments to Orange County noise regulations. ▪ Section 8.28.040, Loud, disturbing and unnecessary noise prohibited, 4.a. Construction or repair activities, stipulates restriction on the timing and use of construction activities unless express written permission is granted by the city engineer. Title 19 of the Buena Park Municipal Code contains ordinances related to vibration.

Policy Title	Summary
The Fullerton Plan (2025)	▪ Goal 8: Protection from the adverse effects of noise. – P8.1: Noise Reduction Measures: Support regional and subregional efforts to implement projects or programs that abate and/or attenuate noise across jurisdictions, particularly where the source is not under the City's authority. – P8.2 Mobile Sources: Support projects, programs, policies and regulations to control and abate noise generated by mobile sources. – P8.3 Consideration of Noise in Land Use Decisions: Support projects, programs, policies and regulations which ensure noise-compatible land use planning recognizing the relative importance of noise sources in order of community impact, the local attitudes towards these sources, and the suburban or urban characteristics of the environment, while identifying noise-sensitive uses. – P8.4 Noise Reduction Measures: Support projects, programs, policies and regulations to control and abate noise generated by stationary sources. – P8.5 Focus Area Planning: Support projects, programs, policies and regulations to evaluate ways to ensure noise compatible land use planning as part of community-based planning of Focus Areas. – P8.6 Noise Receptors: Support projects, programs, policies, and regulations to permit uses where the noise level of the surroundings—after taking into account noise insulation features and other control techniques of the use—is not detrimental to the use. – P8.7 Noise Generators: Support projects, programs, policies and regulations to permit uses and/or activities where the noise generated by the use and/or activity is not detrimental or otherwise a nuisance to the surroundings.
Fullerton Municipal Code (2025)	Chapter 15.90 of the City of Fullerton Municipal Code contains ordinances related to noise. ▪ Section 15.90.030 contains noise standards for the city of Fullerton. ▪ Section 15.09.040 contains exempt activities from noise standards. Chapters 15.17, 15.30, 15.40, and 15.70 contain ordinances related to vibration.
City of Anaheim General Plan (2025)	▪ Goal 1.1: Protect sensitive land uses from excessive noise through diligent planning and regulation. – Policy 1: Update City regulations to adopt Land Use Compatibility for Community Noise Exposure and California Interior and Exterior Noise Standards as appropriate. – Policy 2: Continue to enforce acceptable noise standards consistent with health and quality of life goals and employ effective techniques of noise abatement through such means as a noise ordinance, building codes, and subdivision and zoning regulations. – Policy 3: Consider the compatibility of proposed land uses with the noise environment when preparing, revising, or reviewing development proposals. – Policy 4: Require mitigation where sensitive uses are to be placed along transportation routes to ensure that noise levels are minimized through appropriate means of mitigation thereby maintaining quality of life standards. – Policy 5: Encourage proper site planning and architecture to reduce noise impacts. – Policy 6: Discourage the siting of sensitive uses in areas in excess of 65 dBA CNEL without appropriate mitigation. – Policy 7: Require that site-specific noise studies be conducted by a qualified acoustic consultant utilizing acceptable methodologies while reviewing the development of sensitive land uses or development that has the potential to impact sensitive land uses. ▪ Goal 2.1: Encourage the reduction of noise from transportation-related noise sources such as motor vehicles, aircraft operations, and railroad movements.

Policy Title	Summary
	– Policy 1: Continue to enforce the noise standards of the State Motor Vehicle Code and other State and Federal legislation pertaining to motor vehicle noise. – Policy 3: Require that development generating increased traffic and subsequent increases in the ambient noise level adjacent to noise-sensitive land uses provide appropriate mitigation measures. – Policy 4: Maintain roadways so that the paving is in good condition to reduce noise-generating cracks, bumps, and potholes. – Policy 5: Require sound walls, berms, and landscaping along existing and future freeways and railroad rights-of-way to beautify the landscape and reduce noise, where appropriate. – Policy 6: Encourage the construction of noise barriers by the Public Utilities Commission, Southern California Regional Rail Authority, Union Pacific, Burlington Northern & Santa Fe and Amtrak where residences exist next to the track. – Policy 7: Encourage the Public Utilities Commission, Southern California Regional Rail Authority, Union Pacific, Burlington Northern & Santa Fe and Amtrak to minimize the level of noise produced by train movements and whistle noise within the City by reducing the number of nighttime operations, improving vehicle system technology and developing improved sound barriers where residences exist next to the track. – Policy 8: Encourage the use sound-deadening matting (as opposed to wood) leading to, from and between the rails where public roads cross tracks in residential areas. – Policy 10: Participate in the planning activities of County, regional and State agencies relative to the location of new airports and the assessment of their impact on the environment of the City. – Policy 11: Encourage the development of alternative transportation modes that minimize noise within residential areas. – Policy 12: Monitor proposals for future transit systems and require noise control to be considered in the selection of transportation systems that may affect the City. ▪ Goal 3.1: Protect residents from the effects of “spill over” or nuisance noise emanating from the City’s activity centers. – Policy 1: Discourage new projects located in commercial or entertainment areas from exceeding stationary-source noise standards at the property line of proximate residential or commercial uses, as appropriate. – Policy 2: Prohibit new industrial uses from exceeding commercial or residential stationary-source noise standards at the most proximate land uses, as appropriate. (Industrial noise may spill over to proximate industrial uses so long as the combined noise does not exceed the appropriate industrial standards.) – Policy 3: Enforce standards to regulate noise from construction activities. Particular emphasis shall be placed on the restriction of the hours in which work other than emergency work may occur. Discourage construction on weekends or holidays except in the case of construction proximate to schools where these operations could disturb the classroom environment. – Policy 4: Require that construction equipment operate with mufflers and intake silencers no less effective than originally equipped. – Policy 5: Encourage the use of portable noise barriers for heavy equipment operations performed within 100 feet of existing residences or make applicant provide evidence as to why the use of such barriers is infeasible.

Policy Title	Summary
City of Anaheim Municipal Code (2025)	Chapter 6.70 of the City of Anaheim Municipal Code contains ordinances related to noise. This section describes standards sound levels, violations and penalties, and enforcement powers. Chapters 18.08 and 18.10 contain ordinances related to vibration.

Sources: City of Anaheim 2025a, 2025b; City of Bell 2022, 2024; City of Buena Park 2022, 2025; City of Commerce 2008, 2024; City of Fullerton 2025a, 2025b; City of La Mirada 2003, 2024; City of Los Angeles 2024a, 2024b, 2025; City of Montebello 2024a, 2024b; City of Norwalk 2023, 2024; City of Pico Rivera 2014, 2025; City of Santa Fe Springs 2022, 2025; City of Vernon 2023, 2024; County of Los Angeles 2025a, 2025b; County of Orange 2024, 2025; Los Angeles County Airport Land Use Commission 2004
Caltrans = California Department of Transportation; CEQA = California Environmental Quality Act; CNEL = community equivalent noise level; CSS = Community and Safety Section; dB = decibel; dBA = A-weighted decibel; HVAC = heating, ventilation, and air conditioning; I = Interstate; L_{dn} = day-night sound level; Metro = Los Angeles County Metropolitan Transportation Authority; OSHA = Occupational Safety and Health Administration; SR = State Route

3.2 Vibration

3.2.1 Federal

Vibratory motion of the ground at a specific location caused by the passage of HSR may result in two forms of human annoyance that are discussed above under FTA and FRA guidelines (Section 3.1.1, Federal). Ground-borne vibration is tactile movement of the ground or structures, whereas ground-borne noise is the radiation of acoustical energy from ground and structural surfaces excited by ground-borne vibration. Broadly speaking, vibration impact criteria levels are influenced by land-use category and vibration event frequency (i.e., how often a train passage occurs within a given time period).

As with train passage events, construction activity can also be considered on the basis of vibration occurrence frequency, so the same vibration criteria (in the absence of standardized construction vibration compliance criteria) may be used to help determine vibration impacts during project construction.

3.2.1.1 Federal Railroad Administration Guidelines

The FRA guidelines (FRA 2012), which acknowledge the FTA guidance document (FTA 2018) as their basis, provide ground-borne vibration and noise criteria for a general assessment as presented in Table 3-7. These levels represent the maximum root mean square (RMS) level of an event. In addition, the guidelines provide criteria for special buildings that are very sensitive to ground-borne noise and vibration. The impact criteria for these special buildings are presented in Table 3-8.

Both Table 3-7 and Table 3-8 differentiate the vibration impact threshold depending on the number of vibration events per day, with fewer than 30 vibration events per day considered “infrequent,” between 30 and 70 vibration events considered “occasional,” and more than 70 events considered “frequent” for Table 3-7. For Table 3-8, fewer than 70 vibration events per day are considered “occasional or infrequent” and more than 70 events are considered “frequent.” This dividing line was originally selected so that most commuter rail or intercity rail projects would fall into the “infrequent” category and most urban transit projects (subway and light rail transit) would more typically be in the “frequent” category.

Table 3-7 Ground-Borne Vibration and Noise Impact Criteria

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch per second)			Ground-Borne Noise Impact Levels (dBA re 20 micro-Pascals)		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1: Buildings where vibration would interfere with interior operations	65 VdB[4]	65 VdB[4]	65 VdB[4]	N/A[5]	N/A[5]	N/A[5]
Category 2: Residences and buildings where people normally sleep	72 VdB	75 VdB	80 VdB	35 dBA	38 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use	75 VdB	78 VdB	83 VdB	40 dBA	43 dBA	48 dBA

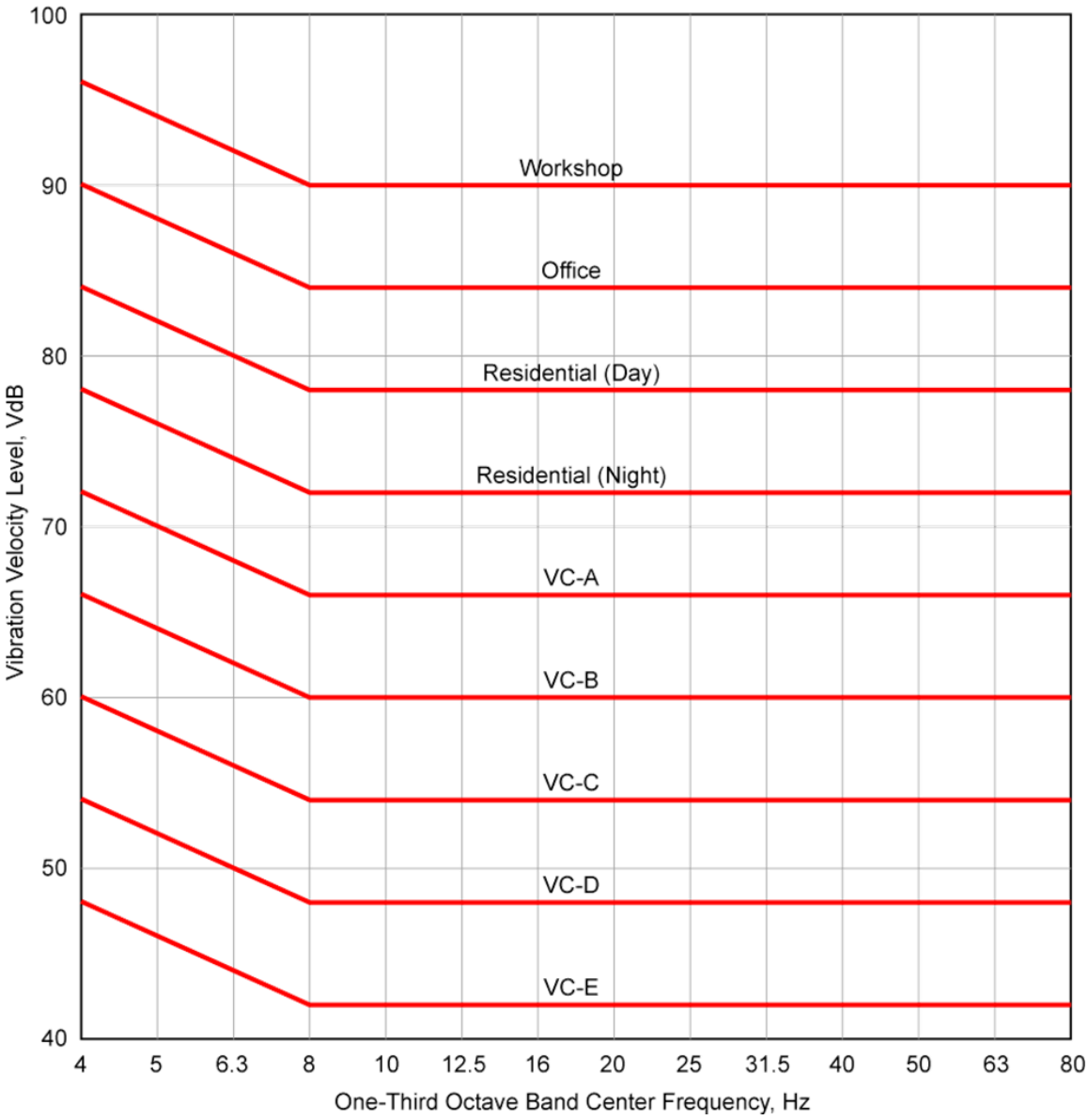
Source: FRA 2012
[1] Frequent events are defined as more than 70 vibration events of the same kind per day.
[2] Occasional events are defined as between 30 and 70 vibration events of the same kind per day.
[3] Infrequent events are defined as fewer than 30 vibration events of the same kind per day.
[4] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. For vibration-sensitive manufacturing or research equipment, a detailed vibration analysis must be performed.
[5] Vibration-sensitive equipment is generally not sensitive to ground-borne noise.
dBA = A-weighted decibels; N/A = not applicable; VdB = vibration decibels

Table 3-8 Ground-Borne Vibration and Noise Impact Criteria for Special Buildings

Type of Building or Room	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch per second)		Ground-Borne Noise Impact Levels (dBA 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: FRA 2012
[1] Frequent events are defined as more than 70 vibration events per day.
[2] Occasional or infrequent events are defined as fewer than 70 vibration events per day.
dBA = A-weighted decibels; N/A = not applicable; VdB = vibration decibels

For a detailed vibration analysis, more refined impact criteria are required than for a general assessment. Therefore, the criteria for a detailed vibration assessment are expressed in terms of one-third octave band frequency spectra, based on international and industry standards. The FRA criteria for a detailed vibration assessment are depicted on Figure 3-4 and descriptions of the curves are presented in Table 3-9. The curves of Figure 3-4 are applied to the projected vibration spectrum for the project section. If the vibration level at any one frequency exceeds the criteria, there would be an impact. Conversely, if the entire proposed vibration spectrum of the project section were below the curve, there would be no impact.



Source: FRA 2012

Figure 3-4 Federal Railroad Administration Detailed Ground-Borne Vibration Impact Criteria

Table 3-9 Interpretation of Vibration Criteria for Detailed Analysis

Criterion Curve (Figure 3-4)	Max Lv (VdB)[1]	Description of Use
Workshop	90	Distinctly feelable vibration. Appropriate to workshops and nonsensitive areas.
Office	84	Feelable vibration. Appropriate to offices and nonsensitive areas.
Residential Day	78	Barely feelable vibration. Adequate for computer equipment and low-power optical microscopes (up to 20X).
Residential Night, Operating Rooms	72	Vibration not feelable, but ground-borne noise may be audible inside quiet rooms. Suitable for medium-power optical microscopes (100X) and other equipment of low sensitivity.
VC-A	66	Adequate for medium- to high-power optical microscopes (400X), microbalances, optical balances, and similar specialized equipment.
VC-B	60	Adequate for high-power optical microscopes (1000X), inspection and lithography equipment to 3-micron line widths.
VC-C	54	Appropriate for most lithography and inspection equipment to 1-micron detail size.
VC-D	48	Suitable in most instances for the most demanding equipment, including electron microscopes operating to the limits of their capability.
VC-E	42	The most demanding criterion for extremely vibration-sensitive equipment.

Source: FRA 2012
[1] As measured in 1/3-octave bands of frequency over the frequency range 8 to 80 Hertz
Lv = velocity level in decibels; VdB = vibration decibels

3.2.1.2 Existing Vibration Conditions

One factor not incorporated in the criteria is how to account for existing vibration. In most cases, except near railroad tracks, the existing environment does not include a substantial number of perceptible ground-borne vibration or ground-borne noise events. However, HSR projects commonly use parts of existing rail routes. The criteria given in Table 3-7 and Table 3-8 do not indicate how to account for existing vibration, a common situation for HSR projects using existing rail rights-of-way. Methods of handling representative scenarios include the following:

- **Infrequently used rail route:** Use the vibration criteria from Table 3-7 and Table 3-8 when the existing rail traffic consists of four or fewer trains per day.
- **Moderately used rail route:** If the existing rail traffic consists of 5 to 12 trains per day with vibration that substantially exceeds the impact criteria, there would be no impact as long as the project vibration levels estimated using the procedures outlined in either Chapters 8 or 9 of the FRA guidelines are at least 5 vibration decibels (VdB) less than the existing vibration. Vibration from existing trains could be estimated using the General Assessment procedures in Chapter 8 of the FRA guidelines; however, measuring vibration from existing train traffic is usually preferable.
- **Heavily used rail route:** If the existing traffic exceeds 12 trains per day and if the project would not substantially increase the number of vibration events (less than doubling the number of trains is usually considered not substantial), there would be no additional impact unless the project vibration, estimated using the procedures of Chapters 8 or 9 of the FRA guidelines, would be higher than the existing vibration. In locations where the new trains would be operating at much higher speeds than the existing rail traffic, the HSR would likely generate substantially higher levels of ground-borne vibration. When the project would cause

vibration more than 5 VdB greater than the existing source, the existing source can be ignored and the vibration criteria in Table 3-7 and Table 3-8 can be applied to the project.

- **Moving existing tracks:** Another scenario where existing vibration can be substantial is a new HSR line within an existing rail right-of-way that requires shifting the location of existing tracks. Where the track relocation would cause higher vibration levels at sensitive receptors, the projected vibration levels from both rail systems must be compared to the appropriate impact criterion to determine if there would be a new impact. If an impact were judged to have existed prior to moving the tracks, new impacts would be assessed only if the relocation would result in more than a 3 VdB increase in vibration level. Although the impact thresholds given in Table 3-7 and Table 3-8 are based on experience with vibration from rail transit systems, the thresholds can be applied to freight train vibrations as well. However, locomotive and rail car vibration should be considered separately. Because locomotive vibration only lasts for a few seconds, the infrequent-event limit is appropriate, but for a typical line haul freight train where the rail car vibration lasts for several minutes, the frequent-event limits should be applied to the rail car vibration. Some judgment must be exercised to make sure that the approach is reasonable. For example, some spur rail lines carry very little rail traffic (sometimes only one train per week) or have short trains, in which case the infrequent-event limits are appropriate.

3.2.1.3 Federal Transit Administration Guidelines

The FTA guidelines (FTA 2018) form the basis of the FRA guidelines (FRA 2012) and use the same criteria for ground-borne vibration and noise described above in Section 3.2.1.1, Federal Railroad Administration Guidelines.

3.2.2 State and Local

Appendix G, Section XIII, Item b of the State CEQA Guidelines refers to potential vibration impacts. CEQA does not have specific standards listed, but allows the use of standards developed for a given industry. In this case, the most detailed vibration criteria for impacts are included in the Caltrans *Transportation and Construction Vibration Guidance Manual* (Caltrans 2020) and in the FRA methodology; these criteria are listed in Table 3-7, Table 3-8, Table 3-9, and Table 4-9. Applicable local vibration standards are summarized below.[9]

3.2.2.1 County of Los Angeles

County of Los Angeles Ordinance, Section 12.08.350, states, “operating or permitting the operation of any device that creates vibration that is above the vibration perception threshold of any individual at or beyond the property boundary of the source if on private property, or at 150 feet from the source if on a public space or public right-of-way is prohibited. The perception threshold shall be a motion velocity of 0.01 in/sec [inch per second] over the range of 1 to 100 Hertz” (County of Los Angeles 2025a).

3.2.2.2 City of Vernon

The city of Vernon Code of Ordinances states that, “cumulatively with existing Vibrations of all new and existing equipment of all businesses on the Lot, the steady ground Vibration inherently and recurrently generated shall not exceed four hundredths of one inch (0.04) per second particle velocity when measured at any point along the Lot line of the Lot on which the source of the Vibration is located. The cumulative effect of Vibrations in excess of four hundredths (0.04) of 1 inch measured at any point along the Lot line on which the source of the Vibration is located shall be permitted only with a Conditional Use Permit” (City of Vernon 2024).

3.2.2.3 City of Commerce

The city of Commerce Vibration Ordinance (City of Commerce 2024) is as follows:

[9] Orange County does not have a specific vibration standard.

Vibration may disturb the conduct of certain activities and create discomfort for some individuals. To minimize the disturbance and inconvenience from vibrations, the following performance standards shall apply to all uses:

A. No use shall cause or create ground vibration that is harmful or injurious to the use or development of surrounding properties.

B. No person or use shall create, maintain, or cause ground vibration that is perceptible without instruments to a person of normal sensitivity at any point on a property that is adjacent to the property of the vibration source.

3.2.2.4 City of Pico Rivera

Table 11-2 from the City of Pico Rivera General Plan, Noise Element, Policy 11.3-2, Vibration Standard, consists of the FTA ground-borne vibration criteria for a general assessment (City of Pico Rivera 2014).

3.2.2.5 City of Buena Park

The City of Buena Park General Plan Noise Element states the following (City of Buena Park 2022):

The existing vibration environment, similar to that of the noise environment, is dominated by transportation-related vibration from roadways and rail lines in the City. Heavy truck traffic on local and regional roadway networks can generate groundborne vibration, which varies considerably depending on vehicle type, weight, and pavement conditions. However, groundborne vibration levels generated from vehicular traffic are not typically perceptible outside of the right-of-way for major roadways and smart streets with a large capacity of heavy vehicle traffic. Railroad operation and transit systems, such as freight trains and Metrolink operations, are an additional potentially substantial source of groundborne vibration that occurs within the City.

Transportation and construction activities can generate varying degrees of ground-borne vibration, depending on the construction procedure and the construction equipment used. Operation of construction equipment generates vibrations that spread through the ground and diminish in amplitude with distance from the source. The effect on buildings located in the vicinity of a construction site often varies depending on soil type, ground strata, and construction characteristics of the receiver building(s). The results from vibration can range from no perceptible effects at the lowest vibration levels, to low rumbling sounds and perceptible vibration at moderate levels, to slight damage at the highest levels. Ground-borne vibrations from construction activities rarely reach levels that damage structures.

The City does not have regulatory standards for construction or operational vibration sources. The Federal Transit Administration (FTA) and Caltrans have published guidelines for the analysis of groundborne noise and vibration relating to transportation and construction-induced vibration. Caltrans guidelines recommend that a standard of 0.2 in/sec [inch per second] PPV [peak particle velocity] not be exceeded for the protection of normal residential buildings, and that 0.08 in/sec PPV not be exceeded for the protection of old or historically significant structures.

4 METHODS FOR EVALUATING IMPACTS

The evaluation of impacts on noise and vibration resources is a requirement of NEPA and CEQA. Evaluation of noise and vibration impacts is a requirement of the Noise Emission Compliance Regulation adopted by the USEPA, the California Noise Control Act of 1973 (California Health and Safety Code 46010 et seq.), CEQA, NEPA, and the following procedures:

- The methods and criteria for evaluating high-speed ground transportation noise and vibration impacts are found in the FRA's *High-Speed Ground Transportation Noise and Vibration Impact Assessment* (FRA 2012).
- The methods and criteria for evaluating non-high-speed transit noise and vibration impacts (e.g., ancillary facilities, stations, maintenance facilities and construction) are found in the FTA's Transit Noise and Vibration Impact Assessments (FTA 2018).
- The criteria for roadway noise impacts (relevant to the extent HSR causes changes in traffic patterns) are included in the FHWA's *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (23 CFR Part 772). The FHWA procedures are implemented as defined by the Caltrans *Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects* (Caltrans 2020). The FHWA requires each state to write its own noise policy, based upon the FHWA's *Highway Traffic Noise: Analysis and Abatement Guidance* (FHWA 2011). The state policy must address the issues of (1) required noise reduction needed for a wall to be reasonable, (2) cost of a reasonable wall, and (3) noise level reduction required for a receiver to be considered benefitted. The Caltrans *Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects* addresses these issues. Caltrans *Technical Noise Supplement to the Traffic Noise Analysis Protocol* (Caltrans 2013) gives guidance on how Caltrans requires noise measurements, modeling, and barrier analyses to be done. Caltrans Standard Environmental Reference Volume 1 on Noise gives an outline for the noise report.

Noise and vibration measurements collected within the resource study area (RSA) were used to characterize existing conditions at noise- and vibration-sensitive receiver locations, for the purpose of applying FRA and FTA criteria. Project section information was used in noise and vibration models.

Noise and vibration from construction and operation of the project section were analyzed quantitatively by using guidelines established by the FRA and FTA. Project information on the proposed alignment and the conceptual HSR operations was used in noise and vibration models. Field noise and vibration measurements along with professional judgment supplemented the FTA and FRA model methodology.

The FRA guidance manual (FRA 2012) was used as the primary source of guidance for analysis of HSR noise and vibration impacts; FTA guidance (FTA 2018) supplemented the FRA guidance. Chapter 5 (Detailed Noise Analysis) of the FRA guidance manual was followed for impact analyses of the project to be carried forward in the project-level Draft EIR/EIS.

For the vibration impact analyses of the project carried forward for environmental analysis, the process presented in Chapter 9 (Detailed Vibration Assessment) of the FRA guidance manual was used at residences, schools, hotels/motels, medical facilities, and other vibration-sensitive receptors.

For non-HSR noise sources, such as stations, maintenance facilities, and construction, the methods described in the FTA guidance manual were used.

The following sections summarize the RSAs and the methods used to analyze noise and vibration impacts on noise-sensitive areas in the project section.

4.1 Definition of Resource Study Area

RSAs are the geographic boundaries in which the Authority conducted environmental investigations specific to each resource topic. For noise and vibration, the RSAs define the areas in which environmental investigations specific to noise and vibration are conducted in order to determine the resource characteristics and potential impacts of the project section. The boundaries of the RSA extend beyond the project footprint, as the impact analysis focuses on the effects of source noise and vibration on sensitive receivers, which are assessed at the receiver. The same RSAs apply to both direct and indirect impacts. Direct impacts consist of increases in noise and vibration as a result of construction activities or HSR operation, while indirect impacts for noise include the Shared Passenger Track Alternatives' impact on traffic patterns, which indirectly affect noise levels.

To identify areas that could be affected by noise from the Shared Passenger Track Alternatives, the locations of noise-sensitive areas (NSA) were determined by segmenting the corridor into areas between major road crossings that include clusters of noise-sensitive receivers. The Authority identified 46 NSAs and conducted ambient noise measurements at 45 sites throughout the noise RSA along the proposed HSR alignment in the project section. They collected long-term (24- to 48-hour) measurements at 30 sites and short-term (1-hour) measurements at 15 sites. They then used the measurement results at these locations to characterize the existing noise conditions at particular NSAs, as noted in Section 5.3, Existing Noise Conditions.

To identify areas that could be affected by vibration from the Shared Passenger Track Alternatives, the locations of vibration-sensitive areas (VSA) were determined. The Authority identified 46 VSAs and conducted vibration propagation measurements at 11 sites throughout the vibration RSA along the project section to determine the transmission of vibration from its source (propagation measurements are used to determine the response of the ground from a vibration source at a specific location). The Authority then used the measurement results at these locations to characterize the ground vibration propagation conditions at particular VSAs. Vibration test results are presented in Section 5.4, Existing Vibration Environment.

Table 4-1 provides general definitions and RSA boundary descriptions for noise and vibration resources within the project section.

Table 4-1 Definition of Resource Study Areas

General Definition	Resource Study Area Boundary
Noise	
Construction and operations	For direct and indirect noise impacts on sensitive receivers, the FRA defines the estimated impact distance as 700 feet from the centerline of the rail corridor for steel-wheeled vehicles operating on new or existing track at any speed or frequency in a suburban or nonsuburban setting with an unobstructed view (FRA 2012). This is used as the RSA for the noise analysis for rail operation, as elevated track sections may result in an unobstructed view of trains for receivers at this distance from the track. This RSA has been determined based on typical estimated impact distances as defined by the FRA and project-specific factors of the project section.
Vibration	
Construction and operations	▪ Station RSA: 150 feet from the station boundary, which corresponds to light rail transit sources for residential (Category 2) land use (FTA 2018) ▪ Alignment RSA, including existing railroads: up to 275 feet from the edge of the right-of-way, which corresponds to the maximum estimated impact distance for more than 70 passbys per day in a residential area (FRA 2012) ▪ Maintenance Facility RSA: 1,000 feet from the facility boundary, which corresponds to the estimated impact distance for this type of facility (FRA 2012)

FRA = Federal Railroad Administration; RSA = resource study area

4.2 Categories of High-Speed Rail

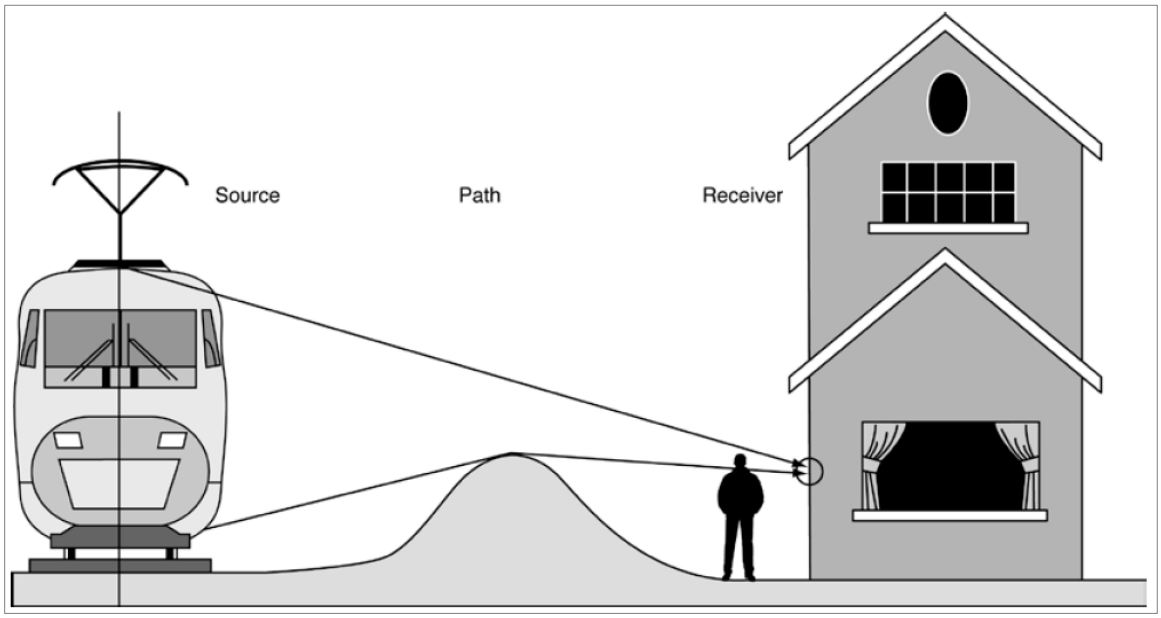
High-speed ground transportation systems include steel-wheeled, electrically powered, or fossil-fueled trains capable of maximum speeds of 90 to 250 mph, as well as magnetically levitated systems capable of maximum speeds of up to 300 mph. Because the noise characteristics of these trains vary considerably as speed increases, the FRA guidelines subdivide these systems into three categories:

- "High-speed," with a maximum speed of 150 mph
- "Very high-speed," with a maximum speed of 250 mph
- "Maglev," magnetically levitated and powered systems representing the upper range of speed performance up to 300 mph

The project section would involve steel-wheeled, electrically powered trains. Maximum train speeds would vary from 70 to 90 mph, with the exception of Imperial Highway to Foster Road, where maximum train speeds would be 40 mph because of trains going into and coming out of a curve. Thus, trains in this project section would be operating in the "high-speed" category.

4.3 Noise Prediction Components

Noise from HSR can be evaluated in terms of a Source-Path-Receiver framework, as illustrated on Figure 4-1, in which the source of noise is a train moving on its tracks. The path describes the intervening course between the source and the receiver, wherein the noise levels are reduced by distance, topographical and built obstacles, reflections from surfaces, atmospheric effects, and other factors. At each receiver, the noise from sources and source paths combines and composes the noise environment at that location.



Source: FRA 2012

Figure 4-1 Source-Path-Receiver Framework

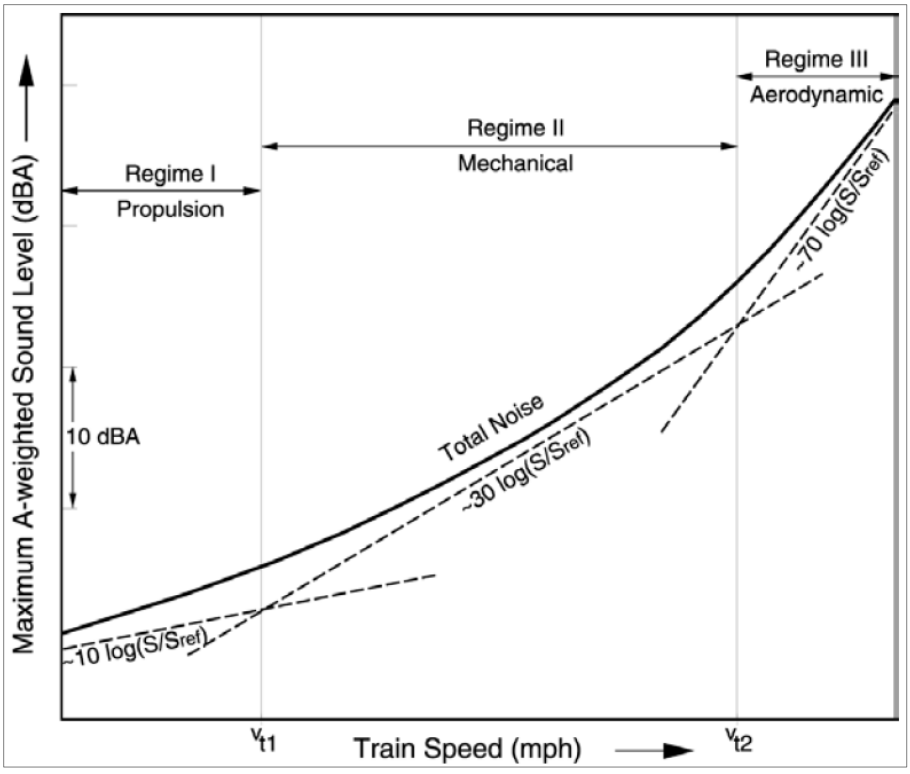
4.3.1 Sources of High-Speed Rail Noise

Three individual noise mechanisms generate noise levels at a nearby noise-sensitive receiver as the train passes by. The three mechanisms are dependent on source location, noise level, frequency content, directivity, and speed. These three mechanisms are as follows:

- **Regime I:** Propulsion or machinery noise
- **Regime II:** Mechanical noise resulting from wheel/rail interactions or guideway vibrations
- **Regime III:** Aerodynamic noise resulting from airflow moving past the train

Three different regimes are involved in predicting noise levels because certain regimes dominate the overall noise level depending on the previously mentioned noise components and the speed of the train. For steel-wheeled trains, low speeds are dominated by mechanical noise sources that are involved with the propulsion of the train (Regime I). Internal cooling fans are near the power units at approximately 10 feet above the rails and dominate noise levels around the frequency spectrum near 1,000 Hertz (kHz) when the train is in motion, while external cooling fans dominate the total noise level when the train is stopped at a station. Wheel interactions with the railway define Regime II. Noise is generated when the steel wheels roll along the rail. In Regime II, the majority of the noise falls into the frequency range from 2 kHz to 4 kHz. A majority of the vibratory effects from HSR results from these interactions. Wheel-rail interactions tend to dominate the A-weighted overall noise levels up to about 160 mph. After the train reaches 160 mph, aerodynamic noise (Regime III) begins to become a part of the overall noise level. Substantial contributions to the overall noise level from aerodynamic noise begin at 180 mph. Noise is generated by the airflow around the train. Discontinuities in the surface along the length of the train and inter-coach gaps are a couple of the structural components that contribute to aerodynamic noise. However, because the maximum operating speed is 90 mph, aerodynamic noise would not be a contributing factor in this project section.

Figure 4-2 illustrates the generalized sound level dependence on speed for the three regimes. V_t represents the speed of the train where the dominant train noise source transitions to another dominant train noise source. V_{t1} is the speed where the dominant noise source transitions from propulsion to wheel-rail interaction. V_{t2} is the speed where the dominant noise source transitions from wheel-rail interaction to aerodynamic noise.



Source: FRA 2012

Figure 4-2 Regime Sound Level Dependence on Speed

4.3.2 Operating Conditions

Project implementation operating conditions are important in determining peak hour noise levels, hourly L_{eq} values, and L_{dn}/CNEL values at noise-sensitive receivers. The values from Table 4-2 are used only as reference values in helping to determine the predicted project section sound exposure level (SEL) values. Once the appropriate system category and reference quantities are established, the following input parameters are required to adjust each reference SEL to the appropriate project section operating conditions:

- Number of passenger cars in the train, N_{cars} = 0 for this project section (all cars are powered)
- Number of power units in the trains, N_{power} = 8 for this project section (high-speed electric-powered multiple unit power units)
- Length of one passenger car, $ulen_{car}$ (not applicable for this project section)
- Length of one power unit, $ulen_{power}$ = 82.5 feet (high-speed electric-powered multiple unit vehicles)
- Train speed in mph, S (varies by location, with maximum of 90 mph)

The following equation is used to adjust each sub-source, *n*, SEL to the project section operating conditions identified above:

$$SEL_n = \left(SEL_{ref}\right)_n + 10\log\left(\frac{len}{len_{ref}}\right)_n + K\log\left(\frac{S}{S_{ref}}\right)_n$$

The consistent adjustment in the above equation is reflected in the "10 log(len/len_{ref})" term, where *len* represents the sub-source length (len_{power}, len_{train}) specified in Table 4-2. These variables are defined as:

$$len_{power} = N_{power} \times ulen_{power}$$

and

$$len_{train} = \left(N_{power} \times ulen_{power}\right) + \left(N_{cars} \times ulen_{car}\right).$$

The speed adjustment is given by the "K log(S/S_{ref})" term, using the appropriate value for K in Table 4-2.

Finally, the hourly L_{eq} and L_{dn} values at a reference distance of 50 feet are calculated based on the reference SEL and the volume of train traffic. For this project section, the train volumes, hours of operation, and headways were based on the timetable information provided by the project team. In addition, the changes in noise from the project-related relocation of freight tracks within the right-of-way were evaluated based on the changes in distance between the freight tracks and nearby sensitive receptors using FRA methodology.

Table 4-2 Source Reference Sound Exposure Levels at 50 Feet

System Category	Sub-Source Component	Sub-Source Parameters		Reference Quantities			
		Length Definition, len	Height Above Rails (feet)	SELref (dBA)	Lenref (feet)	Sref (mph)	K
HS EMU	Propulsion	len_{power}	2	86	634	--[1]	--[1]
	Wheel-rail	len_{train}	1	91	634	90	20

System Category	Sub-Source Component	Sub-Source Parameters		Reference Quantities			
		Length Definition, len	Height Above Rails (feet)	SELref (dBA)	Lenref (feet)	Sref (mph)	K
VHS EMU	Propulsion	len_{power}	2	86	634	--[1]	--[1]
	Wheel-rail	len_{train}	1	91	634	90	20
	Aero: train nose	len_{power}	10	89	73	180	60
	Aero: wheel region	len_{train}	5	89	634	180	60
	Aero: pantograph	--	15	86	--[2]	180	60

Source: FRA 2012

[1] Source level is not adjusted for train speed; hence, K=0.

[2] Source level is not adjusted for train length.

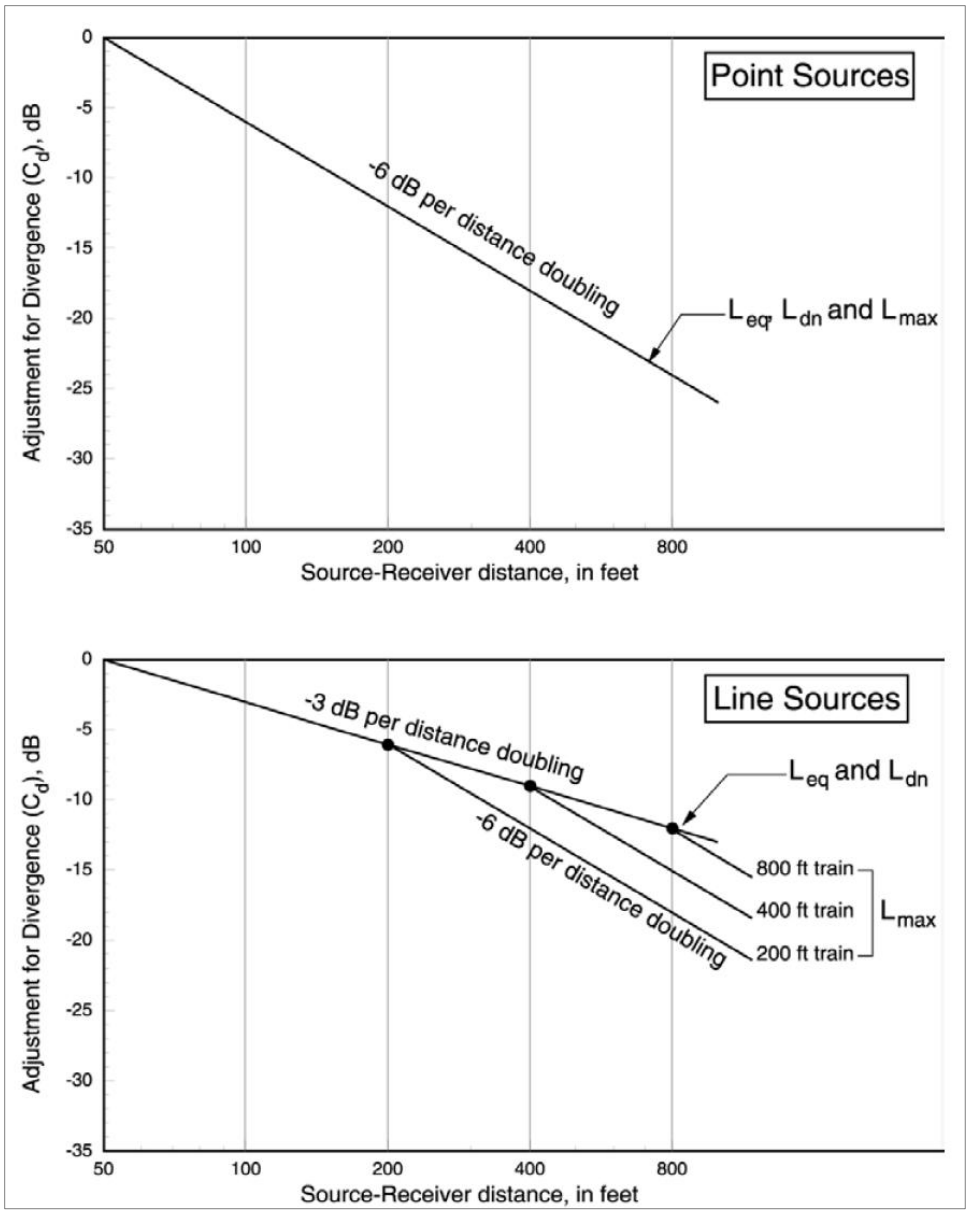
The SELref values provided in the table are for ballast tracks. For concrete slab tracks, SELref values for propulsion, wheel-rail, aero train nose, and aero wheel region are increased by 3 dBA, as provided by the Authority.

Aero = aerodynamic; dBA = A-weighted decibels; HS EMU = high-speed electric-powered multiple unit, maximum speed is 150 mph; K = speed adjustment factor; len_{power} = length of power car; Lenref = referenced source length; len_{train} = length of train; mph = miles per hour; SELref = sound exposure level reference value; Sref = referenced source speed; VHS EMU = very high-speed, steel-wheeled electric-powered multiple Unit, maximum speed is 250 mph

4.3.3 Propagation of Noise to Receivers

The propagation, or spread, of noise from the three HSR sub-sources depends on several key components, which pertain to the specific noise exposure versus distance relationship. The propagation characteristics between each sub-source and each receiver must be determined. Using these characteristics, an SEL-distance relationship for each sub-source is made. Final adjustments are then made to the SEL-distance relationship because of terrain, shielding, or other propagation path intervening features.

The distance between each sub-source on the HSR and noise-sensitive receivers have a unique relationship pertaining to how the noise levels attenuate over a given distance. Sound levels naturally attenuate over distance. Figure 4-3 depicts the attenuation over distance for both point sources and line sources from HSR. For point sources, noise levels are attenuated by 6 dB per doubling of distance. Each sub-source on the HSR radiates individually as a point source. Most of the individual sub-sources on the HSR are in a linear arrangement and act as line sources. Noise levels from line sources attenuate by 3 dB per doubling of distance for L_{eq} values and L_{dn} values and 3 dB to 6 dB per doubling of distance for maximum sound level (L_{max}) values. The amount of attenuation for L_{max} values is dependent upon the length of the train. Once the distance from the noise source to the noise-sensitive receiver is equal to that of the length of the train, the L_{max} values attenuate by 6 dB per doubling of distance, as illustrated in Figure 4-3.



Source: FRA 2012

Figure 4-3 Attenuation Caused by Distance (Divergence)

The cross-sectional geometry between the sub-source and the receiver is an important aspect in determining the SEL-distance relationship. More attenuation because of ground absorption will occur as the distance between the sub-source and receiver increases. The heights of both the receivers and the sub-sources, and their relation to each other and the ground, are relevant to the propagation path and SEL-distance relationship. The amount of attenuation from ground absorption from sub-source to noise-sensitive receiver is dependent upon the direct line of sight from one to the other and the average height between the two. As the average height decreases, the ground will absorb more noise generated by propulsion sub-sources and wheel-rail interaction. Ground absorption does little to attenuate aerodynamic noise. The following equations illustrate how to determine the effect of ground attenuation on the noise propagation path. H_{eff} represents the average path height between the sub-source and the noise-sensitive

receiver. *G* represents the ground factor. For hard ground, there is no noise attenuation from ground absorption.

For soft ground:

$$G = \begin{cases} 0.66 & H_{eff} < 5 \\ 0.75\left(1 - \frac{H_{eff}}{42}\right) & 5 < H_{eff} < 42 \\ 0 & H_{eff} > 42 \end{cases}$$

For hard ground:

$$G = 0$$

Shielding because of the terrain and the introduction of noise barriers are two important components in determining the propagation of noise to noise-sensitive receivers. If a line of sight exists from a sub-source on the HSR to a noise-sensitive receiver, the ground factor becomes more critical in determining the amount of attenuation over a given distance. Once the line of sight is broken, additional attenuation will be accrued. The line of sight may be broken because of intervening noise barriers and uneven terrain features in the natural topography, which allow for shielding along the noise propagation path.

An SEL versus distance relationship can be established for the three sub-sources from the HSR. Using the distance from each sub-source to the noise-sensitive receiver, the amount of ground absorption, the amount of attenuation provided by intervening noise barriers, and the amount of attenuation provided by shielding because of natural topography, the total noise exposure at specific noise-sensitive receivers can be determined.

4.3.4 Benchmark Test to Validate Noise Prediction Modeling Methodology

In order to calculate the future noise level from proposed HSR operations, the noise parameters and equations within the protocol (FRA 2012) needed to be compiled into a usable, coded noise model. During the development of the noise model, the environmental program manager for the Authority distributed a series of reference input parameters and output results against which the noise model could be compared to ensure that noise levels for all segments of the HSR system were calculated with similar results. The input parameters included operational assumptions (length of train, number of trains during daytime and nighttime hours, and train speed) as well as a range of site conditions (height of source, height of receiver, and distance to receiver). The results of the analysis were compared to the sample results provided, and the results of these comparisons are presented in Table 4-3 and Table 4-4. These results demonstrate very close agreement between the modeled and reference noise predictions.

4.3.5 Cumulative Noise Exposure

Cumulative noise exposure refers to the noise exposure of the project section in combination with other past, present, and reasonably foreseeable future projects. Because the FRA project noise assessment is based on a comparison of the existing noise levels (refer to Section 3.1.1 for information on the noise impact criteria) and the project section noise levels, past and current projects are already considered, on a cumulative basis, in the existing noise levels and are accounted for in the direct impacts of the project section. Other future expansions of rail service are discussed in Section 6.11, Cumulative Impacts.

Table 4-3 Comparison of Modeled Results to Reference Results at 100 Miles per Hour

100 mph Results and Model Input Parameters Using HS EMU					Modeled Barrier Height (feet)	Barrier to Near Track Distance (feet)	Reference Results			Modeled Results		
Test Case	Receiver Height (feet)	Building Floor	Receiver to Near Track Distance (feet)	Source Ground Height (feet)[1]			L_{dn} (dBA)	Peak Hour L_{eq} (dBA)	L_{max} (dBA)	L_{dn} (dBA)	Peak Hour L_{eq} (dBA)	L_{max} (dBA)
1	5	1	100	4	4	6	69.3	69.4	86.7	69.3	69.5	86.7
1	5	1	200	4	4	6	64.9	65.0	79.2	65.0	65.2	79.2
1	5	1	400	4	4	6	60.4	60.5	71.7	60.6	60.7	71.7
1	25	3	100	4	4	6	70.2	70.3	87.6	70.3	70.4	87.6
1	25	3	200	4	4	6	66.3	66.5	80.7	66.5	66.6	80.7
1	25	3	400	4	4	6	62.4	62.5	73.7	62.6	62.7	73.7
2	5	1	100	4	12	21.5	68.2	68.3	87.4	68.5	68.6	87.4
2	5	1	200	4	12	21.5	64.7	64.8	80.4	64.7	64.8	80.4
2	25	3	100	4	12	21.5	70.3	70.4	88.4	70.4	70.5	88.4
2	25	3	200	4	12	21.5	66.3	66.4	81.9	66.3	66.5	81.9
3	5	1	200	60	63	15.5	66.2	66.4	83.5	66.3	66.5	83.5
3	25	3	200	60	63	15.5	67.8	67.9	83.5	67.8	67.9	83.5
4	5	1	200	60	67	15.5	61.0	61.1	78.7	61.4	61.6	79.2
4	25	3	200	60	67	15.5	65.3	65.5	83.0	65.3	65.4	83.0

Source: FRA 2012

[1] Height added to each sub-source height in Table 4-2

dBA = A-weighted decibels; HS EMU = high-speed electric-powered multiple units; L_{dn} = day-night sound level; L_{eq} = equivalent sound level; L_{max} = maximum sound level; mph = miles per hour

Table 4-4 Comparison of Modeled Results to Reference Results at 200 Miles per Hour

200 mph Results and Model Input Parameters Using VHS EMU					Modeled Barrier Height (feet)	Barrier to Near Track Distance (feet)	Reference Results			Modeled Results		
Test Case	Receiver Height (feet)	Building Floor	Receiver to Near Track Distance (feet)	Source Ground Height (feet)[1]			L_{dn} (dBA)	Peak Hour L_{eq} (dBA)	L_{max} (dBA)	L_{dn} (dBA)	Peak Hour L_{eq} (dBA)	L_{max} (dBA)
1	5	1	100	4	4	6	74.0	74.2	89.3	74.1	74.3	89.3
1	5	1	200	4	4	6	70.3	70.4	84.2	70.5	70.6	84.6
1	5	1	400	4	4	6	66.6	66.7	78.3	66.8	66.9	79.1
1	25	3	100	4	4	6	74.6	74.7	90.0	74.7	74.8	90.0
1	25	3	200	4	4	6	71.0	71.2	85.4	71.2	71.3	85.8
1	25	3	400	4	4	6	67.5	67.6	80.1	67.7	67.9	80.8
2	5	1	100	4	12	21.5	71.3	71.4	89.8	71.4	71.5	89.8
2	5	1	200	4	12	21.5	68.3	68.5	82.7	68.3	68.5	82.7
2	25	3	100	4	12	21.5	73.9	74.0	89.2	74.1	74.2	90.7
2	25	3	200	4	12	21.5	69.6	69.7	84.2	69.7	69.8	84.2
3	5	1	200	60	63	15.5	68.7	68.8	85.8	68.7	68.9	85.8
3	25	3	200	60	63	15.5	70.0	70.1	85.8	69.9	70.1	85.8
4	5	1	200	60	67	15.5	65.2	65.4	81.0	65.4	65.5	81.5
4	25	3	200	60	67	15.5	67.8	67.9	85.4	67.8	67.9	85.4

Source: FRA 2012

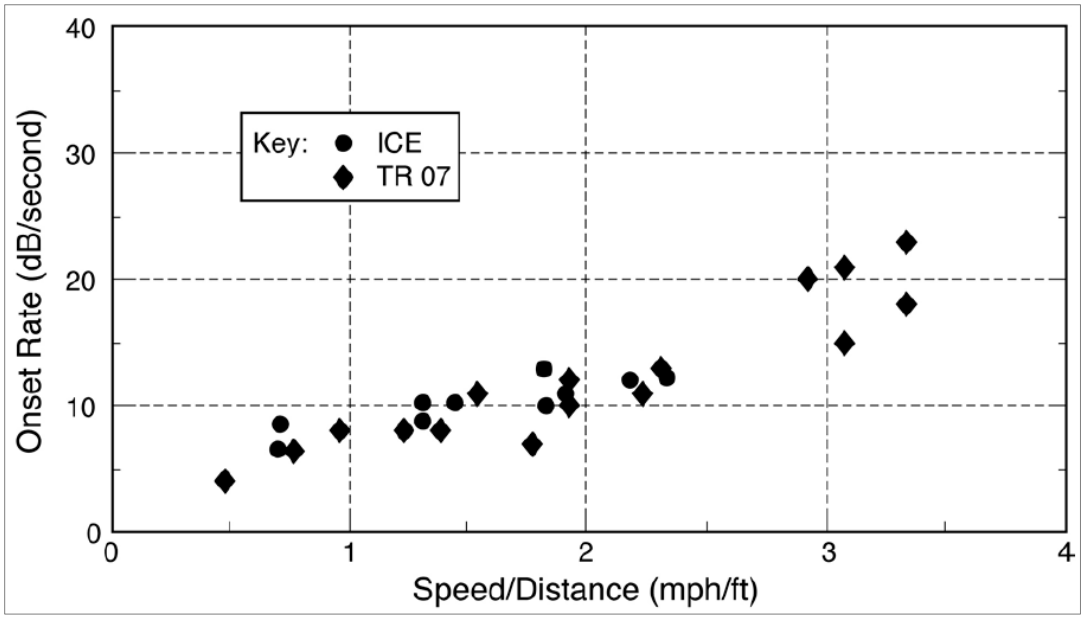
[1] Height added to each sub-source height in Table 4-2

dBA = A-weighted decibels; L_{dn} = day-night sound level; dBA; L_{eq} = equivalent sound level; L_{max} = maximum sound level; mph = miles per hour; VHS EMU = very high-speed, steel-wheeled electric-powered multiple unit

4.4 Annoyance and Startle Effects from Rapid Onset Rates

Rapid onset rates from train noise may cause annoyance and startle effects at human and wildlife noise-sensitive receivers. With very high onset rates, noise-sensitive receivers tend to be startled or surprised by the sudden approaching sound. The *onset rate* is defined as the average rate of change of increasing sound pressure level in decibels per second during a single noise event. The duration of such an event is short (a few seconds depending on the length of the train). For purposes of analyzing noise effects, a single noise event is a single train pass-by. As HSR approaches a noise-sensitive receiver, the noise level will suddenly increase.

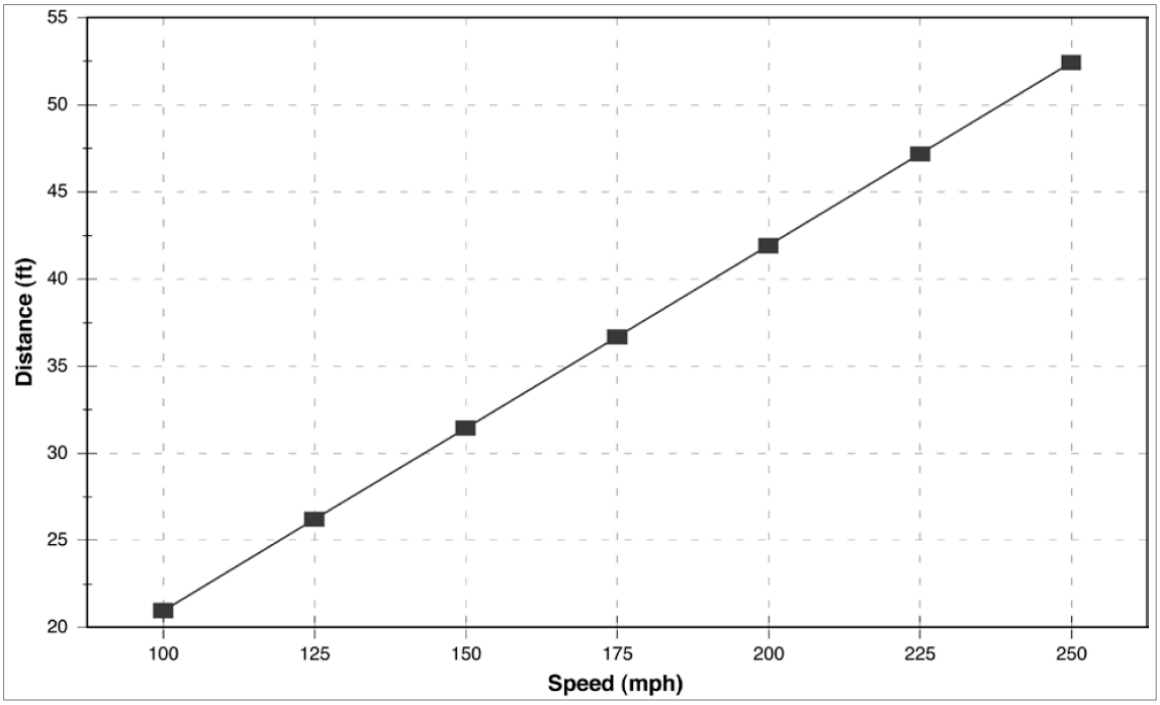
In 1992, the U.S. Air Force studied aircraft noise annoyance and startle response. The FRA used the completed research to develop a distance versus level chart for which startle effects can occur. Figure 4-4 represents the collected data by the U.S. Air Force. The x-axis is calculated by dividing the speed of the HSR by the distance to the receiver. The y-axis is the onset rate with that speed-distance relationship. The “ICE” points represent Germany’s Inter-City Express and are measured steel-wheeled HSR events, and “TR 07” points represent Germany’s Transrapid and are measured magnetically levitated vehicle train events. Figure 4-4 depicts that onset rates at noise-sensitive receivers increase as speeds increase and onset rates increase as the distance between the train and noise-sensitive receiver is reduced. For a given speed, onset rates decrease as the distances from the trains to the noise-sensitive receivers increase.



Source: FRA 2012

Figure 4-4 Measured High-Speed Rail Onset Rates

Figure 4-5 illustrates the distance versus speed relationship for rapid onset rates. The distance (in feet) represents the distance at which a startle response can occur at a human noise-sensitive receiver if the area being analyzed is open, flat terrain with an unobstructed view of the tracks.



Source: FRA 2012

Figure 4-5 Distance from Tracks within Which Human Surprise Can Occur for High-Speed Rail

There is no adopted onset rate at which wildlife will be annoyed by HSR.

4.5 Noise Impacts on Wildlife Noise-Sensitive Receivers

The effect of noise on wildlife involves a number of parameters, but one of the most apparent is the potential for masking of communication. Wildlife depends on calls and song for species identification, mate attraction, and territorial defense. Hearing in all forms of wildlife is not analogous to hearing in mammals. For example, birds exhibit a high degree of frequency selectivity and vocalize in a much higher frequency range than most rail noise produces.

Studies have evaluated the potential for masking of bird song by traffic noise and recommended that continuous noise levels above 60 dBA L_{eq} within habitat areas may affect the suitability of habitat use (SANDAG 1989). Many regulatory agencies recommend that 60 dBA L_{eq} hourly levels be considered an impact at the edge of suitable habitat.

Recent research has indicated that SEL values at wildlife noise-sensitive receivers are a very useful indicator of what type of response to expect from specific types of wildlife. Table 4-5 lists 100 dBA SEL for domestic and wild birds and mammals as an effective criterion level for determining impacts as the result of a train pass-by. Domestic and wild birds and mammals near the project section alignment may be affected by train pass-bys if the animals are subjected to SEL values of 100 dBA or higher.

Table 4-5 Federal Railroad Administration Interim Criteria for Train Noise Effects on Animals

Animal Category	Class	Noise Metric	Noise Level (dBA)
Domestic	Mammals (Livestock)	SEL	100
	Birds (Poultry)	SEL	100

Animal Category	Class	Noise Metric	Noise Level (dBA)
Wild	Mammals	SEL	100
	Birds	SEL	100

Source: FRA 2012
dBA = A-weighted decibels; SEL = sound exposure level

Some animals may become habituated to higher noise levels and may exhibit reduced response to noise after prior exposure. There is no developed general criterion level or threshold for habituation.

Wildlife responses to noise are species dependent. Their responses to noise are dependent upon the same components as any other noise-sensitive receiver, but each animal's responses and thresholds are unique enough that noise standards cannot be established. The duration of the noise, type of noise, and level of existing ambient noise weigh differently upon the type of response to expect from individual species. The types and locations of wildlife along the proposed alignment have not been identified, but wildlife may be affected by the project section if the wildlife is near the project alignment.

4.6 Maintenance Facilities

Noise impacts from maintenance facilities were assessed based on the screening procedure for yards and shops in the FTA guidance manual. Based on this guidance, there is potential for noise impacts at sensitive receivers within a distance of 1,000 feet from the center of the facility where the sound path is unobstructed and within a distance of 650 feet with intervening buildings.

4.7 Stations

The FTA *Transit Noise and Vibration Impact Assessment* (FTA 2018) establishes estimated impact distances for stations. One station is proposed for ARTIC with design options at Norwalk/Santa Fe Springs and Fullerton, with the analysis of LAUS previously evaluated and approved with the adjacent Burbank to Los Angeles Project Section. Only a General Noise Assessment can be made because the HSR operations at the stations have not been defined at this time.

Some of the major noise sources at the station would include signal horns, a public address system, locomotives idling, and other site-specific activities.

4.8 Detailed Vibration Assessment

The vibration impact analysis of the project section was conducted based on the methodology presented in Chapter 9 (Detailed Vibration Assessment) of the FRA guidance manual. An FRA Detailed Vibration Assessment consists of:

- Surveying the existing vibration conditions (vibration propagation testing only). The existing vibration levels are not included as a part of the assessment methodology for FRA. Additionally, access was not available to measure existing vibration levels for this project.
- Predicting future vibration and vibration impacts
- Developing mitigation measures (mitigation measures are to be included as part of the Noise and Vibration section of the Draft EIR/EIS)

4.8.1 Surveying the Existing Vibration Conditions

At the time of this study, access was limited to public rights-of-way and therefore direct measurements of existing train vibration levels at vibration-sensitive properties were not possible. Instead, ground-borne vibration propagation tests were performed at representative, accessible locations in the vicinity of the project alignment to determine the vibration transmission characteristics of the ground near vibration-sensitive land use. The vibration propagation test procedure is depicted schematically on Figure 4-6. An instrumented hammer was used to

generate impulses at specific locations spaced 15 feet apart along a line on or parallel to the proposed alignment. A line of accelerometers was placed perpendicular to the line of impacts as depicted on the figure. The relationship between the input force and the resulting vibration measured by the accelerometers, called the *transfer mobility*, was calculated from the measured data. The transfer mobility represents the vibration propagation characteristics of the ground at the measurement site and at other sites with similar geology.

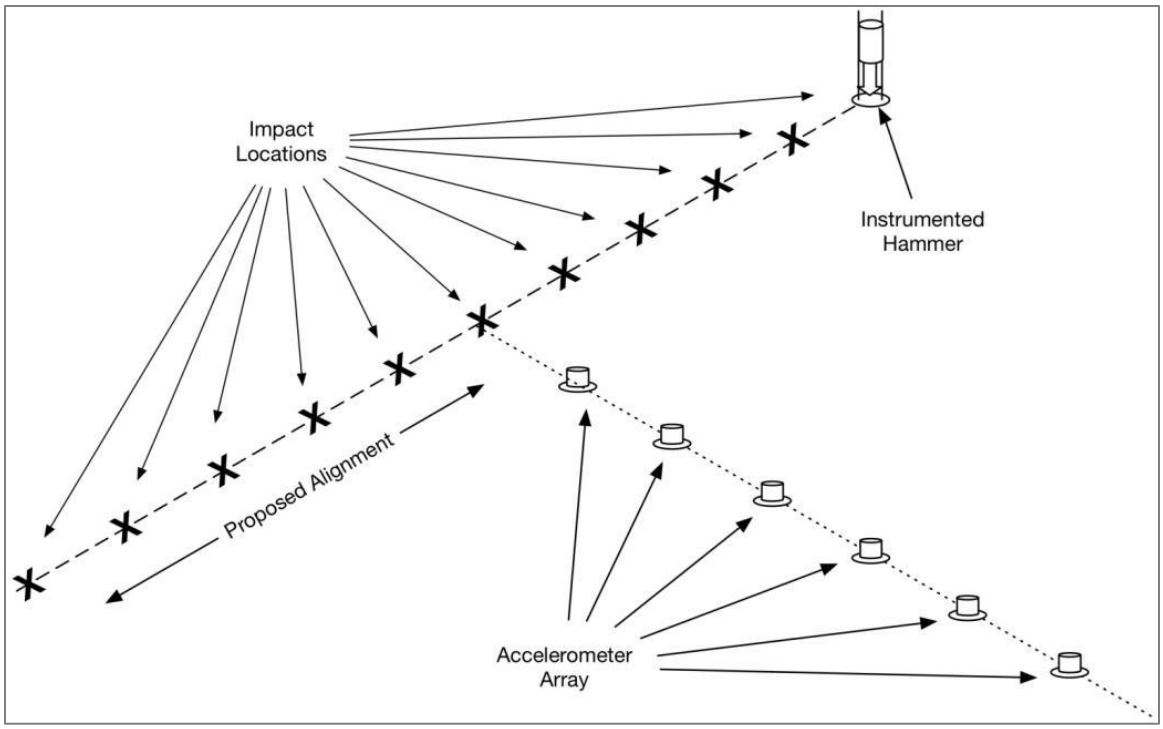


Figure 4-6 Vibration Propagation Measurement Schematic

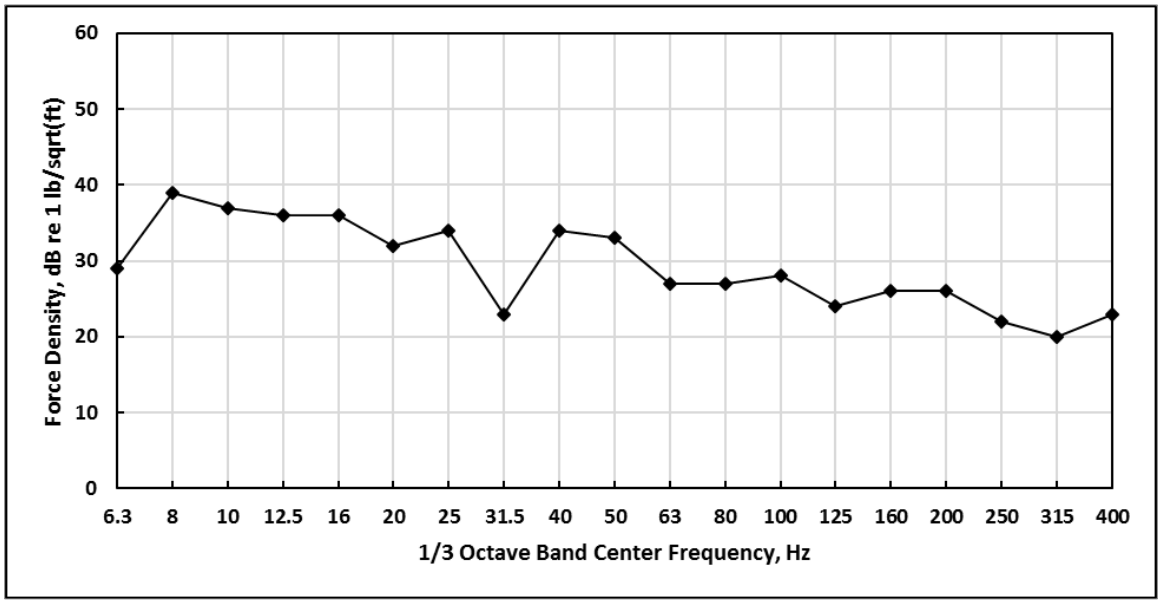
For the data analysis, the following steps were used to calculate the transfer mobility at each measurement site:

- Narrow-band transfer functions for each accelerometer/force pair were computed using custom software. Numerical integration was used to convert the acceleration data into velocity.
- The narrow-band data were converted to one-third-octave band data.
- Numerical integration was used to convert the measured point-source transfer mobility data into line-source transfer mobilities.
- For each one-third-octave band, linear or quadratic regression was used to determine smoothed estimates for each line-source transfer mobility as a function of distance from the source.

4.8.2 Predicting Future Vibration and Vibration Impacts

Ground-borne vibration levels from HSR operations were projected using the detailed vibration assessment prediction methods included in the FRA guidance manual (Chapter 9, Detailed Vibration Assessment). The train vibration source level was based on the force density level for the Pendolino electric-powered multiple-unit HSR as reported in Figure 9-5 of the FRA guidance manual and depicted on Figure 4-7. This force density spectrum was adjusted for speed and combined with the line-source transfer mobility data at each vibration measurement site to project

section ground vibration levels from future HSR operations using the FRA detailed vibration analysis methodology.



Source: FRA 2012

Figure 4-7 Force Density for Pendolino Electric-Powered Multiple-Unit High-Speed Rail at 150 Miles per Hour

4.9 Construction Noise and Vibration Methodology

Construction noise and vibration impacts are assessed using a combination of the methods and construction source data contained in the FRA manual and the FHWA Roadway Construction Noise Model (FHWA 2006). Typical noise levels generated by representative pieces of equipment are listed in Table 4-6.

The noise exposure at a receiver location may be calculated using decibel addition of operating construction equipment using the following equation:

$$L_{eq}(n) = L_{max} + 10\times\text{Log}(U.F.) - 20\times\text{Log}(D/50) - A_{shielding}$$

where:

$L_{eq}(n)$ = noise exposure at a receiver resulting from the operation of a single piece of equipment over n hours

L_{max} = noise emission level of the particular piece of equipment at the reference distance of 50 feet (taken from Table 4-6)

$A_{shielding}$ = shielding provided by barriers, building, or terrain

D = distance from the receiver to the piece of equipment in feet

U.F. = usage factor that accounts for the fraction of time that the equipment is operating at full power over the specified time period. For $L_{eq}(1)$ assume a usage factor equal to 100 percent and for 8 hours or more use the values in Table 4-6.

The combination of noise from several pieces of equipment operating during the same time period is obtained from decibel addition of the L_{eq} of each single piece of equipment calculated using the above equations.

Table 4-6 Construction Equipment Noise Emission Levels

Equipment	Typical Maximum Noise Level (dBA) 50 feet from Source	Usage Factor, %
Air compressor	80	40
Backhoe	80	40
Ballast equalizer	82	50
Ballast tamper	83	50
Compactor	82	20
Concrete mixer	85	40
Concrete pump	82	20
Concrete vibrator	76	20
Crane, derrick	88	16
Crane, mobile	83	16
Dozer	85	16
Generator	82	50
Grader	85	40
Impact wrench	85	50
Jack hammer	88	20
Loader	80	40
Paver	85	50
Pile driver (impact)	101	20
Pile driver (vibratory)	95	20
Pneumatic tool	85	50
Pump	77	50
Rail saw	90	20
Rock drill	85	20
Roller	85	20
Saw	76	20
Scarifier	83	20
Scraper	85	40
Shovel	82	40
Spike driver	77	20
Tie cutter	84	20
Tie handler	80	20
Tie inserter	85	20
Truck	84	40

Sources: FRA 2012; FHWA 2006
dBA = A-weighted decibels

With respect to quantifying the number of affected sensitive receivers from construction activities, a weighted average of the impact screening distances for all construction activities was used. Each impact distance is weighted based on the length of the corridor along which sensitive

receivers would be exposed to noise from each construction activity. For example, the distance from which at-grade rail construction could affect sensitive receivers, although less than other construction activities, was weighted most heavily, because it would affect sensitive receivers along 23.8 miles of the project corridor. The more extensive noise impact distances associated with louder construction activities at fixed locations (e.g., at-grade separations or stations) were weighted less heavily, because they would affect sensitive receivers adjacent to shorter segments of the project corridor (on the order of 500 to 2,000 feet in length at each location). This conservative calculation method resulted in weighted average impact distances of approximately 150 feet for daytime construction and approximately 600 feet for nighttime construction. Additional site-specific analysis was completed for three of the proposed grade separation areas where there would be heavy levels of construction activities in proximity to sensitive receivers: Pioneer Boulevard, Norwalk Boulevard, and State College Boulevard. For these three grade-separation locations, the number of affected sensitive receivers within 355 feet of daytime construction activities and 1,123 feet of nighttime construction activities is identified. Sensitive receivers that could be affected by construction noise activities do not occur at the remaining proposed grade separations.

Construction vibration is assessed for areas where there is potential for impacts from construction activities. Such activities include blasting, pile driving, demolition, and drilling or excavation close to sensitive structures. Typical vibration levels generated by representative pieces of equipment are listed in Table 4-7.

Table 4-7 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 feet (in/sec)	Approximate Lv[1] at 25 feet
Pile driver (impact)	upper range	1.518	112
	typical	0.644	104
Pile driver (vibratory)	upper range	0.734	105
	typical	0.170	93
Clam shovel drop (slurry wall)		0.202	94
Hydromill (slurry wall)	in soil	0.008	66
	in rock	0.017	75
Vibratory roller		0.210	94
Hoe ram		0.089	87
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

Source: FRA 2012
[1] Root mean square velocity in vibration decibels re 1 micro-inch per second
in/sec = inch per second; Lv = velocity level in decibels; PPV = peak particle velocity

For damage assessment the following equation is used:

$$PPV_{equip} = PPV_{ref} \times [(25/D)]^{1.5}$$

where:

PPV_{equip} = the peak particle velocity (PPV) in inches per second of the equipment adjusted for distance

PPV_{ref} = the reference vibration level in inches per second at 25 feet from Table 4-7

D = the distance from the equipment to the receiver in feet

For annoyance assessment, the following equation is used:

L_v (D) = L_v (25 feet) - 30×Log(D/25)

where:

L_v(D) = RMS vibration level at distance D

L_v(25 feet) = RMS vibration level at 25 feet from Table 4-7

D = the distance from the equipment to the receiver in feet

4.9.1 Construction Noise Criteria

There are no standardized construction noise criteria from the FTA or FRA for assessing noise impacts at sensitive receivers from construction. The FTA and FRA Guidance Manuals do outline general assessment and detailed assessment criteria if local ordinances and standards are not adequate. The "reasonable guidelines" established by the FRA are deliberately conservative in order to avoid adverse community reaction.

Table 4-8 presents the FRA noise guidelines for construction. The last column applies to construction activities that extend over 30 days near a given receiver. L_{dn} is used to assess impacts in residential areas and 24-hour L_{eq} is used in commercial and industrial areas. The 8-hour L_{eq} and the 30-day average L_{dn} noise exposure from construction noise calculations use the noise emission levels of the construction equipment, their locations, and operating hours. The construction noise limits are normally assessed at the noise-sensitive receiver property line.

Table 4-8 Federal Railroad Administration Construction Noise Assessment Criteria

Land Use	8-hour L_{eq} (dBA)		L_{dn} (dBA)
	Day	Night	30-Day Average
Residential	80	70	75
Commercial	85	85	80[1]
Industrial	90	90	85[1]

Source: FRA 2012
[1] 24-hour L_{eq}, not L_{dn}
dBA = A-weighted decibels; L_{dn} = day-night sound level; L_{eq} = equivalent sound level

4.9.2 Construction Vibration Criteria

Guidelines in the FRA guidance manual provide the basis for the construction vibration assessment. The FRA provides construction vibration criteria designed primarily to prevent building damage, and to assess whether vibration might interfere with vibration-sensitive building activities or temporarily annoy building occupants during the construction period. The FRA criteria include two ways to express vibration levels: (1) RMS VdB for annoyance and activity interference, and (2) PPV, which is the maximum instantaneous peak of a vibration signal used for assessments of damage potential.

To avoid temporary annoyance to building occupants during construction or construction interference with vibration-sensitive equipment inside special-use buildings, such as a magnetic resonance imaging machine, FRA recommends using the long-term vibration criteria provided above in Section 3.2, Vibration.

Table 4-9 presents the FRA building damage criteria for construction activity; the table lists PPV limits for four building categories. These limits are used to estimate potential problems that should be addressed during final design.

Table 4-9 Federal Railroad Administration Construction Vibration Damage Criteria

Building Category	PPV (inch per second)	Approximate Lv[1]
I. Reinforced concrete, steel, or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Nonengineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Source: FTA 2018; FRA 2012;
[1] Root mean square vibration level in vibration decibels relative to 1 micro-inch per second.
Lv = velocity level in decibels; PPV = peak particle velocity

4.10 Evaluating Impacts Under NEPA

For the purposes of analysis in this document, FRA and FTA guidelines were used to conduct a detailed assessment for noise and vibration impacts at sensitive receivers. Exceedance of recommended limits in the FRA and FTA guidance were assessed to determine impacts under NEPA.

Depending on the magnitude of the proposed project's noise increase, the FTA and the FRA categorize impacts as: (1) no impact, (2) moderate impact, or (3) severe impact. A severe impact is defined as the level at which a significant percentage of people would be highly annoyed by the project's noise. A moderate impact is defined as the point at which the change in the cumulative noise level would be noticeable to most people but may not be sufficient to generate strong, adverse reactions.

For project construction and operation actions that would result in severe noise impacts or vibration impacts, feasible mitigation measures are identified to avoid or minimize impacts or to compensate for impacts. Only after consideration of mitigation measures would NEPA impacts be determined.

4.11 Determining Significance Under CEQA

CEQA requires that an EIR identify the significant environmental impacts of a project (State CEQA Guidelines 15126). One of the primary differences between NEPA and CEQA is that CEQA requires a significance determination for each impact using a threshold-based analysis. By contrast, under NEPA, significance is used to determine whether an EIS will be required; NEPA requires that an EIS is prepared when the proposed federal action (project) as a whole has the potential to "significantly affect the quality of the human environment." The Authority is using the following thresholds to determine if a significant impact on noise and vibration would occur as a result of the Shared Passenger Track Alternatives. A significant impact is one that would:

- Generate temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of FRA/FTA and FHWA standards for severe noise impacts
- Generate temporary or permanent ground-borne vibration or ground-borne noise levels exceeding FRA/FTA standards
- Be located within an airport land use plan area or, where such a plan has not been adopted, within 2 miles of a private airstrip, public airport, or public use airport and expose people residing or working in the project area to excessive noise levels

The analysis relies on noise and vibration standards developed by the FTA and FRA to determine whether the project would result in significant noise or vibration impacts. These standards are derived primarily from the FRA guidelines in *High-Speed Ground Transportation Noise and*

Vibration Impact Assessment (FRA 2012), which is based on the FTA *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018). The noise impact criteria established in these documents are based on the level of human annoyance, and were developed to apply to a wide variety of surface transportation modes and to respond to the varying sensitivities of communities to projects under different background noise conditions. The vibration standards address both human reaction to vibration as well as the potential for physical damage. The FRA standards were developed specifically for assessing noise and vibration impacts caused by HSR projects, and the FTA standards were developed for rail projects and their associated stationary facilities. Accordingly, these standards serve as appropriate thresholds for determining whether the project would result in significant noise or vibration impacts.

For determining the significance of impacts related to traffic noise, the analysis relies in part on criteria that are included in the FHWA's Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 CFR Part 772), which are implemented by Caltrans through its Traffic Noise Analysis Protocol (Caltrans 2020). These criteria are based on the level of human perception or annoyance and consider various types of land uses. Although the FHWA regulations only apply to projects funded or approved by the FHWA, the criteria in these regulations are regularly considered in assessing noise impacts associated with motor vehicles. Moreover, the Caltrans Traffic Noise Analysis Protocol provides policy guidance for assessing traffic noise impacts as well as noise abatement criteria. Therefore, the criteria provided in these documents serve as appropriate thresholds for determining whether traffic noise would result in a significant impact.

For impact analysis, the following thresholds were used in assessing locations with impacts:

- FRA noise impact criteria for HSR operation, as depicted on Figure 3-1 and Figure 3-2
- FRA detailed vibration analysis impact criteria for HSR operation, as defined in Table 3-7 and Table 3-8
- FRA construction noise impact criteria, as defined in Table 4-8
- FRA construction vibration impact criteria, as defined in Table 4-9
- FHWA noise abatement criteria for traffic (on roadways affected by the project section)
- FTA noise impact criteria for ancillary and non-HSR noise sources, depicted on Figure 3-1 and Figure 3-2

5 AFFECTED ENVIRONMENT

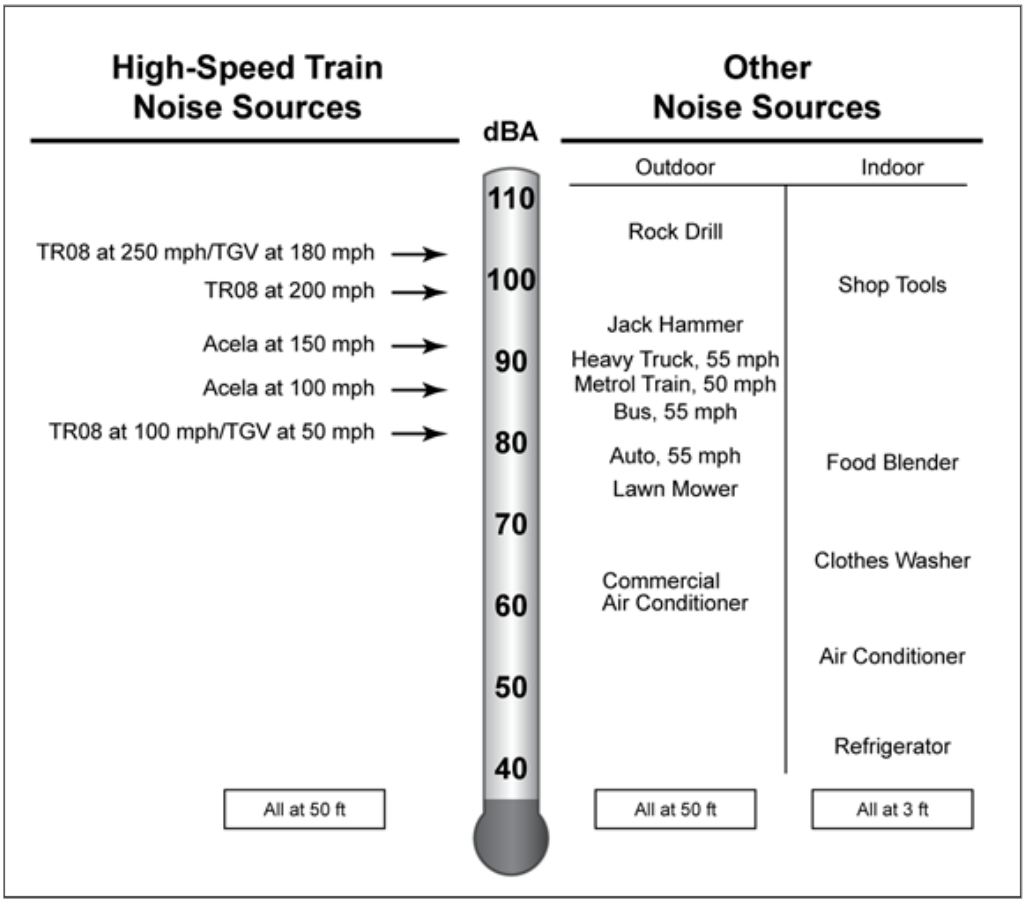
5.1 Key Terms

5.1.1 Noise and Vibration Descriptors

The following subsections identify the basic descriptors and metrics used in this report to quantify noise and vibration and to assess associated impacts. Appendix A, Fundamental Concepts of Noise and Vibration for High-Speed Trains, provides further background information regarding the noise and vibration associated with the project section. Much of this information has been adapted from the FRA's *High-Speed Ground Transportation Noise and Vibration Impact Assessment* manual (FRA 2012).

5.1.2 Noise Descriptors

The universal descriptor used for environmental noise is the A-weighted sound pressure level measured in decibels (dBA). It describes the level of noise measured at a receiver at a moment in time and is read directly from noise-monitoring equipment, with the weighting switch set on "A." Figure 5-1 depicts typical A-weighted sound levels for high-speed ground transportation and other sources. The high-speed ground transportation sources are described further in Appendix A.



Source: FRA 2012
Acela = Acela Express is Amtrak's high-speed rail service along the Northeast Corridor in the Northeastern United States between Washington, DC and Boston, MA via 14 intermediate stops including Baltimore, Philadelphia, and New York City; dBA = A-weighted decibels; TGV = *Train à Grande Vitesse,* French for "high-speed train"; TR08 = Transrapid International TR08 Maglev System, a transportation system employing magnetic levitation (maglev)

Figure 5-1 Typical A-Weighted Sound Pressure Levels

As depicted on Figure 5-1, typical A-weighted sound levels range from 40 dBA to 90 dBA, where 40 dBA represents a quiet sound, like outdoor ambient noise in a rural environment, and 90 dBA represents a loud sound, like a jackhammer at 50 feet. Decibels refer to the general strength of the noise. The scale in the figure is labeled “dBA” to denote the way A-weighted sound levels are typically written. The letters “dB” stand for “decibels,” and refer to the general strength of the noise. The letter “A” indicates that the sound has been filtered to reduce the strength of very low- and very high-frequency sounds, much as the human ear does. Without this A-weighting, noise-monitoring equipment would respond more readily to events that people could not hear, such as high-frequency dog whistles and low-frequency seismic disturbances. On average, each A-weighted sound level increase of 10 dB corresponds to an approximate doubling of subjective loudness. A summary of the fundamentals of noise related to high-speed transit is discussed in Appendix A.

This report uses the following single-number descriptors, based on the A-weighted sound pressure level as the fundamental unit for environmental noise measurements, computations, and assessment:

- **Maximum Instantaneous Noise Level:** L_{max} refers to the maximum observed or recorded noise level during a single noise event or measurement period. There are two standard ways of obtaining the L_{max}: one uses the “fast” response setting on the sound level meter, or $L_{max, fast}$ (obtained by using a 0.125-second averaging time), and the other uses the “slow” setting, or $L_{max, slow}$ (obtained by using a 1-second averaging time). $L_{max, fast}$ can occur arbitrarily and is usually caused by a single component on a moving train, often a defective component such as a flat spot on a wheel. As a result, inspectors from the FRA use $L_{max, fast}$ to identify excessively noisy locomotives and rail cars during enforcement of Railroad Noise Emission Compliance Regulations. $L_{max, slow}$, with a longer averaging time, tends to de-emphasize the effects of nonrepresentative impacts and impulses and is generally better correlated with the SEL, defined below, which is the basis of impact assessment. Therefore, $L_{max, slow}$ is typically used for modeling train noise mathematically. In general, however, the L_{max} descriptor in either form is not recommended for noise impact assessment because L_{max} is used in vehicle noise specifications and is commonly measured for individual vehicles.
- **Sound Exposure Level:** SEL refers to a receiver’s cumulative noise exposure from a single noise event. SEL is represented by the total A-weighted sound energy during the event, normalized to a 1-second interval. SEL is the primary descriptor of HSR vehicle noise emissions and an intermediate value in the calculation of both L_{eq} and L_{dn} (defined below).
- **Equivalent Continuous Sound Level:** L_{eq} refers to a receiver’s energy-averaged noise exposure from events over a specified period (e.g., 1 minute, 1 hour, 24 hours). The L_{eq} for a 1-hour period may be indicated as L_{eq}(1 h) or L_{eq}(h). The L_{eq} value for the 15-hour daytime period (7:00 a.m. to 10:00 p.m.) is described as Lday and the 9-hour nighttime period (10:00 p.m. to 7:00 a.m.) as Lnight. L_{eq} is generally used in this document to report results of short-term noise measurements (usually ranging between 20 minutes and 1 hour). The measured or estimated L_{eq}(1 h) or Lday values are generally used to assess noise impacts for nonresidential land uses with daytime-only uses.
- **Day-Night Equivalent Continuous Sound Level:** L_{dn} refers to a receiver’s energy-averaged noise exposure from events over a 24-hour period with a penalty added for nighttime noise periods. The basic unit used in calculating L_{dn} is the L_{eq}(h) for each 1-hour period. Ldn may be thought of as a noise exposure, totaled after increasing nighttime hourly A-weighted levels (between 10:00 p.m. and 7:00 a.m.) by 10 dB to take into account the increased sensitivity of most people to nighttime noise. Every noise event during the 24-hour period increases this exposure, with louder events increasing the value more than quieter events, and events that are of longer duration increasing the value more than brief events. In this report, Ldn is used to assess noise for residential land uses. Typical community L_{dn} values range from between 50 dBA and 70 dBA, where 50 dBA represents a quiet noise environment and 70 dBA a noisy one.

- **Community Noise Equivalent Level:** CNEL is a community noise descriptor frequently used in California. CNEL is calculated in a manner similar to L_{dn}, except with an additional 5 dBA penalty added for evening hours (between 7:00 p.m. and 10:00 p.m.), to take into account residential evening activities. CNEL values are generally within approximately 1 dBA of L_{dn} values measured for the same noise environments.

5.1.3 Vibratory Motion

Vibration is an oscillatory motion, which can be described in terms of displacement, velocity, or acceleration. Because the motion is oscillatory, no net movement of the vibration element happens and the average of any of the motion descriptors is zero. Displacement is the easiest descriptor to understand. For a vibrating floor, the displacement is simply the distance that a point on the floor moves away from its static position. The velocity represents the instantaneous speed of the floor movement and acceleration is the rate of change of the speed.

Although displacement is easier to understand than velocity or acceleration, it is rarely used to describe ground-borne vibration. This is because most transducers used for measuring ground-borne vibration use either velocity or acceleration, and, even more importantly, the response of humans, buildings, and equipment to vibration is more accurately described using velocity or acceleration.

5.1.4 Amplitude Descriptors

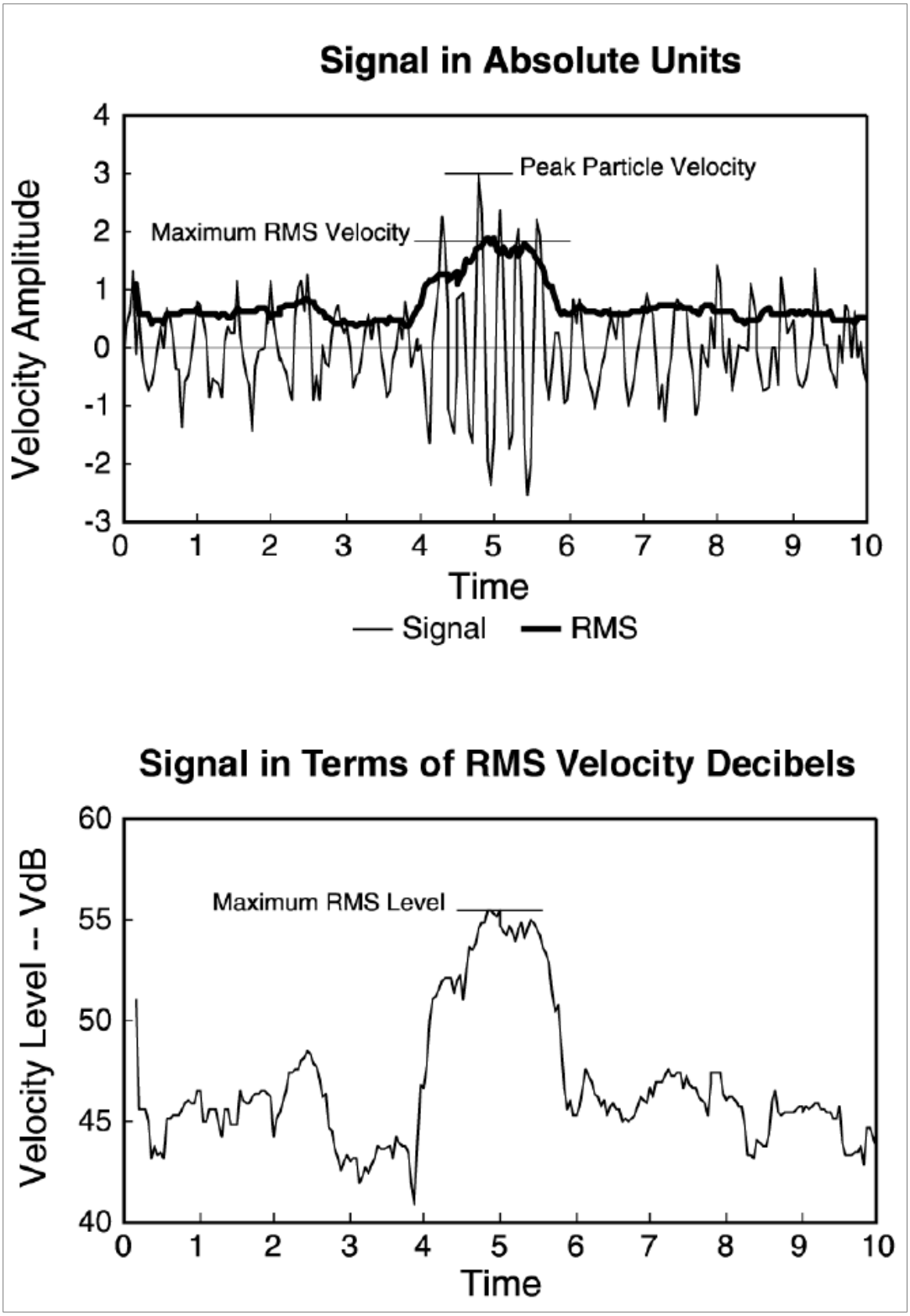
Vibration consists of rapidly fluctuating motions with an average motion of zero. The various methods used to quantify vibration amplitude are depicted on Figure 5-2. The raw signal is the lighter-weight curve in the top graph of Figure 5-2. This is the instantaneous vibration velocity, which fluctuates about the zero point. The PPV is defined as the maximum instantaneous positive or negative peak of the vibration signal. PPV often is used in monitoring blasting vibration because PPV is related to the stresses that are experienced by buildings.

Although PPV is appropriate for evaluating the potential of building damage, it is not suitable for evaluating human response. The human body takes time to respond to vibration signals. In a sense, the human body responds to average vibration amplitude. Because the net average of a vibration signal is zero, the RMS amplitude is used to describe the “smoothed” vibration amplitude. The RMS of a signal is the square root of the average of the squared amplitude of the signal. The average is typically calculated over a 1-second period. The RMS amplitude is depicted superimposed on the vibration signal on Figure 5-2. The RMS amplitude is always less than the PPV and is always positive. The ratio of PPV to maximum RMS amplitude is defined as the *crest factor* for the signal. The crest factor is always greater than 1.71, although a crest factor of 8 or more is not unusual for impulse signals. For ground-borne vibration from trains, the crest factor is usually 4 to 5.

In the United States, the PPV and RMS velocities are normally described in inches per second. Although not universally accepted, decibel notation is in common use for vibration. Decibel notation serves to compress the range of numbers required to describe vibration. The bottom graph on Figure 5-2 depicts the RMS curve of the top graph expressed in decibels. The vibration velocity level in decibels is defined as follows:

$$L_v = 20 \times \text{Log}_{10} (v/v_{ref})$$

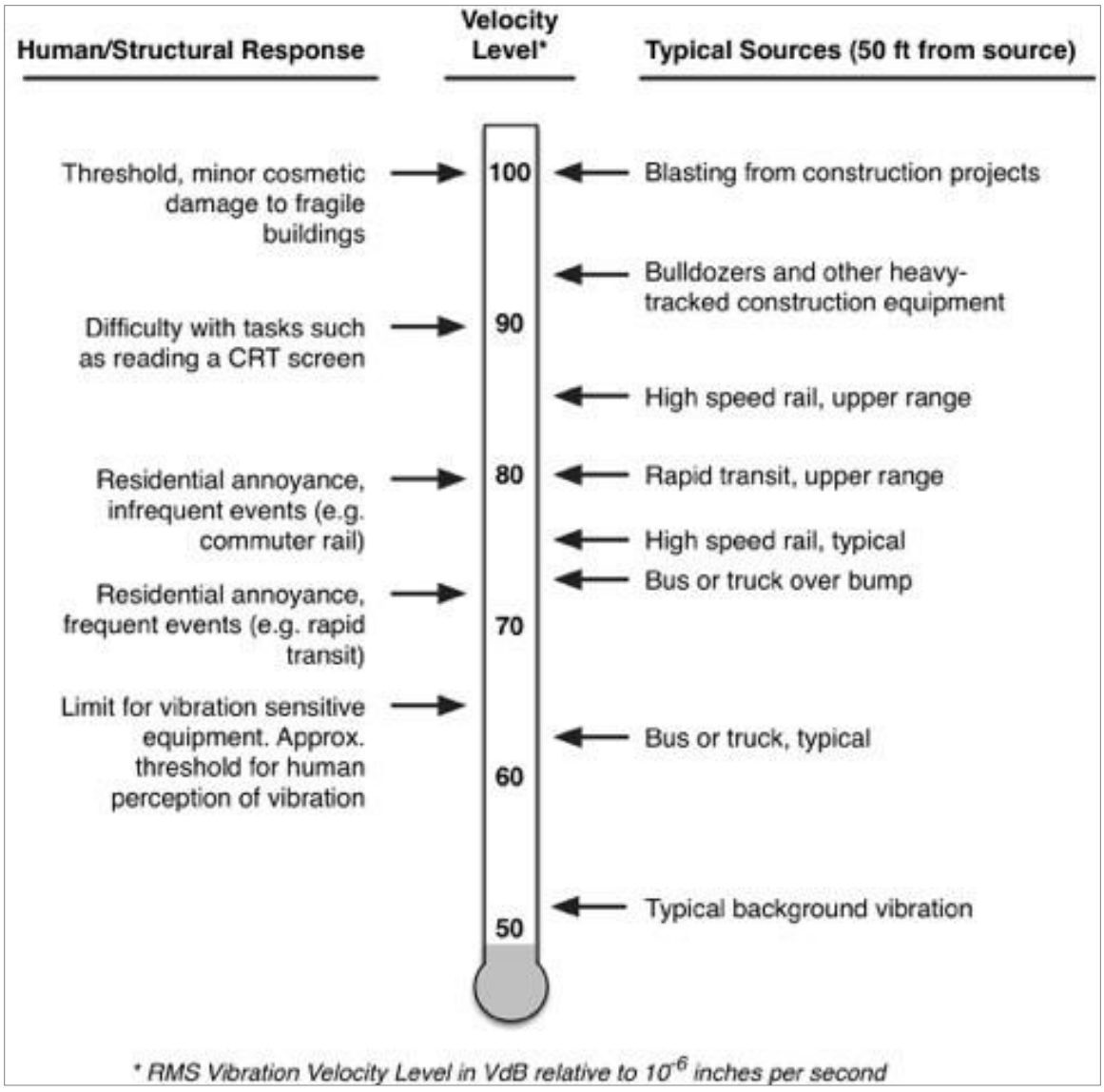
In the above equation, “L_v” is the velocity level in decibels, “v” is the RMS velocity amplitude, and “v_{ref}” is the reference velocity amplitude. A reference always must be specified whenever a quantity is expressed in terms of decibels. The accepted reference quantity for vibration velocity level in the United States is $1x10^{-6}$ inches per second. Vibration levels in this report are referenced to $1x10^{-6}$ inches per second. Although not a universally accepted notation, the abbreviation “VdB” (RMS vibration velocity level, decibels) is used in this document for vibration decibels to reduce the potential for confusion with sound decibels.



Source: FRA 2012

Figure 5-2 Different Methods of Describing a Vibration Signal

Common vibration sources and human and structural response to ground-borne vibration are illustrated on Figure 5-3. Typical vibration levels can range from below 50 VdB to 100 VdB (0.000316 to 0.1 inch per second). The human threshold of perception is approximately 65 VdB.



Source: FRA 2012

Figure 5-3 Typical Levels of Ground-Borne Vibration

5.1.5 Ground-Borne Noise

The rumbling sound caused by the vibration of room surfaces is called ground-borne noise. The annoyance potential of ground-borne noise is usually characterized using the A-weighted sound level. Although the A-weighted level is typically the only descriptor used for community noise, potential problems exist with characterizing low-frequency noise using A-weighting. This is because of the nonlinearity of human hearing, which causes sounds dominated by low-frequency components to seem louder than broadband sounds that have the same A-weighted level. The result is that a ground-borne noise level of 40 dBA sounds louder than 40 dBA broadband airborne noise. This anomaly is accounted for by setting the limits for ground-borne noise lower than would be the case for broadband noise.

Ground-borne noise is generally only an issue for trains operating underground. For systems where the train is operating either at or above grade, the airborne noise level is generally substantially louder than the ground-borne component, so that the ground-borne noise is masked by the airborne noise.

5.2 Existing Noise Environment

Sources of existing noise along the proposed alignment include passenger and freight trains, roadway traffic, aircraft, and local community sources.

5.2.1 Noise-Sensitive Receivers

Along the proposed right-of-way, noise-sensitive receivers within the RSA that could be affected by project-related noise needed to be identified. A series of estimated impact distances were used to narrow the area within which noise-sensitive receivers may be located. The FRA has established estimated impact distances for potential noise impacts based on existing land uses and the speed at which future railroad operations are expected to function. These estimated impact distances are presented in Table 5-1. For the purposes of this analysis, the existing environment is more consistent with the "existing rail corridor, urban/noisy suburban – unobstructed category." Additionally, while the maximum planned speed within this project section is 90 mph, the more conservative estimated impact distance of 700 feet that is associated with higher speed trains was used to be certain that potential impacts were considered. Noise-sensitive receivers were found by identifying existing noise-sensitive land uses (e.g., residences, schools, parks, libraries, and hospitals) within the appropriate noise impact estimated impact distances for the Shared Passenger Track Alternatives. In this case, the estimated impact distances used to identify noise-sensitive receivers were developed in accordance with FRA guidance. These are presented in Table 5-1.

Table 5-1 Estimated Impact Distances for Noise Assessments

Existing Noise Environment	Estimated Impact Distance in Feet for High-Speed Rail[1]	
	90 to 170 mph	170 mph or More
Existing rail corridor, urban/noisy suburban – unobstructed	300 feet	700 feet
Existing rail corridor, urban/noisy suburban – obstructed[2]	200 feet	300 feet
Existing rail corridor, quiet suburban/rural	500 feet	1,200 feet
New rail corridor, urban/noisy suburban – unobstructed	350 feet	700 feet
New rail corridor, urban/noisy suburban – obstructed[2]	250 feet	350 feet
New rail corridor, quiet suburban/rural	600 feet	1,300 feet

Source: FRA 2012
[1] Measured from the centerline of the guideway or rail corridor. Minimum distance is assumed to be 50 feet.
[2] Rows of buildings assumed to be 200, 400, 600, 800, and 1,000 feet parallel to the guideway.
mph = miles per hour

The noise estimated impact distances for noise-sensitive receivers depend on the existing noise environment and speeds of the trains. Ambient noise level measurements were completed at specific noise-sensitive receiver locations within the appropriate noise estimated impact distances for each existing noise environment to define the current ambient noise levels. For noise estimated impact distance purposes, existing noise environments are defined by the existence of rail corridors, by the type of existing noise environment based on the nearby population density (urban, suburban, and rural), and by whether the noise-sensitive receiver is obstructed or unobstructed from view of the Shared Passenger Track Alternatives. Estimated impact distances change based on the speeds of the trains. For example, trains moving up to 100 mph have a shorter screening distance than trains moving up to 200 mph. Existing noise environments where

there is a current rail corridor have shorter estimated impact distances than existing noise environments that lack a current rail corridor. Urban and noisy suburban existing noise environments have shorter estimated impact distances than quiet suburban and rural areas. Unobstructed noise-sensitive receivers have larger estimated impact distances than noise-sensitive receivers that have obstructed views of the potential noise source.

In order to identify areas that could be affected by noise from the project section, the locations of NSAs were determined, based on similar land use and existing noise levels. Forty-six NSAs were identified and ambient noise measurements (refer to Section 5.3) were conducted at 45 sites throughout the noise RSA along the proposed alignment in the project section. The measurement results at these locations were used to characterize the existing noise conditions at particular NSAs as noted in the tables below. The measurement locations are depicted on Figure 5-4, sheets 1 through 4, and site photographs are included in Appendix C, Noise and Vibration Measurement Site Photographs.

5.2.1.1 U.S. Highway 101 to Redondo Junction

NSAs for the area between US 101 and Redondo Junction are listed in Table 5-2 and include the NSA identification number, city, descriptions of the NSAs, and noise measurement sites used for each NSA. In the table, the NSAs are described as being on either the northbound or southbound side of the alignment based on the assumption that trains generally travel on the right side of double-track sections.

Table 5-2 Noise-Sensitive Areas for U.S. Highway 101 to Redondo Junction

NSA ID	Description	Measurement Locations
1a	This area is on the northbound side of the proposed alignment bounded by U.S. Highway 101 and E 1st St. The land use is a mixture of commercial and industrial. The noise-sensitive receiver is Felicitas and Gonzalo Mendez High School 974 feet from the proposed alignment.	ST-1
2a	This area is on the northbound side of the proposed alignment bounded by E 1st St and Whittier Blvd. The land use is a mixture of commercial and industrial. The noise-sensitive receivers are Monarch Studios 595 feet from the proposed alignment and Ace Mission Studios 762 feet from the proposed alignment.	ST-1
3a	This area is on the southbound side of the proposed alignment bounded by E 1st St and Whittier Blvd. The land use is a mixture of commercial, industrial, and multifamily residences. The closest noise-sensitive receiver is 388 feet from the proposed alignment.	LT-1
4a	This area is on the northbound side of the proposed alignment bounded by Whittier Blvd and Redondo Junction. The land use is a mixture of commercial and industrial. The noise-sensitive receivers are Downtown Rehearsal, a recording studio space 552 feet from the proposed alignment, and Lemon Tree Studios – DTLA, a film studio space 660 feet from the proposed alignment.	ST-1
5a	This area is on the southbound side of the proposed alignment bounded by Whittier Blvd and Redondo Junction. The land use is a mixture of commercial, industrial, and multifamily residences. Corridor Digital Studio, Orbital Studios, and Void Studios are also in this area. The closest noise-sensitive receiver is 227 feet from the proposed alignment.	LT-1

ID = identification; NSA = noise-sensitive area

5.2.1.2 Redondo Junction to Fullerton Junction

NSAs for the area between Redondo Junction and Fullerton Junction are listed in Table 5-3 and include the NSA identification number, city, descriptions of the NSAs, and noise measurement

sites used for each NSA. In the table, the NSAs are described as being on either the northbound or southbound side of the alignment based on the assumption that trains generally travel on the right side of double-track sections.

Table 5-3 Noise-Sensitive Areas for Redondo Junction to Fullerton Junction

NSA ID	Description	Measurement Locations
1b	This area is on the northbound side of the proposed alignment bounded by I-710 and I-5. The land use is a mixture of commercial and industrial. Noise-sensitive receivers are limited to the Immediate Medical Center 485 feet from the proposed alignment.	ST-3
2b	This area is on the northbound side of the proposed alignment bounded by I-5 and Greenwood Ave. The land use is a mixture of commercial, industrial, and single-family residences. The closest noise-sensitive receiver is 570 feet from the proposed alignment.	LT-3
3b	This area is on the northbound side of the proposed alignment bounded by Greenwood Ave and the Rio Hondo Channel. The land use is a mixture of single- and multifamily residences. The closest noise-sensitive receiver is 121 feet from the proposed alignment.	LT-3
4b	This area is on the southbound side of the proposed alignment bounded by the Rio Hondo Channel and Rosemead Blvd. The land use is single-family residential. The closest noise-sensitive receiver is 26 feet from the proposed alignment.	LT-4
5b	This area is on the northbound side of the proposed alignment bounded by Rosemead Blvd and Passons Blvd. The land use is a mixture of single- and multifamily residential. The closest noise-sensitive receiver is 113 feet from the proposed alignment.	LT-5
6b	This area is on the southbound side of the proposed alignment bounded by Rosemead Blvd and Passons Blvd. The land use is a mixture of residential, commercial, and industrial buildings. The closest noise-sensitive receiver is 308 feet from the proposed alignment.	LT-4/ST-11
7b	This area is on the northbound side of the proposed alignment bounded by Passons Blvd and I-605. The land use includes single-family houses and the Plaza de la Raza/ Maizeland School. The closest noise-sensitive receiver is 126 feet from the proposed alignment.	LT-5/LT-7/ST-6
8b	This area is on the southbound side of the proposed alignment bounded by Passons Blvd and I-605. The land use is single-family residential. A row of commercial buildings and Slauson Ave lie between the proposed alignment and the closest receiver. The closest noise-sensitive receiver is 278 feet from the proposed alignment.	LT-6
9b	This area is on the northbound side of the proposed alignment bounded by I-605 and Norwalk Blvd. The land use includes single-family homes, Los Nietos Middle School, and Our Lady of Perpetual Help. The closest noise-sensitive receiver is 71 feet from the proposed alignment.	LT-7/LT-8/ST-7
10b	This area is on the southbound side of the proposed alignment bounded by Telegraph Rd and Lakeland Rd. The land use includes single-family residential. The closest noise-sensitive receiver is 854 feet from the proposed alignment.	LT-9
11b	This area is on the southbound side of the proposed alignment bounded by Lakeland Rd and Imperial Hwy. The land use is a mixture of commercial and industrial. The noise-sensitive receiver is the PIH Health Urgent Care Center – Santa Fe Springs, 712 feet from the proposed alignment.	ST-8

NSA ID	Description	Measurement Locations
12b	This area is on the southbound side of the proposed alignment bounded by Imperial Hwy and Foster Rd. The land use is a mixture of single- and multifamily residential. This area includes John H. Glenn High School. The closest noise-sensitive receiver is 101 feet from the proposed alignment.	LT-9/LT-10/ST-8
13b	This area is on the northbound side of the proposed alignment bounded by La Canada Verde Creek and Valley View Ave. The land use is a mixture of single-family residential, commercial, and industrial buildings. The closest noise-sensitive receiver is 595 feet from the proposed alignment.	LT-11
14b	This area is on the northbound side of the proposed alignment bounded by Valley View Ave and La Mirada Creek. The land use is a mixture of single- and multifamily houses. Stage Rd runs between the tracks and the houses. The closest noise-sensitive receiver is 104 feet from the proposed alignment.	LT-11
15b	This area is on the northbound side of the proposed alignment bounded by La Mirada Creek and Alondra Blvd. The land use is single-family residential. Stage Rd runs between the tracks and the houses. The closest noise-sensitive receiver is 104 feet from the proposed alignment.	LT-12
16b	This area is on the northbound side of the proposed alignment bounded by Alondra Blvd and Coyote Creek. The land use is single-family residential and Neff Park. Stage Rd runs between the tracks and the houses. The closest noise-sensitive receiver is 99 feet from the proposed alignment.	LT-13
17b	This area is on the northbound side of the proposed alignment bounded by Coyote Creek and Stanton Ave. The land use is a mixture of multifamily residential and commercial. The closest noise-sensitive receiver is 295 feet from the proposed alignment.	LT-13/LT-16
18b	This area is on the southbound side of the proposed alignment bounded by Coyote Creek and Stanton Ave. The land use is a mixture of single and multifamily residences, commercial buildings, and Jesus' Hands Montessori Preschool. The closest noise-sensitive receiver is 130 feet from the proposed alignment.	LT-14/LT-15
19b	This area is on the northbound side of the proposed alignment bounded by Stanton Ave and Artesia Ave. The land use is a mixture of single- and multifamily residential. The closest noise-sensitive receiver is 29 feet from the proposed alignment.	LT-16
20b	This area is on the southbound side of the proposed alignment bounded by Stanton Ave and Artesia Ave. The land use is a mixture of industrial buildings and single- and multifamily houses. This area includes the Praise Chapel of Buena Park. The closest noise-sensitive receiver is 109 feet from the proposed alignment.	LT-15/ST-4
21b	This area is on the southbound side of the proposed alignment bounded by Artesia Ave and Brookhurst St. The land use is a mixture of industrial buildings and single- and multifamily houses. The closest noise-sensitive receiver is 184 feet from the proposed alignment.	LT-17
22b	This area is on the northbound side of the proposed alignment bounded by Brookhurst St and Euclid St. The land use is a mixture of commercial and single- and multifamily residential. The closest noise-sensitive receiver is 131 feet from the proposed alignment.	LT-18/ST-15

NSA ID	Description	Measurement Locations
23b	This area is on the southbound side of the proposed alignment bounded by Brookhurst St and Euclid St. The land use is a mixture of industrial, commercial, and single- and multifamily residential. This area includes the Hunt Branch Library, Pacific Drive Elementary School, One Spirit Church, and Grace Korean Ministries. The closest noise-sensitive receiver is 38 feet from the proposed alignment.	LT-19/ST-13
24b	This area is on the northbound side of the proposed alignment bounded by Euclid St and S Harbor Blvd. The land use is a mixture of commercial and single- and multifamily residential. This area includes Saint Mary's Catholic Church. The closest noise-sensitive receiver is 99 feet from the proposed alignment.	LT-20/ST-9
25b	This area is on the southbound side of the proposed alignment bounded by Euclid St and S Harbor Blvd. The land use is a mixture of industrial, commercial, and single- and multifamily residential. This area includes the Vietnamese Muslim Community and Independence Park. The closest receiver is 62 feet from the proposed alignment.	LT-21/ST-9
26b	This area is on the northbound side of the proposed alignment bounded by S Harbor Blvd and Fullerton Junction. The land use is a mixture of industrial, commercial, and single- and multifamily residential. This area includes STAGES theater and Alt Timelines Video Productions. The closest noise-sensitive receiver is 164 feet from the proposed alignment.	ST-9
27b	This area is on the southbound side of the proposed alignment bounded by S Harbor Blvd and Fullerton Junction. The land use is a mixture of industrial, commercial, and single- and multifamily residential. This area includes the Vineyard Fullerton Church, Maverick Theater, and Pure Water Church. On the eastern side, E Walnut Ave is between the tracks and the first row of multifamily receivers. On the western side, there is a row of industrial buildings between the tracks and the first row of houses. The closest noise-sensitive receiver is 82 feet from the proposed alignment.	LT-22/ST-9

I- = Interstate; ID = identification; NSA = noise-sensitive area

5.2.1.3 Fullerton Junction to ARTIC

NSAs for the area between Fullerton Junction and ARTIC are listed in Table 5-4 and include the NSA identification number, city, descriptions of the NSAs, and noise measurement sites used for each NSA. In the table, the NSAs are described as being on either the northbound or southbound side of the alignment based on the assumption that trains generally travel on the right side of double-track sections.

Table 5-4 Noise-Sensitive Areas for Fullerton Junction to ARTIC

NSA ID	Description	Measurement Locations
1c	This area is on the northbound side of the proposed alignment bounded by Fullerton Junction and E Orangethorpe Ave. The land use is a mixture of industrial, commercial, and single- and multifamily residential. The closest noise-sensitive receiver is 380 feet from the proposed alignment.	LT-24
2c	This area is on the southbound side of the proposed alignment bounded by Fullerton Junction and E Orangethorpe Ave. The land use is primarily single-family residential adjacent to the track. The closest noise-sensitive receiver is 48 feet from the proposed alignment.	LT-22

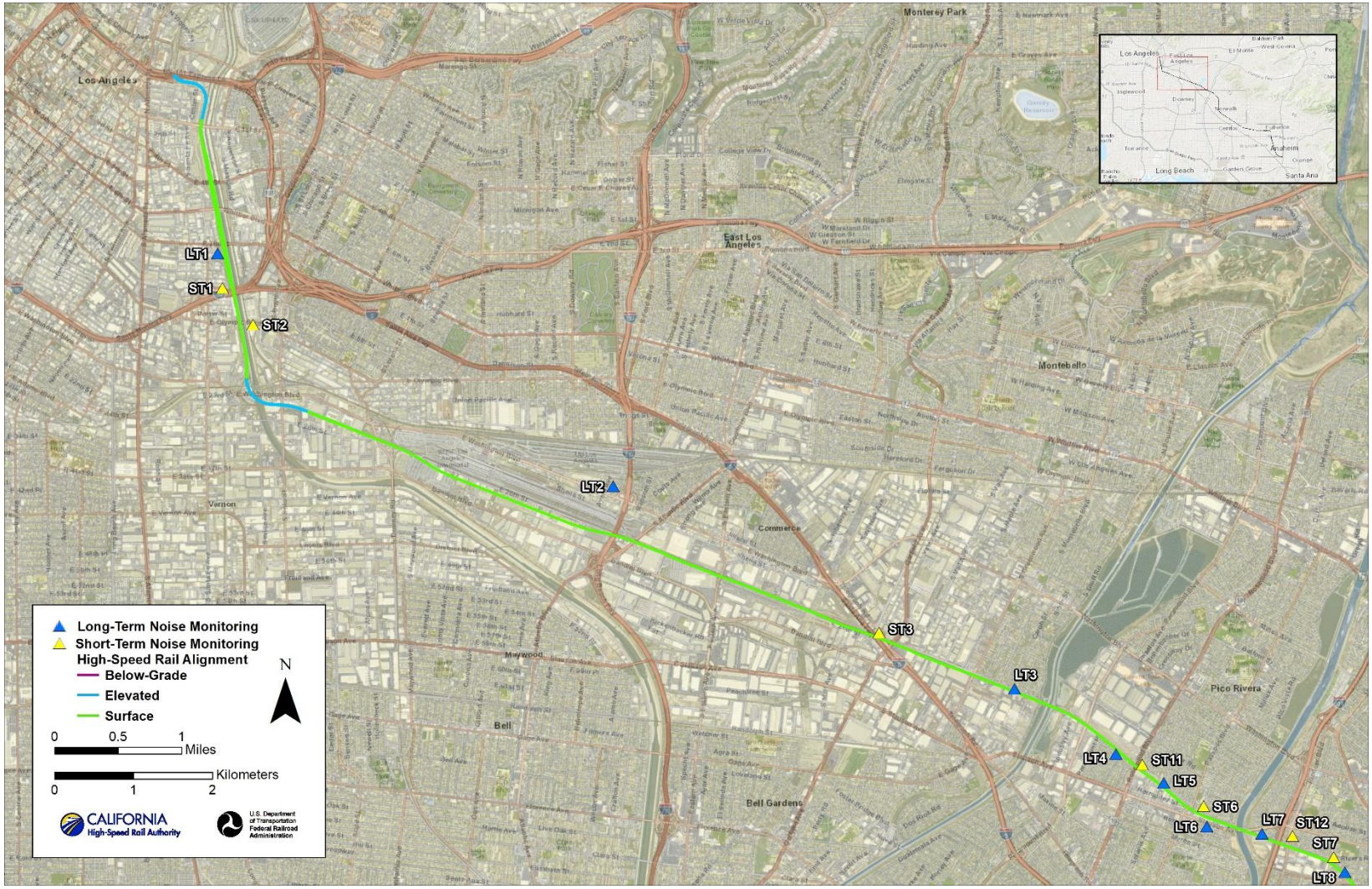
NSA ID	Description	Measurement Locations
3c	This area is on the northbound side of the proposed alignment bounded by E Orangethorpe Ave and E La Palma Ave. The land use is a mixture of industrial and single- and multifamily residential. This area includes the Recording Connection Audio Institute. The houses are south SR-91 and adjacent to the tracks. The closest noise-sensitive receiver is 60 feet from the proposed alignment.	LT-25
4c	This area is on the northbound side of the proposed alignment bounded by E La Palma Ave and E Wilhelmina St. The land use is a mixture of single- and multifamily residential. The closest noise-sensitive receiver is 59 feet from the proposed alignment.	LT-26
5c	This area is on the southbound side of the proposed alignment bounded by E La Palma Ave and E Wilhelmina St. The land use is a mixture of industrial and single- and multifamily residential. There is an industrial use lot between the proposed alignment and the nearest residence. The closest noise-sensitive receiver is 137 feet from the proposed alignment.	LT-27
6c	This area is on the northbound side of the proposed alignment bounded by E Wilhelmina St and Lincoln Ave. The land use is a mixture of single- and multifamily residential. The closest noise-sensitive receiver is 21 feet from the proposed alignment.	LT-27/LT-28
7c	This area is on the southbound side of the proposed alignment bounded by E Wilhelmina St and Lincoln Ave. The land use is a mixture of industrial and single- and multifamily residential. The closest noise-sensitive receiver is 33 feet from the proposed alignment.	LT-27/LT-28
8c	This area is on the northbound side of the proposed alignment bounded by Lincoln Ave and E Santa Ana St. The land use includes a mixture of single- and multifamily residences directly adjacent to the proposed alignment. The closest noise-sensitive receiver is 42 feet from the proposed alignment.	LT-28/LT-29
9c	This area is on the southbound side of the proposed alignment bounded by Lincoln Ave and E Santa Ana St. The land use is a mixture of commercial and single- and multifamily residential. There is a row of commercial or other land use between the proposed alignment and the nearest residence. The closest noise-sensitive receiver is 208 feet from the proposed alignment.	LT-28/LT-29
10c	This area is on the northbound side of the proposed alignment bounded by E Santa Ana St and E Vermont Ave. The land use is a mixture of industrial and multifamily residential. The closest noise-sensitive receiver is 50 feet from the proposed alignment.	LT-29
11c	This area is on the southbound side of the proposed alignment bounded by E Santa Ana St and E Vermont Ave. The land use is a mixture of industrial and single- and multifamily residential. This area includes Thomas Jefferson Elementary School. The closest noise-sensitive receiver is 30 feet from the proposed alignment.	LT-30/ST-10
12c	This area is on the northbound side of the proposed alignment bounded by E Vermont Ave and E Cerritos Ave. The land use is a mixture of commercial and industrial. This area includes the Martinez Granite (a place of worship) and the Salvation Army Adult Rehabilitation Center. The closest noise-sensitive receiver is 396 feet from the proposed alignment.	LT-31/ST-10

NSA ID	Description	Measurement Locations
13c	This area is on the northbound side of the proposed alignment bounded by E Cerritos Ave and ARTIC. The land use is a mixture of commercial and industrial. This area includes Tru One Records. The closest noise-sensitive receiver is 373 feet from the proposed alignment.	ST-10
14c	This area is on the southbound side of the proposed alignment bounded by E Cerritos Ave and ARTIC. The land use is a mixture of industrial, commercial, and multifamily residential. This area includes the Saddleback Church Anaheim, Iglesia Adventista Del 7mo Dia Hispana Emmanuel, City National Grove of Anaheim (a theater space), and Magnolia Park. The closest noise-sensitive receiver is 80 feet from the proposed alignment.	LT-31/ST-10

ARTIC = Anaheim Regional Transportation Intermodal Center; NSA = noise-sensitive area; SR = State Route

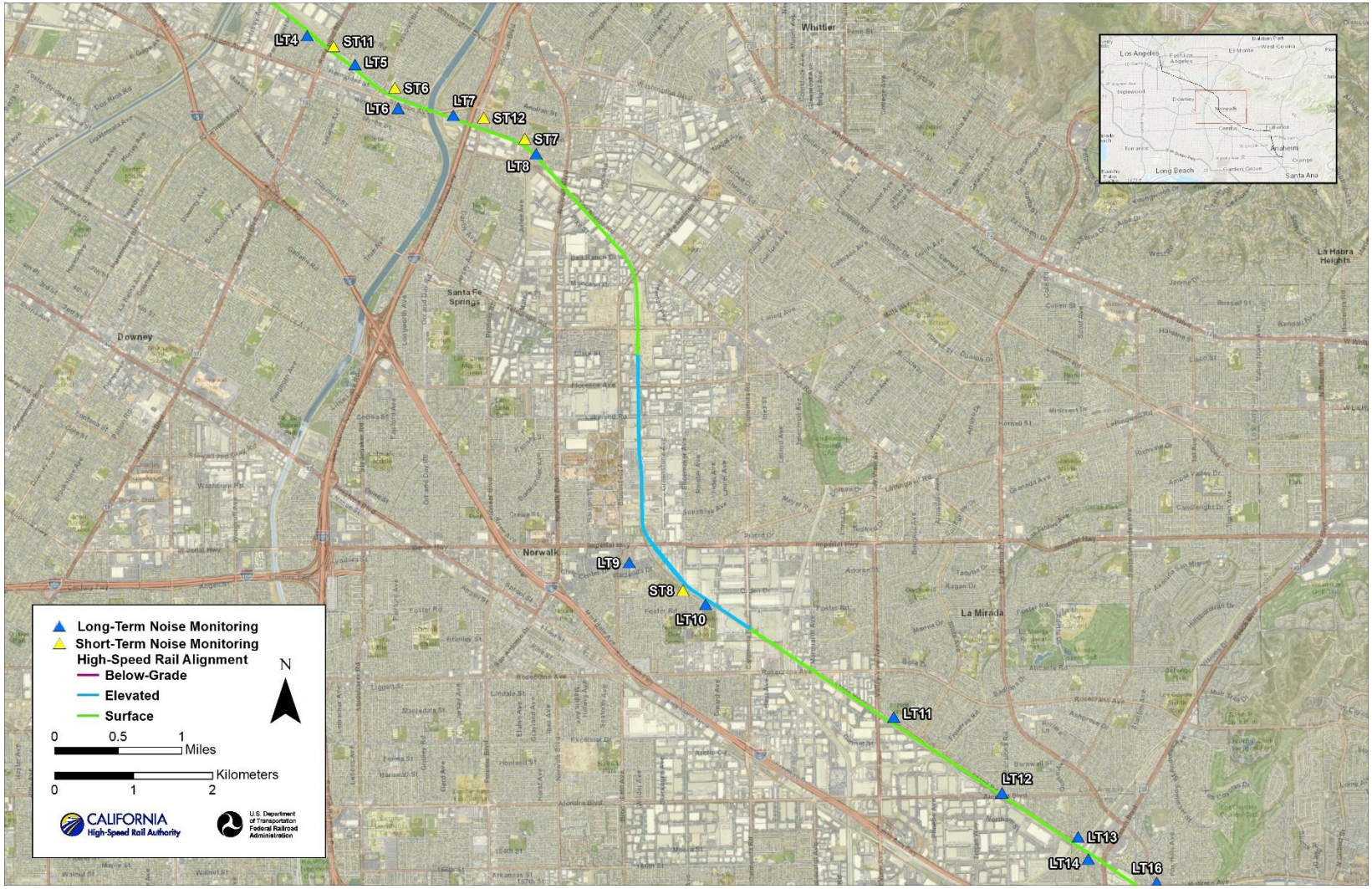
5.3 Existing Noise Conditions

Existing ambient noise measurements were conducted at 45 locations in the noise RSA along the proposed HSR alignment in the project section. Long-term (24- to 48-hour) measurements were made at 30 sites and short-term (1-hour) measurements were made at 15 sites. The 24- to 48-hour measurements were analyzed in 24-hour periods for long-term analysis purposes. The measurement locations are depicted on Figure 5-4, sheets 1 through 3, and site photographs are included in Appendix C. In addition, field data are included in Appendix D, Field Noise Measurement Documentation and Detail. Descriptions of the measurement sites are provided below, and the results are summarized in Table 5-5. For the short-term measurements in Table 5-5, L_{dn} values were estimated by subtracting 2 dB from the measured 1-hour L_{eq} values, based on FTA methodology.



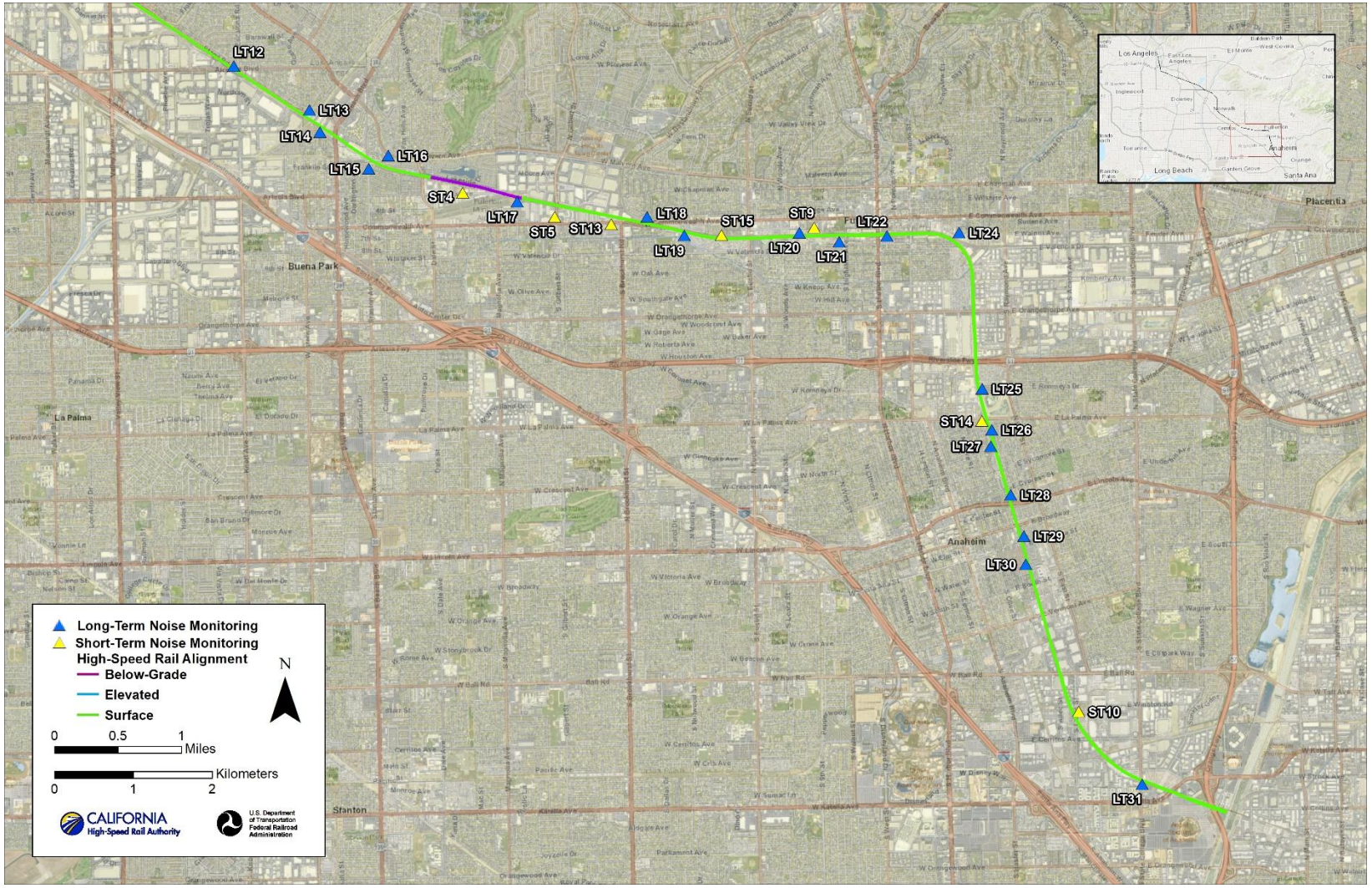
Source: ESRI 2024
Preliminary draft; alignment subject to change.

Figure 5-4 Existing Noise Measurement Locations (Sheet 1 of 3)



Source: ESRI 2024
Preliminary draft; alignment subject to change.

Figure 5-4 Existing Noise Measurement Locations (Sheet 2 of 3)



Source: ESRI 2024
Preliminary draft; alignment subject to change.

Figure 5-4 Existing Noise Measurement Locations (Sheet 3 of 3)

Table 5-5 Summary of Existing Noise Measurements

Site No.	NSA	Measurement Location	City	Measurement Start		Meas. Duration (hr)	Noise Level (dBA)	
				Date	Time		L_{eq}[1]	L_{dn}
LT-1	3a/5a	2140 E 7th Pl	Los Angeles	8/3/2016	11:00 a.m.	24	62	67
LT-2	N/A	2308 Bedessen Ave	Commerce	8/4/2016	11:00 a.m.	24	60	67
LT-3	2b/3b	1498 Carob Wy	Montebello	8/2/2016	4:00 p.m.	24	64	74
LT-4	4b	8743 Warvale St	Pico Rivera	8/1/2016	1:00 p.m.	24	61	67
LT-5	5b/7b	7560 Serapis Ave	Pico Rivera	8/1/2016	1:00 p.m.	24	67	75
LT-6	8b	7805 Hasty Ave	Pico Rivera	8/1/2016	1:00 p.m.	24	62	67
LT-7	7b/9b	10481 Cascade Cir	Whittier	8/1/2016	12:00 p.m.	24	77	82
LT-8	9b	11437 Burke St	Whittier	8/1/2016	12:00 p.m.	24	70	77
LT-9	10b/12b	12657 Civic Center Dr	Norwalk	8/8/2016	4:00 p.m.	24	57	63
LT-10	12b	Hayden Ave	Norwalk	7/28/2016	12:00 p.m.	24	61	68
LT-11	13b/14b	14354 San Ardo Dr	La Mirada	7/27/2016	12:00 p.m.	24	60	68
LT-12	15b	Stage Rd	La Mirada	7/27/2016	12:00 p.m.	24	73	76
LT-13	16b/17b	7756 Granada Dr	Buena Park	7/27/2016	11:00 a.m.	24	64	70
LT-14	18b	7632 Tulare St	Buena Park	7/27/2016	11:00 a.m.	24	61	68
LT-15	18b/20b	5751 Stanton Ave	Buena Park	7/27/2016	11:00 a.m.	24	57	64
LT-16	17b/19b	5622 Cajon Ave	Buena Park	8/8/2016	2:00 p.m.	24	68	72
LT-17	21b	139 N Pritchard Ave	Fullerton	7/25/2016	3:00 p.m.	24	64	71
LT-18	22b	1812 Gregory Ave	Fullerton	7/25/2016	2:00 p.m.	24	63	67
LT-19	23b	207 S Basque Ave	Fullerton	7/25/2016	1:00 p.m.	24	60	68
LT-20	24b	201 Chestnut Pl	Fullerton	8/3/2016	11:00 a.m.	24	66	74
LT-21	25b	311 S Highland Ave	Fullerton	7/25/2016	12:00 p.m.	24	54	60
LT-22	27b/2c	303 Metro Ct	Fullerton	7/25/2016	12:00 p.m.	24	68	75
LT-24	1c	145 S Princeton Ave	Fullerton	7/20/2016	5:00 p.m.	24	61	68
LT-25	3c	801 E Balsam Ave	Anaheim	7/20/2016	4:00 p.m.	24	65	69
LT-26	4c/6c	759 N Mavis St	Anaheim	7/19/2016	4:00 p.m.	24	65	67
LT-27	5c/7c	712 N Pauline St	Anaheim	7/19/2016	4:00 p.m.	24	58	61

Site No.	NSA	Measurement Location	City	Measurement Start		Meas. Duration (hr)	Noise Level (dBA)	
				Date	Time		L_{eq}[1]	L_{dn}
LT-28	6c/7c/8c/9c	198 N Vintage Ln	Anaheim	7/19/2016	3:00 p.m.	24	57	61
LT-29	8c/9c/10c	385 S Vine St	Anaheim	7/19/2016	1:00 p.m.	24	58	61
LT-30	11c	696 E Water St	Anaheim	7/19/2016	12:00 p.m.	24	59	62
LT-31	12c/14c	Marriot TownePlace Suites	Anaheim	7/19/2016	11:00 a.m.	24	68	71
ST-1	1a/2a/4a	2444 E 8th St	Los Angeles	8/4/2016	3:09 p.m.	1	61	59[2]
ST-2	N/A	2556 E Olympic Blvd	Los Angeles	8/4/2016	4:22 p.m.	1	66	64[2]
ST-3	1b	6630 Telegraph Rd	Commerce	8/9/2016	3:00 p.m.	1	73	71[2]
ST-4	20b	Praise Chapel Orange County	Fullerton	7/28/2016	4:50 p.m.	1	70	68[2]
ST-5	N/A	Kingdom Hall	Fullerton	7/28/2016	3:43 p.m.	1	68	66[2]
ST-6	7b	7601 Cord Ave	Pico Rivera	8/9/2016	4:30 p.m.	1	60	58[2]
ST-7	9b	8600 S Alburtis Ave	Whittier	8/8/2016	5:00 p.m.	1	61	59[2]
ST-8	11b/12b	13031 Shoemaker Ave	Norwalk	8/8/2016	3:40 p.m.	1	58	56[2]
ST-9	24b/25b/26b/27b	100 S Richman Ave	Fullerton	8/3/2016	4:16 p.m.	1	57	55[2]
ST-10	11c/12c/13c/14c	1300 S Lewis St	Anaheim	8/10/2016	7:53 a.m.	1	67	65[2]
ST-11	6b	9016 Rivera Rd	Pico Rivera	8/1/2016	1:40 p.m.	1	56	54[2]
ST-12	N/A	10701 Wheelock Cir	Whittier	8/1/2016	2:56 p.m.	1	64	62[2]
ST-13	23b	1830 Commonwealth Ave	Fullerton	7/25/2016	4:30 p.m.	1	70	68[2]
ST-14	N/A	828 N Pauline St	Anaheim	7/19/2016	3:54 p.m.	1	65	63[2]
ST-15	22b	140 S Citrus Ave	Fullerton	7/25/2016	2:34 p.m.	1	58	56[2]

[1] One-hour L_{eq} measurements during a representative peak hour period.
[2] Estimated based on measured 1-hour L_{eq}.
dBA = A-weighted decibels; hr = hours; L_{dn} = day-night sound level; L_{eq} = equivalent sound level; N/A = not applicable; NSA = noise-sensitive area

5.3.1 U.S. Highway 101 to Redondo Junction

Descriptions of the noise measurement sites for the areas they represent are as follows.

Site LT-1: 2140 E Seventh Place, Los Angeles. The measured L_{dn} at this location was 67 dBA. The dominant noise sources were local roadway traffic and rail traffic. The rail line runs

perpendicular to E Seventh Place. Noise levels were measured for 24 hours outside the apartment building on E Seventh Place. This site is representative of the ambient noise conditions between Whittier Boulevard and Redondo Junction (NSAs 3a and 5a).

Site LT-2: 2308 Bedessen Avenue, Commerce. The measured L_{dn} at this location was 67 dBA. The dominant noise sources were local traffic, rail traffic, and industrial noise sources. Noise levels were measured for 24 hours in front of the house. This site is representative of the ambient noise conditions at the rail yard close to I-710. This measurement was not used because there were no sensitive receivers in the area.

Site ST-1: 2444 E Eighth Street, Los Angeles. The measured L_{eq} at this location was 61 dBA. The dominant noise sources were local traffic and aircraft. Noise levels were measured for 1 hour (starting at 3:09 p.m.) on the sidewalk in front of the distillery. This measurement site is representative of the noise at the Downtown Rehearsal studio and other studios in the Los Angeles Arts District (NSAs 1a, 2a and 4a).

Site ST-2: 2556 E Olympic Boulevard, Los Angeles. The measured L_{eq} at this location was 66 dBA. The dominant noise sources were local traffic and trains. Noise levels were measured for 1 hour (starting at 4:22 p.m.) on the paved area below the raised roadway of Olympic Boulevard. This measurement was not used because ST-1 was closer to the sensitive receivers.

5.3.2 Redondo Junction to Fullerton Junction

Descriptions of the noise measurement sites for the areas they represent are as follows.

Site LT-3: 1498 Carob Way, Montebello. The measured L_{dn} at this location was 74 dBA. The dominant noise sources were rail traffic and local traffic on Sycamore Street. The rail line runs parallel to Sycamore Street. Noise levels were measured for 24 hours on the southwestern edge of the property. This site is representative of the ambient noise conditions on the northbound side of the project section between I-5 and the Rio Hondo Channel (NSAs 2b and 3b).

Site LT-4: 8743 Warvale Street, Pico Rivera. The measured L_{dn} at this location was 67 dBA. The dominant noise source was rail traffic. The rail line runs parallel to Warvale Street on the far side of a row of houses. Noise levels were measured for 24 hours in front of the house. This site is representative of the ambient noise conditions on the southbound side of the proposed project alignment between the Rio Hondo Channel and Passons Boulevard (NSA 4b).

Site LT-5: 7560 Serapis Avenue, Pico Rivera. The measured L_{dn} at this location was 75 dBA. The dominant noise sources were local traffic and rail traffic. The rail line runs parallel to Rivera Road. Noise levels were measured for 24 hours on the southwestern edge of the property. This site is representative of the ambient noise conditions on the northbound side of the project alignment between Whittier Boulevard and Redondo Junction (NSAs 5b and 7b).

Site LT-6: 7805 Hasty Avenue, Pico Rivera. The measured L_{dn} at this location was 67 dBA. The dominant noise source was local traffic on Slauson Avenue. The rail line is parallel to Slauson Avenue. Noise levels were measured for 24 hours in front of the house at 7805 Hasty Avenue. This site is representative of the ambient noise conditions on the northbound side of the proposed project alignment between Rosemead Boulevard and I-605 (NSA 8b).

Site LT-7: 10481 Cascade Circle, Whittier. The measured L_{dn} at this location was 82 dBA. The dominant noise sources were local traffic, traffic on I-605 and rail traffic. The rail line runs parallel to Rivera Road. Noise levels were measured for 24 hours in front of the house on Cascade Circle, approximately 115 feet from the existing tracks. This site is representative of the ambient noise conditions on the northbound side of the proposed project alignment between San Gabriel River and Millergrove Drive (NSAs 7b and 9b).

Site LT-8: 11437 Burke Street, Whittier. The measured L_{dn} at this location was 77 dBA. The dominant noise sources were rail traffic and neighborhood activities. The rail line is adjacent to the corner of Short Street and Burke Street. Noise levels were measured for 24 hours on the south corner of Short Street and Burke Street. This site is representative of the ambient noise

conditions on the northbound side of the proposed project alignment between I-605 and Norwalk Boulevard (NSA 9b).

Site LT-9: 12657 Civic Center Drive, Norwalk. The measured L_{dn} at this location was 63 dBA. The dominant noise sources were local traffic and other ambient sources. The rail line runs perpendicular to Civic Center Drive. Noise levels were measured for 24 hours next to the apartments on the north side of Civic Center Drive. This site is representative of the ambient noise conditions on the southbound side of the proposed project alignment between Imperial Highway and Foster Road (NSAs 10b and 12b).

Site LT-10: Hayden Avenue, Norwalk. The measured L_{dn} at this location was 68 dBA. The dominant noise sources were rail traffic and ambient neighborhood sources. The rail line runs perpendicular to Hayden Avenue. Noise levels were measured for 24 hours in front of the house on the southwest side of the cul-de-sac. This site is representative of the ambient noise conditions on the southbound side of the proposed project alignment between Imperial Highway and Foster Road (NSA 12b).

Site LT-11: 14354 San Ardo Drive, La Mirada. The measured L_{dn} at this location was 68 dBA. The dominant noise sources were existing rail traffic, local traffic, and ambient neighborhood sources. The rail line runs parallel to Stage Road a block south of the measurement site. Noise levels were measured for 24 hours on the southwest corner of Castellon Road and San Ardo Drive. This site is representative of the ambient noise conditions on the northbound side of the proposed project alignment between La Canada Verde Creek and La Mirada Creek (NSAs 13b and 14b).

Site LT-12: Stage Road, La Mirada. The measured L_{dn} at this location was 76 dBA. The dominant noise sources were local traffic and rail traffic. The rail line runs parallel to Stage Road. Noise levels were measured for 24 hours in a grassy area on the corner of Alondra Blvd and Stage Road. This site is representative of the ambient noise conditions on the northbound side of the proposed project alignment between La Mirada Creek and Alondra Boulevard (NSA 15b).

Site LT-13: 7756 Granada Drive, Buena Park. The measured L_{dn} at this location was 70 dBA. The dominant noise sources were local traffic and ambient residential sources. The rail line runs parallel to Stage Road a block south of the noise measurement site. Noise levels were measured for 24 hours on the western edge of the property. This site is representative of the ambient noise conditions on the northbound side of the proposed project alignment between Alondra Boulevard and Stanton Avenue (NSAs 16b and 17b).

Site LT-14: 7632 Tulare Street, Buena Park. The measured L_{dn} at this location was 68 dBA. The dominant noise sources were rail traffic and industrial sources. The rail line runs parallel to Tulare Street. Noise levels were measured for 24 hours in front of the house. This site is representative of the ambient noise conditions on the southbound side of the proposed project alignment between Coyote Creek and Stanton Avenue (NSA 18b).

Site LT-15: 5751 Stanton Avenue, Buena Park. The measured L_{dn} at this location was 64 dBA. The dominant noise sources were rail traffic and ambient residential sources. The rail line runs perpendicular to Stanton Avenue on the far side of a row of houses. Noise levels were measured for 24 hours across Stanton Avenue from the site lot on the southeast corner of Stanton Avenue and Franklin Street. This site is representative of the ambient noise conditions on the southbound side of the proposed project alignment between Coyote Creek and Artesia Avenue (NSAs 18b and 20b).

Site LT-16: 5622 Cajon Avenue, Buena Park. The measured L_{dn} at this location was 72 dBA. The dominant noise sources were existing rail traffic, ambient residential noises, and local traffic on Malvern Avenue. The rail line is south of the measurement site, running parallel to Malvern Avenue. Noise levels were measured for 24 hours on the northern edge of the parking lot. This site is representative of the ambient noise conditions on the northbound side of the proposed project alignment between Coyote Creek and Artesia Avenue (NSAs 17b and 19b).

Site LT-17: 139 N Pritchard Avenue, Fullerton. The measured L_{dn} at this location was 71 dBA. The dominant noise sources were aircraft and rail traffic. The rail line runs perpendicular to Pritchard Avenue. Noise levels were measured for 24 hours on the western edge of the property. This site is representative of the ambient noise conditions on the southbound side of the proposed project alignment between Artesia Avenue and Brookhurst Street (NSA 21b).

Site LT-18: 1812 Gregory Avenue, Fullerton. The measured L_{dn} at this location was 67 dBA. The dominant noise sources were rail traffic and ambient residential sources. The rail line runs parallel to Gregory Avenue. Noise levels were measured for 24 hours in front of a house on the north side of Gregory Avenue. This site is representative of the ambient noise conditions on the northbound side of the proposed project alignment between Brookhurst Street and Euclid Street (NSA 22b).

Site LT-19: 207 S Basque Avenue, Fullerton. The measured L_{dn} at this location was 68 dBA. The dominant noise sources were local traffic and rail traffic. The rail line runs north of the measurement site. Noise levels were measured for 24 hours on the southwest corner of S Basque Avenue. This site is representative of the ambient noise conditions on the southbound side of the proposed project alignment between Brookhurst Street and Euclid Street (NSA 23b).

Site LT-20: 201 Chestnut Place, Fullerton. The measured L_{dn} at this location was 74 dBA. The dominant noise sources were local traffic and rail traffic. The rail line runs perpendicular to Chestnut Place. Noise levels were measured for 24 hours on the eastern edge of a parking lot. This site is representative of the ambient noise conditions on the northbound side of the proposed project alignment between Euclid Street and S Harbor Boulevard (NSA 24b).

Site LT-21: 311 S Highland Avenue, Fullerton. The measured L_{dn} at this location was 60 dBA. The dominant noise source was industrial noise from surrounding businesses. The rail line runs perpendicular to S Highland Avenue. Noise levels were measured for 24 hours on the southern edge of the property. This site is representative of the ambient noise conditions on the southbound side of the proposed project alignment between Euclid Street and S Harbor Boulevard (NSA 25b).

Site LT-22: 303-321 Metro Court, Fullerton. The measured L_{dn} at this location was 75 dBA. The dominant noise sources were rail traffic and ambient commercial and residential sources. The rail line is parallel to Walnut Avenue. Noise levels were measured for 24 hours on the northeast edge of the apartment building. This site is representative of the ambient noise conditions on the southbound side of the proposed project alignment between S Harbor Boulevard and E Orangethorpe Avenue (NSAs 27b and 2c).

Site ST-3: 6630 Telegraph Road, Commerce. The measured L_{eq} at this location was 73 dBA. The dominant noise sources were local traffic and trains. Noise levels were measured for 1 hour (starting at 3:00 p.m.) on the sidewalk adjacent to Telegraph Road (NSA 1b).

Site ST-4: Praise Chapel of Buena Park, 4121 Artesia Avenue, Fullerton. The measured L_{eq} at this location was 70 dBA. The dominant noise sources were existing rail traffic, local traffic and aircraft. Noise levels were measured for 1 hour (starting at 4:50 p.m.) in front of the Praise Chapel of Buena Park (NSA 20b).

Site ST-5: Kingdom Hall, 121 N Gilbert Street, Fullerton. The measured L_{eq} at this location was 68 dBA. The dominant noise source was local traffic along Gilbert Street and Commonwealth Avenue. Noise levels were measured for 1 hour (starting at 3:43 p.m.) in the parking lot of the Kingdom Hall.

Site ST-6: Plaza de la Raza/Maizeland School, 7601 Cord Avenue, Pico Rivera. The measured L_{eq} at this location was 60 dBA. The dominant noise sources were rail traffic and ambient neighborhood sources. Noise levels were measured for 1 hour (starting at 4:30 p.m.) on the sidewalk adjacent to Cord Avenue close to the Plaza de la Raza/Maizeland School (NSA 7b).

Site ST-7: Los Nietos Middle School, 8600 South Alburtis Avenue, Whittier. The measured L_{eq} at this location was 61 dBA. The dominant noise source was rail traffic. Noise levels were

measured for 1 hour (starting at 5:00 p.m.) on the sidewalk adjacent to Alburtis Avenue close to Los Nietos Middle School (NSA 9b).

ST-8: 13031 Shoemaker Avenue, Norwalk. The measured L_{eq} at this location was 58 dBA. The dominant noise sources were rail traffic and ambient industrial sources. Noise levels were measured for 1 hour (starting at 3:40 p.m.) on the sidewalk next to the Zimmerman Park. This noise site is representative of the existing noise at John H. Glenn High School (NSAs 11b and 12b).

Site ST-9: 100 S Richman Avenue, Fullerton. The measured L_{eq} at this location was 57 dBA. The dominant noise sources were rail traffic and ambient neighborhood sources. Noise levels were measured for 1 hour (starting at 4:16 p.m.) on the sidewalk adjacent to Richman Avenue. This noise site is representative of the existing noise at Pure Water Church, Vietnamese Muslim Community, Maverick Theater, Vineyard Fullerton Church, Saint Mary's Catholic Church, and STAGEStheater (NSAs 24b through 27b).

Site ST-11: 9016 Rivera Road, Pico Rivera. The measured L_{eq} at this location was 56 dBA. The dominant noise sources were ambient neighborhood sources and aircraft flyovers. Noise levels were measured for 1 hour (starting at 1:40 p.m.) on the sidewalk adjacent to Rivera Road.

Site ST-12: 10701 Wheelock Circle, Whittier. The measured L_{eq} at this location was 64 dBA. The dominant noise source was local traffic. Noise levels were measured for 1 hour (starting at 2:56 p.m.) on the sidewalk adjacent to Wheelock Circle.

Site ST-13: 1830 Commonwealth Avenue, Fullerton. The measured L_{eq} at this location was 70 dBA. The dominant noise source was local traffic. Noise levels were measured for 1 hour (starting at 4:30 p.m.) on the sidewalk adjacent to Commonwealth Avenue. This noise site is representative of the existing noise at the One Spirit Church, the Pacific Drive Elementary School, and the Hunt Branch Library (NSA 23b).

Site ST-15: 140 S Citrus Avenue, Fullerton. The measured L_{eq} at this location was 58 dBA. The dominant noise sources were rail traffic and industrial sources. Noise levels were measured for 1 hour (starting at 2:34 p.m.) at the end of S Citrus Avenue adjacent to the proposed project alignment.

5.3.3 Fullerton Junction to ARTIC

Descriptions of the noise measurement sites for the areas they represent are as follows.

Site LT-24: 145 S Princeton Avenue, Fullerton. The measured L_{dn} at this location was 68 dBA. The dominant noise sources were local traffic and rail traffic. The rail line runs parallel to E Walnut Avenue. Noise levels were measured for 24 hours on the northwest corner of Princeton Avenue and E Walnut Avenue. This site is representative of the ambient noise conditions on the northbound side of the proposed project alignment between Fullerton Junction and E Orangethorpe Avenue (NSA 1c).

Site LT-25: 801 E Balsam Avenue, Anaheim. The measured L_{dn} at this location was 69 dBA. The dominant noise sources were ambient residential sources and rail traffic. The rail line runs perpendicular to E Balsam Avenue. Noise levels were measured for 24 hours on the eastern end of E Balsam Avenue. This site is representative of the ambient noise conditions on the northbound side of the proposed project alignment between E Orangethorpe Avenue and E La Palma Avenue (NSA 3c).

Site LT-26: 759 N Mavis Street, Anaheim. The measured L_{dn} at this location was 67 dBA. The dominant noise sources were rail traffic and ambient residential sources. The rail line is parallel to N Mavis Street. Noise levels were measured for 24 hours on the northern edge of the apartment building. This site is representative of the ambient noise conditions on the northbound side of the proposed project alignment between E La Palma Avenue and Lincoln Avenue (NSAs 4c and 6c).

Site LT-27: 712 N Pauline Street, Anaheim. The measured L_{dn} at this location was 61 dBA. The dominant noise sources were rail traffic and ambient residential sources. The rail line runs parallel

to N Pauline Street. Noise levels were measured for 24 hours in the alley behind N Pauline Street. This site is representative of the ambient noise conditions on the southbound side of the proposed project alignment between E La Palma Avenue and E Wilhelmina Street (NSAs 5c and 7c).

Site LT-28: 198 N Vintage Lane, Anaheim. The measured L_{dn} at this location was 61 dBA. The dominant noise sources were local traffic and rail traffic. The rail line runs parallel to N Vintage Lane. Noise levels were measured for 24 hours in front of the house on the eastern side of N Vintage Lane. This site is representative of the ambient noise conditions on the northbound and southbound sides of the proposed project alignment between E Wilhelmina Street and E Santa Ana Street (NSAs 6c through 9c).

Site LT-29: 385 Vine Street, Anaheim. The measured L_{dn} at this location was 61 dBA. The dominant noise sources were local traffic and rail traffic. The rail line runs parallel to Vine Street. Noise levels were measured for 24 hours on the east side of the apartment building. This site is representative of the ambient noise conditions on the northbound and southbound sides of the proposed project alignment between Lincoln Avenue and E Santa Ana Street (NSAs 8c, 9c, and 10c).

Site LT-30: 696 E Water Street, Anaheim. The measured L_{dn} at this location was 62 dBA. The dominant noise sources were rail traffic and ambient residential sources. The rail line runs perpendicular to E Water Street. Noise levels were measured for 24 hours on the south side of the apartment building. This site is representative of the ambient noise conditions on the southbound side of the proposed project alignment between E Santa Ana Street and E Vermont Avenue (NSA 11c).

Site LT-31: Marriot TownePlace Suites, Anaheim. The measured L_{dn} at this location was 71 dBA. The dominant noise sources were local traffic and rail traffic. The rail line is north of the property. Noise levels were measured for 24 hours on the western side of the hotel. This site is representative of the ambient noise conditions on the southbound side of the proposed project alignment between E Cerritos Avenue and ARTIC (NSAs 12c and 14c).

Site ST-10: 1300 S Lewis Street, Anaheim. The measured L_{eq} at this location was 67 dBA. The dominant noise source was local traffic. Noise levels were measured for 1 hour (starting at 7:53 a.m.) on the grass next to the Salvation Army Campus. This noise site is representative of the existing noise at the City National Grove of Anaheim, Saddleback Church Anaheim, Tru One Records & Rehearsals, Iglesia Adventista Del 7mo Dia Hispana Emmanuel, Martinez Granite, and Thomas Jefferson Elementary (NSAs 11c through 14c).

Site ST-14: 828 N Pauline Street, Anaheim. The measured L_{eq} at this location was 65 dBA. The dominant noise sources were local traffic and rail traffic. Noise levels were measured for 1 hour (starting at 3:54 p.m.) in an undeveloped lot on the corner of E La Palma Avenue and N Pauline Street. This noise site is not used because there were no sensitive institutional receivers in the area.

5.4 Existing Vibration Environment

The only substantial sources of existing ground vibration along the proposed HSR alignment are passenger and freight trains.

5.4.1 Vibration-Sensitive Receivers

In order to identify areas that could be affected by vibration along the project section, the locations of VSAs were determined. Forty-six VSAs were identified and vibration propagation measurements (refer to Section 5.4.2, Measured Vibration Propagation) were conducted at 11 sites throughout the vibration RSA along the proposed HSR alignment. The measurement results at these locations were used to characterize the ground vibration propagation conditions at particular VSAs as noted in the tables below.

5.4.1.1 U.S. Highway 101 to Redondo Junction

VSAs for the area from US 101 to Redondo Junction are listed in Table 5-6 and include the VSA identification number, city, descriptions of the VSAs, and vibration propagation sites used for each VSA. In the table, the VSAs are described as being on either the northbound or southbound side of the alignment based on the assumption that trains generally travel on the right side of double-track sections.

Table 5-6 Vibration-Sensitive Areas for U.S. Highway 101 to Redondo Junction

VSA ID	Description	Measurement Locations
1a	This area is on the northbound side of the proposed alignment bounded by U.S. Highway 101 and E 1st St. The land use is a mixture of commercial and industrial. The vibration-sensitive receiver is Felicitas and Gonzalo Mendez High School 974 feet from the proposed alignment.	VP-1
2a	This area is on the northbound side of the proposed alignment bounded by E 1st St and Whittier Blvd. The land use is a mixture of commercial and industrial. The vibration-sensitive receivers are Monarch Studios 595 feet from the proposed alignment and Ace Mission Studios 762 feet from the proposed alignment.	VP-1
3a	This area is on the southbound side of the proposed alignment bounded by E 1st St and Whittier Blvd. The land use is a mixture of commercial, industrial, and multifamily residences. The closest vibration-sensitive receiver is 388 feet from the proposed alignment.	VP-1
4a	This area is on the northbound side of the proposed alignment bounded by Whittier Blvd and Redondo Junction. The land use is a mixture of commercial and industrial. The vibration-sensitive receivers are Downtown Rehearsal, a recording studio space 552 feet from the proposed alignment, and Lemon Tree Studios – DTLA, a film studio space 660 feet from the proposed alignment.	VP-1
5a	This area is on the southbound side of the proposed alignment bounded by Whittier Blvd and Redondo Junction. The land use is a mixture of commercial, industrial, and multifamily residences. Corridor Digital Studio, Orbital Studios, and Void Studios are also in this area. The closest vibration-sensitive receiver is 227 feet from the proposed alignment.	VP-1

ID = identification; VSA = vibration-sensitive area

5.4.1.2 Redondo Junction to Fullerton Junction

VSAs for the area between Redondo Junction and Fullerton Junction are listed in Table 5-7 and include the VSA identification number, city, descriptions of the VSAs, and vibration propagation sites used for each VSA. In the table, the VSAs are described as being on either the northbound or southbound side of the alignment based on the assumption that trains generally travel on the right side of double-track sections.

Table 5-7 Vibration-Sensitive Areas for Redondo Junction to Fullerton Junction

VSA ID	Description	Measurement Locations
1b	This area is on the northbound side of the proposed alignment bounded by I-710 and I-5. The land use is a mixture of commercial and industrial. Vibration-sensitive receivers are limited to the Immediate Medical Center 485 feet from the proposed alignment.	VP-2

VSA ID	Description	Measurement Locations
2b	This area is on the northbound side of the proposed alignment bounded by I-5 and Greenwood Ave. The land use is a mixture of commercial, industrial, and single-family residences. The closest vibration-sensitive receiver is 570 feet from the proposed alignment.	VP-2
3b	This area is on the northbound side of the proposed alignment bounded by Greenwood Ave and the Rio Hondo Channel. The land use is a mixture of single- and multifamily houses. The closest vibration-sensitive receiver is 121 feet from the proposed alignment.	VP-2
4b	This area is on the southbound side of the proposed alignment bounded by the Rio Hondo Channel and Rosemead Blvd. The land use is single-family homes. The closest vibration sensitive receiver is 26 feet from the proposed alignment.	VP-3
5b	This area is on the northbound side of the proposed alignment bounded by Rosemead Blvd and Passons Blvd. The land use is a mixture of single- and multifamily houses. The closest vibration-sensitive receiver is 113 feet from the proposed alignment.	VP-3
6b	This area is on the southbound side of the proposed alignment bounded by Rosemead Blvd and Passons Blvd. The land use is a mixture of residential, commercial, and industrial buildings. The closest vibration-sensitive receiver is 308 feet from the proposed alignment.	VP-3
7b	This area is on the northbound side of the proposed alignment bounded by Passons Blvd and I-605. The land use is single-family houses. The closest vibration-sensitive receiver is 126 feet from the proposed alignment.	VP-3/VP-4
8b	This area is on the southbound side of the proposed alignment bounded by Passons Blvd and I-605. The land use is single-family houses. There is a row of commercial buildings and Slauson Ave between the proposed alignment and the closest receiver. The closest vibration-sensitive receiver is 278 feet from the proposed alignment.	VP-3
9b	This area is on the northbound side of the proposed alignment bounded by I-605 and Norwalk Blvd. The land use is single-family houses. The closest vibration-sensitive receiver is 71 feet from the proposed alignment.	VP-4
10b	This area is on the southbound side of the proposed alignment bounded by Telegraph Rd and Lakeland Rd. The land use includes single-family residential. The closest vibration-sensitive receiver is 854 feet from the proposed alignment.	VP-5
11b	This area is on the southbound side of the proposed alignment bounded by Lakeland Rd and Imperial Hwy. The land use is a mixture of commercial and industrial. The vibration-sensitive receiver is the PIH Health Urgent Care Center – Santa Fe Springs, 712 feet from the proposed alignment.	VP-5
12b	This area is on the southbound side of the proposed alignment bounded by Imperial Hwy and Foster Rd. The land use is a mixture of single- and multifamily houses. The closest vibration-sensitive receiver is 101 feet from the proposed alignment.	VP-5
13b	This area is on the northbound side of the proposed alignment bounded by La Canada Verde Creek and Valley View Ave. The land use is a mixture of single-family residential, commercial, and industrial buildings. The closest vibration-sensitive receiver is 595 feet from the proposed alignment.	VP-5
14b	This area is on the northbound side of the proposed alignment bounded by Valley View Ave and La Mirada Creek. The land use is a mixture of single- and multifamily houses. Stage Rd runs between the tracks and the houses. The closest vibration-sensitive receiver is 104 feet from the proposed alignment.	VP-6

VSA ID	Description	Measurement Locations
15b	This area is on the northbound side of the proposed alignment bounded by La Mirada Creek and Alondra Blvd. The land use is single-family houses. Stage Rd runs between the tracks and the houses. The closest vibration-sensitive receiver is 104 feet from the proposed alignment.	VP-6
16b	This area is on the northbound side of the proposed alignment bound by Alondra Blvd and Coyote Creek. The land use is single-family houses. Stage Rd runs between the tracks and the houses. The closest vibration-sensitive receiver is 94 feet from the proposed alignment.	VP-6
17b	This area is on the northbound side of the proposed alignment bounded by Coyote Creek and Stanton Ave. The land use is a mixture of multifamily residential and commercial. The closest vibration-sensitive receiver is 295 feet from the proposed alignment.	VP-7/VP-8
18b	This area is on the southbound side of the proposed alignment bounded by Coyote Creek and Stanton Ave. The land use is a mixture of single- and multifamily houses and commercial buildings. The closest vibration-sensitive receiver is 130 feet from the proposed alignment.	VP-7/VP-8
19b	This area is on the northbound side of the proposed alignment bounded by Stanton Ave and Artesia Ave. The land use is a mixture of single- and multifamily houses. The closest vibration-sensitive receiver is 29 feet from the proposed alignment.	VP-8
20b	This area is on the southbound side of the proposed alignment bound by Stanton Ave and Artesia Ave. The land use is a mixture of industrial buildings and single- and multifamily houses. This area includes the Praise Chapel of Buena Park. The closest vibration-sensitive receiver is 109 feet from the proposed alignment.	VP-8
21b	This area is on the southbound side of the proposed alignment bounded by Artesia Ave and Brookhurst St. The land use is a mixture of industrial buildings and single- and multifamily houses. The closest vibration-sensitive receiver is 184 feet from the proposed alignment.	VP-8/VP-9
22b	This area is on the northbound side of the proposed alignment bounded by Brookhurst St and Euclid St. The land use is a mixture of commercial and single- and multifamily residences. The closest vibration-sensitive receiver is 131 feet from the proposed alignment.	VP-9
23b	This area is on the southbound side of the proposed alignment bounded by Brookhurst St and Euclid St. The land use is a mixture of industrial, commercial, and single- and multifamily residences. This area includes the Hunt Branch Library. The closest vibration-sensitive receiver is 38 feet from the proposed alignment.	VP-9
24b	This area is on the northbound side of the proposed alignment bound by Euclid St and S Harbor Blvd. The land use is a mixture of commercial and single- and multifamily residences. The closest vibration-sensitive receiver is 99 feet from the proposed alignment.	VP-9
25b	This area is on the southbound side of the proposed alignment bounded by Euclid St and S Harbor Blvd. The land use is a mixture of industrial, commercial, and single- and multifamily residences. The closest receiver is 62 feet from the proposed alignment.	VP-9/VP-10
26b	This area is on the northbound side of the proposed alignment bound by S Harbor Blvd and Fullerton Junction. The land use is a mixture of industrial, commercial, and single- and multifamily residences. This area includes STAGES theater and Alt Timelines Video Productions. The closest vibration-sensitive receiver is 164 feet from the proposed alignment.	VP-10

VSA ID	Description	Measurement Locations
27b	This area is on the southbound side of the proposed alignment bound by S Harbor Blvd and Fullerton Junction. The land use is a mixture of industrial, commercial, and single- and multifamily residences. On the east side, E Walnut Ave is between the tracks and the first row of multifamily receivers. On the west side, there is a row of industrial buildings between the tracks and the first row of houses. The closest vibration-sensitive receiver is 82 feet from the proposed alignment.	VP-10

I- = Interstate; ID = identification; VSA = vibration-sensitive area

5.4.1.3 Fullerton Junction to ARTIC

VSAs for the area between Fullerton Junction and ARTIC are listed in Table 5-8 and include the VSA identification number, city, descriptions of the VSAs, and vibration propagation sites used for each VSA. In the table, the VSAs are described as being on either the northbound or southbound side of the alignment based on the assumption that trains generally travel on the right side of double-track sections.

Table 5-8 Vibration-Sensitive Areas for Fullerton Junction to ARTIC

VSA ID	Description	Measurement Locations
1c	This area is on the northbound side of the proposed alignment bounded by Fullerton Junction and E Orangethorpe Ave. The land use is a mixture of industrial, commercial, and single- and multifamily residential. The closest vibration-sensitive receiver is 380 feet from the proposed alignment.	VP-10
2c	This area is on the southbound side of the proposed alignment bounded by Fullerton Junction and E Orangethorpe Ave. The land use is mainly single-family residences adjacent to the track. The closest vibration-sensitive receiver is 48 feet from the proposed alignment.	VP-10
3c	This area is on the northbound side of the proposed alignment bounded by E Orangethorpe Ave and E La Palma Ave. The land use is a mixture of industrial and single- and multifamily residences. This area includes the Recording Connection Audio Institute. The houses are south of SR-91 and adjacent to the tracks. The closest vibration-sensitive receiver is 60 feet from the proposed alignment.	VP-11
4c	This area is on the northbound side of the proposed alignment bounded by E La Palma Ave and E Wilhelmina St. The land use is a mixture of single- and multifamily residences. The closest vibration-sensitive receiver is 59 feet from the proposed alignment.	VP-11
5c	This area is on the southbound side of the proposed alignment bound by E La Palma Ave and E Wilhelmina St. The land use is a mixture of industrial and single- and multifamily residences. There is an industrial use lot between the proposed alignment and the nearest residence. The closest vibration-sensitive receiver is 137 feet from the proposed alignment.	VP-11
6c	This area is on the northbound side of the proposed alignment bounded by E Wilhelmina St and Lincoln Ave. The land use is a mixture of single- and multifamily residences. The closest vibration-sensitive receiver is 21 feet from the proposed alignment.	VP-11
7c	This area is on the southbound side of the proposed alignment bounded by E Wilhelmina St and Lincoln Ave. The land use is a mixture of industrial and single- and multifamily residences. The closest vibration-sensitive receiver is 33 feet from the proposed alignment.	VP-11

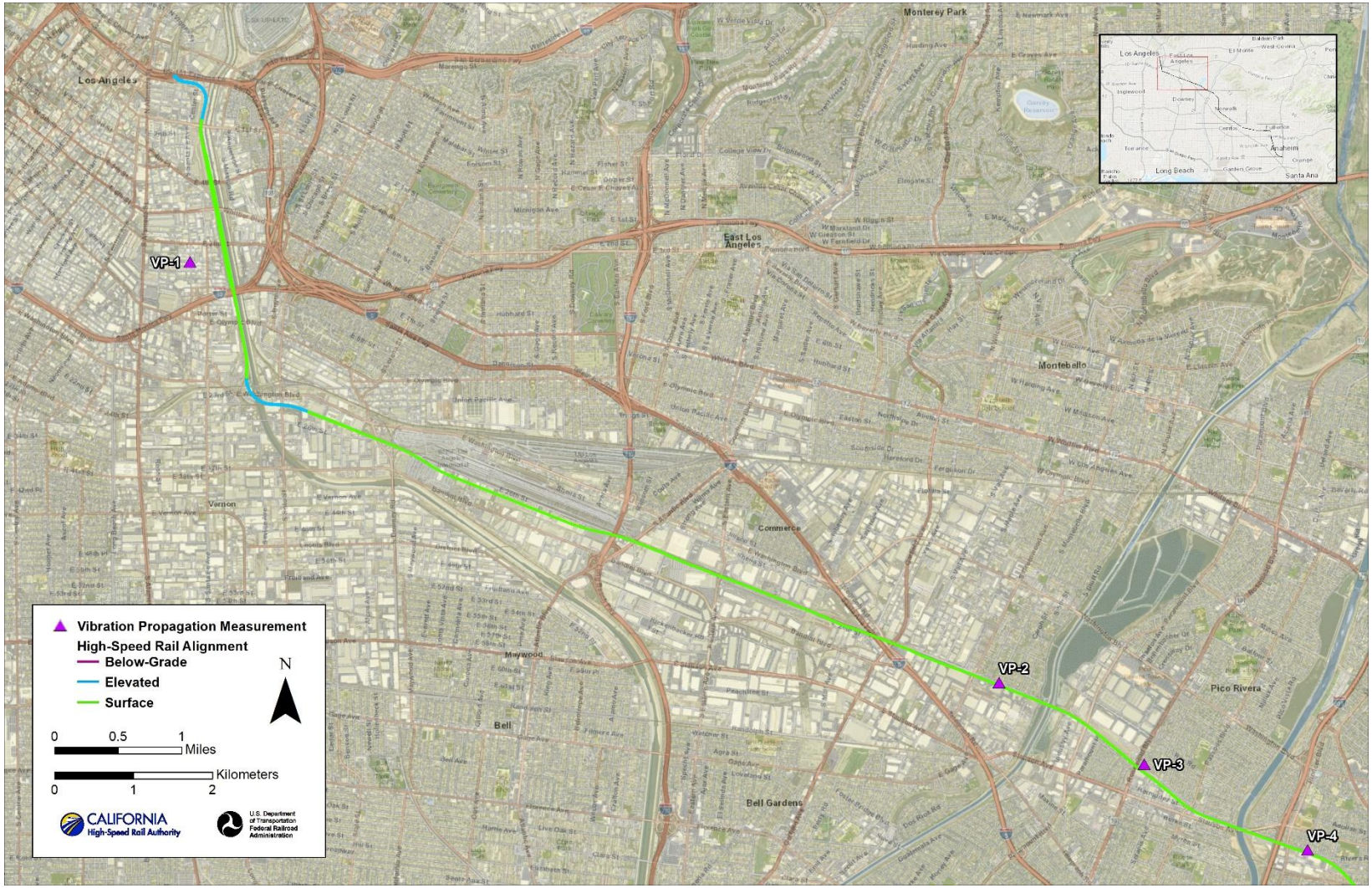
VSA ID	Description	Measurement Locations
8c	This area is on the northbound side of the proposed alignment bounded by Lincoln Ave and E Santa Ana St. The land use is a mixture of single- and multifamily residences directly adjacent to the proposed alignment. The closest vibration-sensitive receiver is 42 feet from the proposed alignment.	VP-11
9c	This area is on the southbound side of the proposed alignment bounded by Lincoln Ave and E Santa Ana St. The land use is a mixture of commercial and single- and multifamily residences. There is a row of commercial or other land use between the proposed alignment and the nearest residence. The closest vibration-sensitive receiver is 208 feet from the proposed alignment.	VP-11
10c	This area is on the northbound side of the proposed alignment bounded by E Santa Ana St and E Vermont Ave. The land use is a mixture of industrial and multifamily residential. The closest vibration-sensitive receiver is 50 feet from the proposed alignment.	VP-11
11c	This area is on the southbound side of the proposed alignment bounded by E Santa Ana St and E Vermont Ave. The land use is a mixture of industrial and single- and multifamily residential. The closest vibration-sensitive receiver is 30 feet from the proposed alignment.	VP-11
12c	This area is on the northbound side of the proposed alignment bounded by E Vermont Ave and E Cerritos Ave. The land use is a mixture of commercial and industrial. This area includes the Martinez Granite (a place of worship) and the Salvation Army Adult Rehabilitation Center. The closest vibration-sensitive receiver is 396 feet from the proposed alignment.	VP-11
13c	This area is on the northbound side of the proposed alignment bounded by E Cerritos Ave and ARTIC. The land use is a mixture of commercial and industrial. This area includes Tru One Records. The closest vibration-sensitive receiver is 373 feet from the proposed alignment.	VP-11
14c	This area is on the southbound side of the proposed alignment bounded by E Cerritos Ave and ARTIC. The land use is a mixture of industrial, commercial, and multifamily housing. This area includes the Saddleback Church in Anaheim, Iglesia Advenstista Del 7mo Dia Hispana Emmanuel, and City National Grover of Anaheim (a theater space). The closest vibration-sensitive receiver is 80 feet from the proposed alignment.	VP-11

ARTIC = Anaheim Regional Transportation Intermodal Center; ID = identification; SR = State Route; VSA = vibration-sensitive area

5.4.2 Measured Vibration Propagation

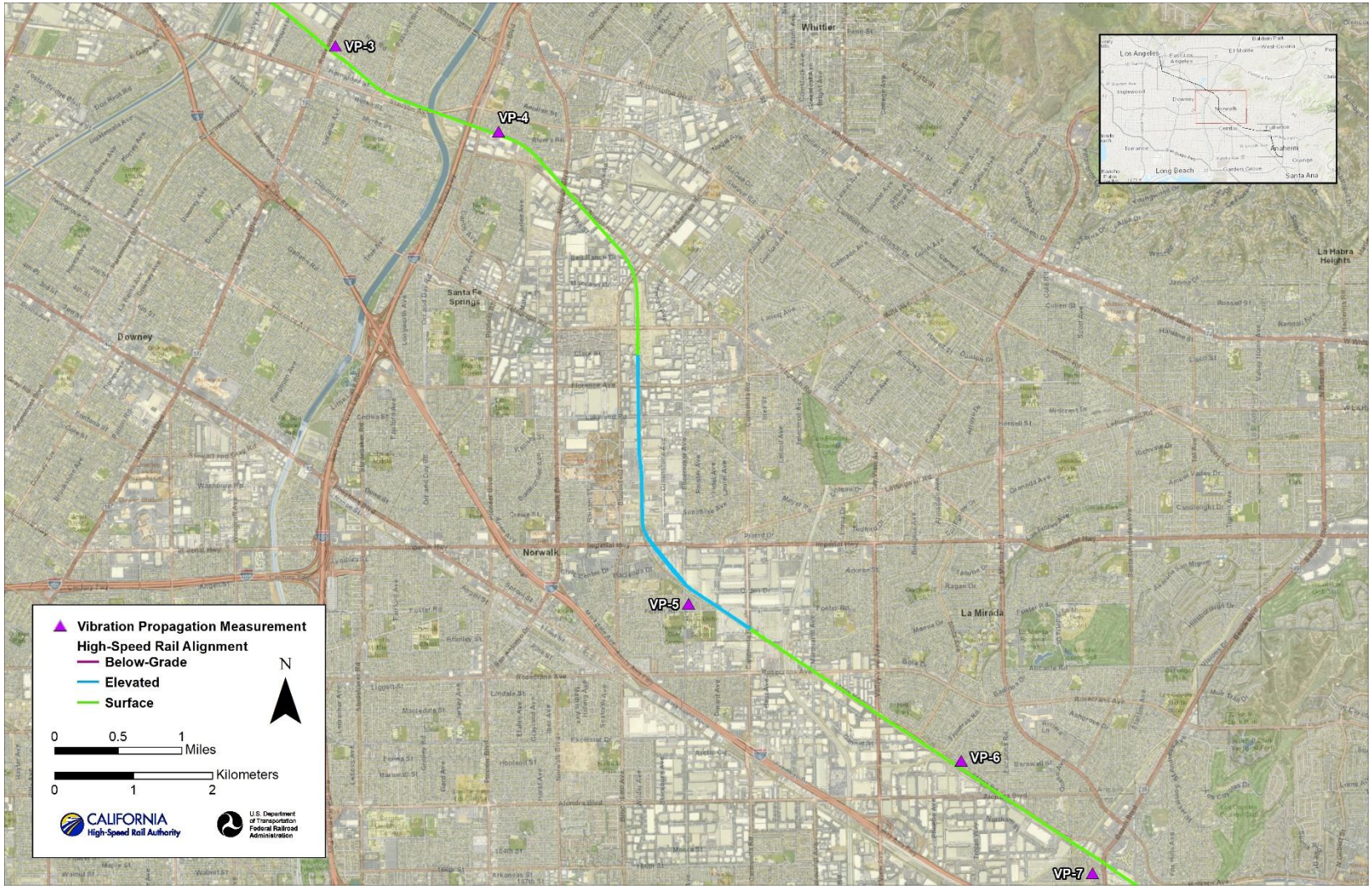
Vibration propagation measurements were conducted at 11 locations in the vibration RSA along the proposed HSR alignment to determine the spread of vibration from its source. The measurement locations are depicted on Figure 5-5, sheets 1 through 3, and site photographs are included in Appendix C.

Descriptions of the measurement sites are provided in the subsections below, and representative results of the vibration propagation tests are depicted on Figure 5-6, Figure 5-7, and Figure 5-8 in terms of the measured line-source transfer mobilities at a distance of 100 feet. Detailed vibration propagation data are provided in Appendix G, Field Transfer Mobility Measurement and Documentation Details.



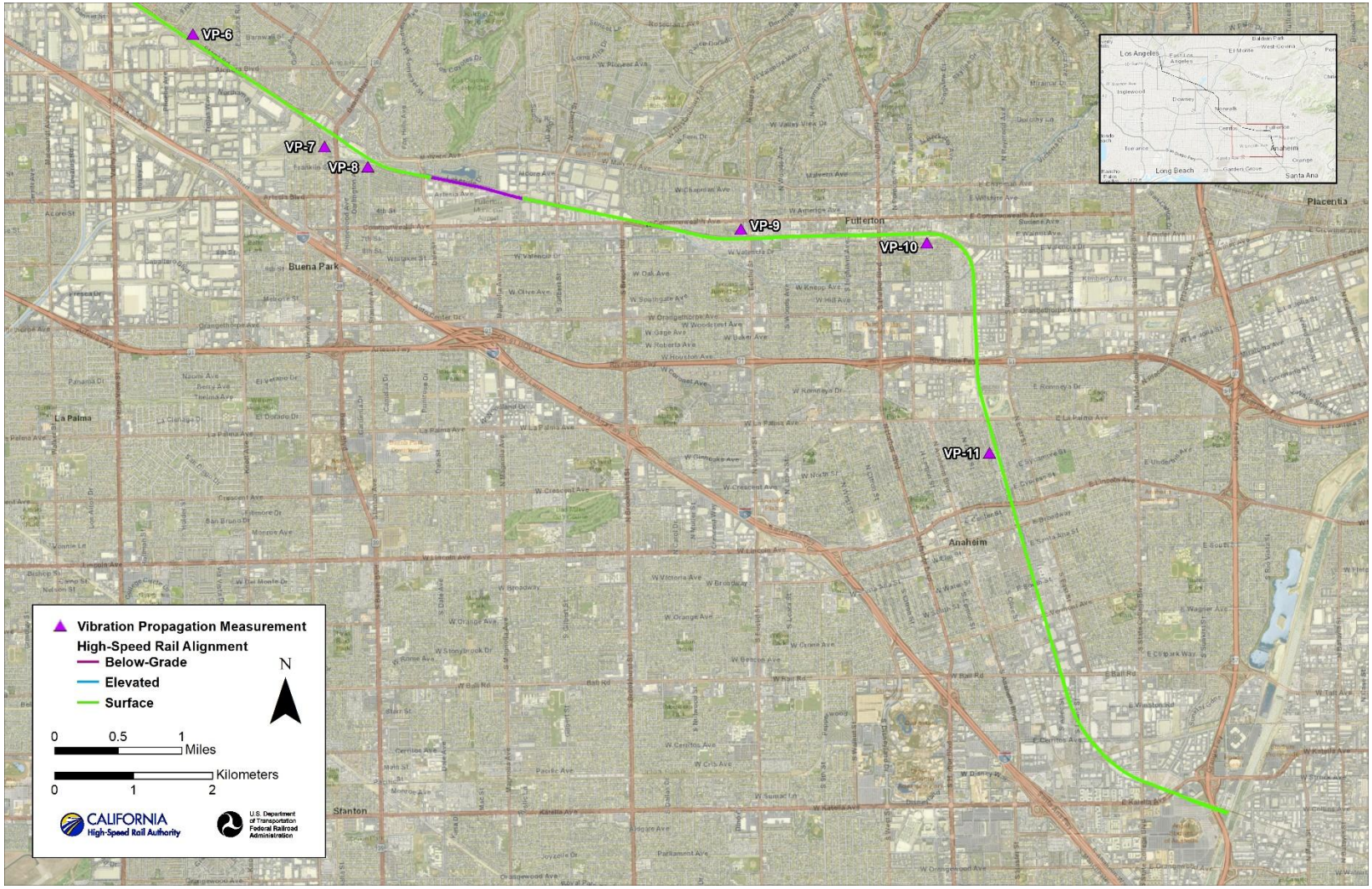
Source: ESRI 2024
Preliminary draft; alignment subject to change.

Figure 5-5 Vibration Propagation Measurement Locations (Sheet 1 of 3)



Source: ESRI 2024
Preliminary draft; alignment subject to change.

Figure 5-5 Vibration Propagation Measurement Locations (Sheet 2 of 3)



Source: ESRI 2024
Preliminary draft; alignment subject to change.

Figure 5-5 Vibration Propagation Measurement Locations (Sheet 3 of 3)

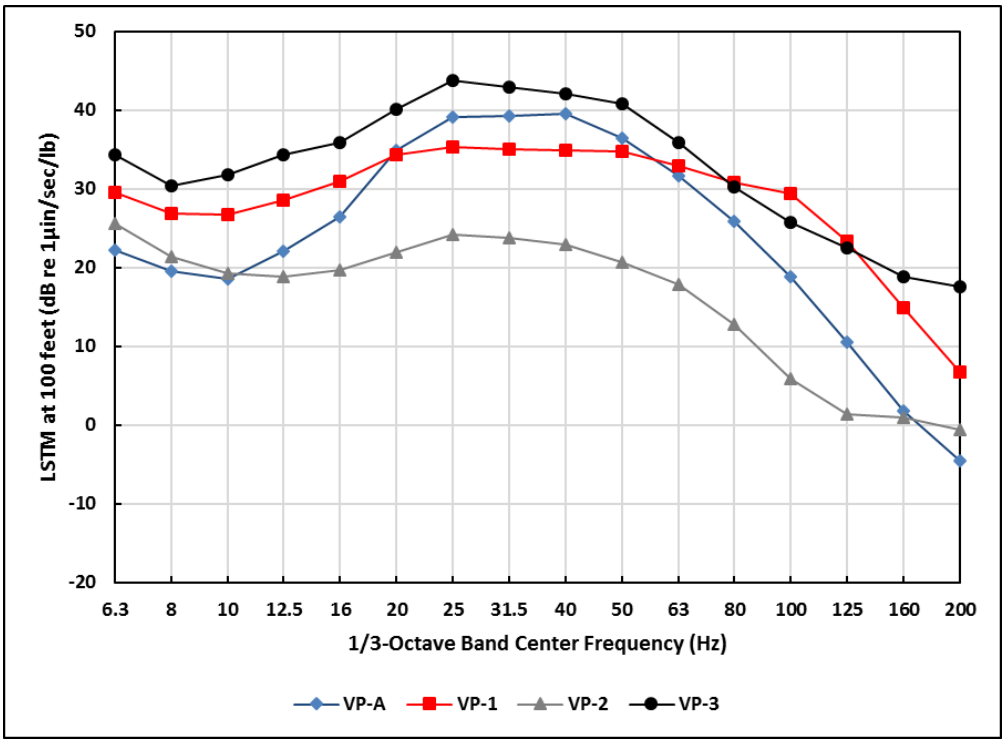


Figure 5-6 Vibration Propagation Test Data (Sites VP-A, VP-1, VP-2, and VP-3)

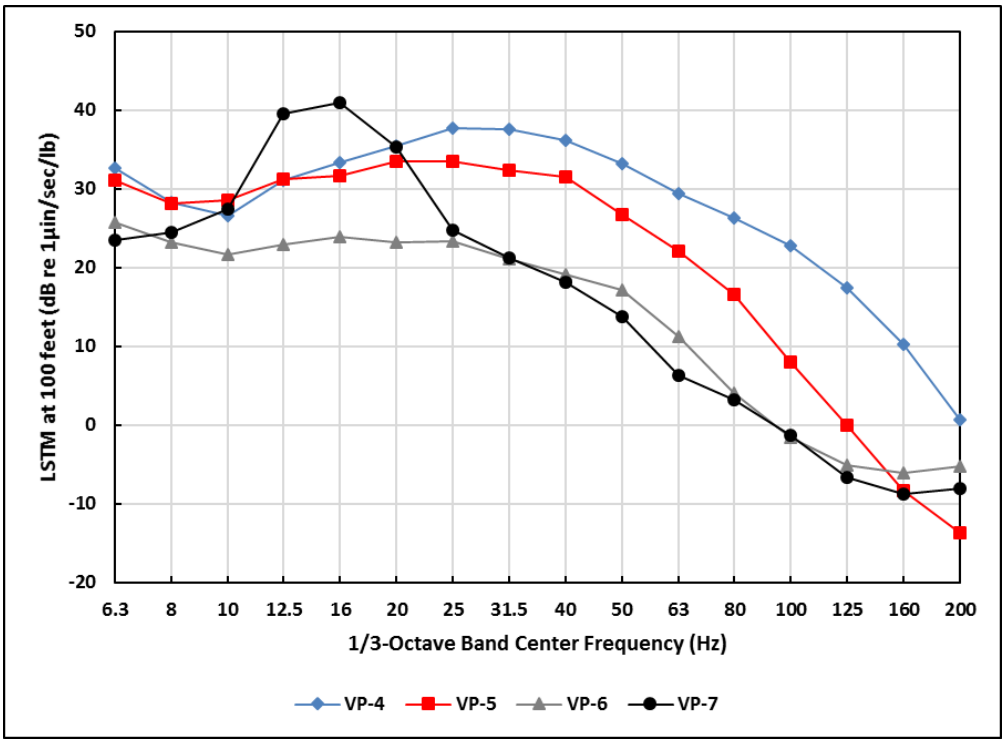


Figure 5-7 Vibration Propagation Test Data (Sites VP-4, VP-5, VP-6, and VP-7)

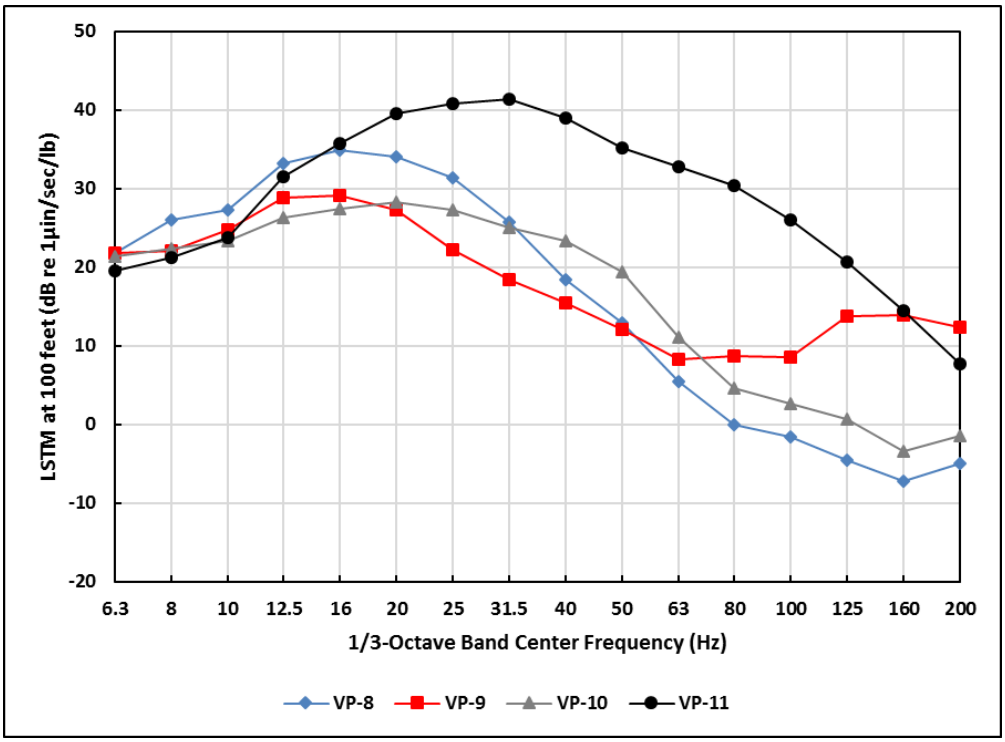


Figure 5-8 Vibration Propagation Test Data (Sites VP-8, VP-9, VP-10, and VP-11)

5.4.2.1 U.S. Highway 101 to Redondo Junction

Descriptions of the vibration measurement sites for the areas they represent are as follows.

Site VP-1: Mateo Street and Violet Street. The vibration propagation measurement was conducted at the northwest corner of Mateo Street and Violet Street in Los Angeles. The measurement site is representative of sensitive receivers from I-10 to Redondo Junction (VSAs 1a through 5a).

5.4.2.2 Redondo Junction to Fullerton Junction

Descriptions of the vibration measurement sites for the areas they represent are as follows.

Site VP-2: Sycamore Street and Montebello Boulevard. The vibration propagation measurement was conducted at the northeast corner of Sycamore Street and Montebello Boulevard in Montebello. The measurement site is representative of sensitive receivers from Redondo Junction to the Rio Hondo Channel (VSAs 1b, 2b and 3b).

Site VP-3: Rivera Road and Lindell Avenue. The vibration propagation measurement was conducted at the northwest corner of Rivera Road and Lindell Avenue in Pico Rivera. The measurement site is representative of sensitive receivers from the Rio Hondo Channel to the San Gabriel River (VSAs 4b through 8b).

Site VP-4: Rivera Road and Miller Grove Drive. The vibration propagation measurement was conducted at the northeast corner of Rivera Road and Miller Grove Drive in Whittier. The measurement site is representative of sensitive receivers from the San Gabriel River to Norwalk Boulevard (VSAs 7b and 9b).

Site VP-5: Arrey Avenue and Ross Street. The vibration propagation measurement was conducted on the northeast corner of Arrey Avenue and Ross Street in Norwalk. The measurement site is representative of sensitive receivers from Norwalk Boulevard to Valley View Avenue (VSAs 10b through 13b).

Site VP-6: San Ardo Drive and Vanada Road. The vibration propagation measurement was conducted at the northeast corner of San Ardo Drive and Vanada Road in La Mirada. The measurement site is representative of sensitive receivers from Valley View Avenue to Coyote Creek (VSAs 14b, 15b and 16b).

Site VP-7: Fullerton Avenue and Pacific Avenue. The vibration propagation measurement was conducted at the northwest corner of Pacific Avenue and Fullerton Avenue in Buena Park. The measurement site is representative of sensitive receivers from Coyote Creek to Stanton Avenue (VSAs 17b and 18b).

Site VP-8: Franklin Street and Stanton Avenue. The vibration propagation measurement was conducted at the southwest corner of Franklin Street and Stanton Avenue in Buena Park. The measurement site is representative of sensitive receivers from Stanton Avenue to Brookhurst Street (VSAs 17b through 21b).

Site VP-9: Orange Avenue and Williamson Avenue. The vibration propagation measurement was conducted at the northwest corner of S Orange Avenue and W Williamson Avenue in Fullerton. The measurement site is representative of sensitive receivers from Brookhurst Street to S Harbor Boulevard (VSAs 21b through 25b).

Site VP-10: Truslow Avenue and Lawrence Avenue. The vibration propagation measurement was conducted at the northwest corner of Truslow Avenue and Lawrence Avenue in Fullerton. The measurement site is representative of sensitive receivers from S Harbor Boulevard to E Orangethorpe Avenue (VSAs 25b, 26b and 27b).

5.4.2.3 Fullerton Junction to ARTIC

Descriptions of the vibration measurement sites for the areas they represent are as follows.

Site VP-10: Truslow Avenue and Lawrence Avenue. The vibration propagation measurement was conducted at the northwest corner of Truslow Avenue and Lawrence Avenue in Fullerton. The measurement site is representative of sensitive receivers from S Harbor Boulevard to E Orangethorpe Avenue (VSAs 1c and 2c).

Site VP-11: Wilhelmina Street and Pauline Street. The vibration propagation measurement was conducted at the southwest corner of N Pauline Street and E Wilhelmina Street in Anaheim. The measurement site is representative of sensitive receivers from E Orangethorpe Avenue to ARTIC (VSAs 3c through 14c).

6 IMPACT ANALYSIS

6.1 Introduction

This section summarizes the noise and vibration effects assessment for the project.

6.2 No Project Alternative

Under the No Project Alternative, no improvements would be made within the project section other than the projects that are already planned and committed to be built by or before 2040. However, it is anticipated that these planned and committed projects would result in potential noise and vibration impacts.

6.3 Rail Corridor Construction Impacts

Construction of the project comprises eight major construction phases with a number of sub-phases that make up the construction schedule. These eight construction phases include at-grade rail construction, direct fixation rail installation for aerial and tunnel structures, trench construction, elevated structure construction (Commerce and Norwalk/Santa Fe Springs), grade separation roadway improvements, water crossings, system sites, and station construction. Each phase has a unique set of construction equipment that would be used. Tables I-1 through I-9 in Appendix I, High-Speed Rail Corridor Construction Equipment List by Construction Phase, provide a complete list of the construction equipment that may be used for each phase and sub-phase of construction.

For each of the eight construction phases, a worst-case scenario was evaluated where all pieces of construction equipment for each activity operate concurrently at a given site over an 8-hour day. Analysts calculated the total 8-hour L_{eq} and the distance within which the L_{eq} would exceed the daytime and nighttime noise impact criteria. The construction noise impact analysis is based on the unique set of construction equipment that would be used in each phase of construction. Construction phases generally run sequentially, with one phase completing use of the most noise-intensive equipment before equipment for another phase is mobilized. Therefore, it is not anticipated that activities associated with multiple phases would occur simultaneously such that the noise effects would combine.

6.3.1 Construction Noise Impacts

Table 6-1 summarizes the estimated residential noise impact distances for daytime and nighttime work for each phase and sub-phase of construction. These distances were calculated using the methodology described in Section 4.9, Construction Noise and Vibration Methodology. However, to be conservative, the impact distance estimates did not assume topography or ground effects. The methodology used to estimate the total number of potential construction noise impacts at sensitive-receiver locations along the project section for all 23 construction scenarios presented in Table 6-1 is also discussed in further detail in Section 4.9. Based on a geographic information system inventory of noise-sensitive receivers within the impact screening distances for all construction activities detailed in Section 4.9, noise impacts are estimated to temporarily occur at a total of 1,379 FRA Category 2 (residential) receivers and at four FRA Category 3 (institutional) receivers (including a theater, a library, and two churches) during daytime construction. During nighttime construction, noise impacts are estimated to temporarily occur at a total of 7,855 residences; nighttime impacts are only applicable to Category 2 receivers.

Descriptions for each construction phase are provided in the subsections below.

Table 6-1 Estimated Noise Impact Distances Based on Federal Railroad Administration Criteria for High-Speed Rail Construction Activities in Residential Areas Along the Project Section

Construction Activity	Construction 8-hour L_{eq} at 50 feet (dBA)[1]	Daytime 80 dBA L_{eq}[2] (feet)[3]	Nighttime 70 dBA L_{eq}[2] (feet)[4]
At-Grade Rail Construction (1st Street City of Los Angeles to ARTIC)			
Utility relocation	87	106	334
New track ballast installation	83	69	218
Direct Fixation Rail Installation for Aerial and Tunnel Structures			
Plinth construction	95	275	871
Trench Construction			
Utility relocation	87	116	368
Tunnel construction	96	312	988
Elevated Structure Construction (Commerce)			
Utility relocation	88	119	376
Foundation and column construction	95	297	940
Precast concrete box girder placement	93	235	742
Elevated Structure Construction (Santa Fe Springs/Norwalk)			
Utility relocation	88	119	376
Foundation and column construction	95	297	940
Precast concrete box girder placement	93	235	742
Grade Separation Roadway Improvements			
Level 1: minor work required	89	136	430
Level 2: light work required	94	253	799
Level 3: medium work required	96	308	973
Level 4: heavy work required	97	355	1,123
Water Crossings			
Level 1: minor work required	87	117	369
Level 2: light work required	102	637	2,013
Level 3: medium work required	102	645	2,038
System Sites			
TPSS, TPPS, TSS, and communication towers	95	288	910
Station Construction			
Commerce and Buena Park Metrolink Station relocations	95	280	887

Construction Activity	Construction 8-hour L_{eq} at 50 feet (dBA)[1]	Daytime 80 dBA L_{eq}[2] (feet)[3]	Nighttime 70 dBA L_{eq}[2] (feet)[4]
Norwalk/Santa Fe Springs Metrolink Station modification	95	295	934
Fullerton Metrolink/Amtrak Station modification	96	321	1,014
ARTIC Station	96	313	990

[1] These values represent combined L_{eq} noise exposures that include all equipment expected to be used during each construction activity and assume a worst-case scenario of all the construction equipment operating at a given location over an 8-hour day. The equipment types assumed in the noise calculation for each construction activity are included in Appendix I.
[2] Federal Railroad Administration construction noise criteria are provided in Table 4-8.
[3] This column presents the distance at which a noise impact would occur for residential receptors between the hours of 7 a.m. and 10 p.m.
[4] This column presents the distance at which a noise impact would occur for residential receptors between the hours of 10 p.m. and 7 a.m.
ARTIC = Anaheim Regional Transportation Intermodal Center; dBA = A-weighted decibels; L_{eq} = equivalent sound level; TPPS = traction power paralleling station; TPSS = traction power substation; TSS = traction power switching station

6.3.1.1 At-Grade Rail Construction

At-grade rail construction is anticipated to occur for 36 months over the course of the project. For general construction between First Street in Los Angeles and ARTIC, activities during this phase would include utility relocation and new track ballast installation. The lists of construction equipment for this activity, along with the assumed equipment numbers, noise emission levels, usage factors, and daily hours of operation, are given in Table I-1 of Appendix I.

Assuming a worst-case scenario with all the construction equipment operating at a given site over an 8-hour day, the composite noise level during this phase of construction would range from 83 dBA to 87 dBA L_{eq} at a distance of 50 feet from the construction site. Depending on the activity, residences within 69 to 106 feet of the construction site would be exposed to noise levels greater than 80 dBA L_{eq} during daytime hours. Noise-sensitive receivers within 218 to 334 feet of the site would be exposed to noise levels greater than 70 dBA L_{eq} during nighttime hours. Noise-sensitive receivers within these distances from the construction site would be affected by noise generated from at-grade rail construction activities that exceeds the recommended FRA construction noise criteria. Noise mitigation would be evaluated for this construction phase.

6.3.1.2 Direct Fixation Rail Installation for Aerial and Tunnel Structures

Direct fixation rail installation for aerial and tunnel structures would include plinth construction and is anticipated to occur for 30 months over the course of the project. The list of construction equipment for this activity, along with the assumed equipment numbers, noise emission levels, usage factors, and daily hours of operation, are given in Table I-2 of Appendix I.

Assuming a worst-case scenario with all of the construction equipment operating at a given site over an 8-hour day, the composite noise level during this phase of construction would be 95 dBA L_{eq} for plinth construction at a distance of 50 feet from the construction site. For this activity, residences within 275 feet of the construction site would be exposed to noise levels greater than 80 dBA L_{eq} during daytime hours. Residences within 871 feet of the site would be exposed to noise levels greater than 70 dBA L_{eq} during nighttime hours. Noise-sensitive receivers within these distances from the construction site would be affected by noise generated from direct fixation rail installation that exceeds the recommended FRA construction noise criteria. Noise mitigation would be evaluated for this construction phase.

6.3.1.3 Trench Construction (Fullerton)

Following 12 months of utility relocation, trench construction is anticipated to occur over a 42-month period for the project. The lists of construction equipment for these activities, along with the assumed equipment numbers, noise emission levels, usage factors, and daily hours of operation, are given in Table I-3 of Appendix I.

Assuming a worst-case scenario with all of the construction equipment operating at a given site over an 8-hour day, the composite noise level during this phase of construction would range from 87 dBA L_{eq} for utility relocation to 96 dBA L_{eq} for tunnel construction at a distance of 50 feet from the construction site. Depending on the activity, residences within 116 to 312 feet of the site would be exposed to noise levels greater than 80 dBA L_{eq} during daytime hours. Noise-sensitive receivers within 366 to 988 feet of the site would be exposed to noise levels greater than 70 dBA L_{eq} during nighttime hours. Noise-sensitive receivers within these distances from the construction site would be affected by noise generated from direct fixation rail installation that exceeds the recommended FRA construction noise criteria. Noise mitigation would be evaluated for this construction phase.

6.3.1.4 Elevated Structure Construction

Elevated structure construction is anticipated to occur over a 30-month period in Commerce and over a 36-month period in Santa Fe Springs. Activities during this construction phase would include utility relocation, foundation and column construction, and the replacement of precast concrete box girders. The lists of construction equipment for these activities, along with the assumed equipment numbers, noise emission levels, usage factors, and daily hours of operation, are given in Table I-4 and Table I-5 of Appendix I.

Assuming a worst-case scenario with all of the construction equipment operating at a given site over an 8-hour day, the composite noise level during this phase of construction would range from 88 dBA to 95 dBA L_{eq} at a distance of 50 feet from the construction site. Depending on the activity, noise-sensitive receivers within 119 to 297 feet of the construction site would be exposed to noise levels greater than 80 dBA L_{eq} during daytime hours. Noise-sensitive receivers within 376 to 940 feet of the site would be exposed to noise levels greater than 70 dBA L_{eq} during nighttime hours. Noise-sensitive receivers within these distances from the construction site would be affected by noise generated from at-grade rail construction activities that exceeds the recommended FRA construction noise criteria. Noise mitigation would be evaluated for this construction phase.

6.3.1.5 Grade Separation Roadway Improvements

The extent of construction for grade separation roadway improvements would vary depending on the complexity of the work required at given locations as indicated below. Typical lists of construction equipment for different activity levels, along with the assumed equipment numbers, noise emission levels, usage factors, and daily hours of operation, are given in Table I-6 of Appendix I.

- Level 1 – Minor Work Required: This level of activity applies to grade separations at I-10, South Downey Road, I-710, I-5, Greenwood Avenue, Paramount Boulevard, State Route 91, and Lincoln Avenue. At these locations, construction is anticipated to occur for periods of 2 to 15 months for the project.

  Assuming a worst-case scenario with all of the construction equipment operating at a given site over an 8-hour day, the composite noise level during this activity would be 89 dBA L_{eq} at a distance of 50 feet from the construction site. Based on this level, noise-sensitive receivers within 136 feet of the construction site would be exposed to noise levels greater than 80 dBA L_{eq} during daytime hours and noise-sensitive receivers within 430 feet of the site would be exposed to noise levels greater than 70 dBA L_{eq} during nighttime hours. Noise-sensitive receivers within these distances from the construction site would be affected by noise generated from at-grade rail construction activities that exceeds the recommended FRA construction noise criteria. Noise mitigation would be evaluated for this construction phase.

- Level 2 – Light Work Required: This level of activity applies to grade separations at Eastern Avenue, Passons Boulevard, Santa Fe Springs Road, Telegraph Road, Valley View Avenue, Beach Boulevard, Gilbert Street, Euclid Street, and Lemon Street. At these locations, construction is anticipated to occur for periods of 12 to 30 months for the project.

  Assuming a worst-case scenario with all of the construction equipment operating at a given site over an 8-hour day, the composite noise level during this activity would be 94 dBA L_{eq} at

a distance of 50 feet from the construction site. Based on this level, noise-sensitive receivers within 253 feet of the construction site would be exposed to noise levels greater than 80 dBA L_{eq} during daytime hours and noise-sensitive receivers within 799 feet of the site would be exposed to noise levels greater than 70 dBA L_{eq} during nighttime hours. Noise-sensitive receivers within these distances from the construction site would be affected by noise generated from at-grade rail construction activities that exceeds the recommended FRA construction noise criteria. Noise mitigation would be evaluated for this construction phase.

- Level 3 – Medium Work Required: This level of activity applies to grade separations at Atlantic Boulevard, Rosemead Boulevard, Slauson Avenue, Carmenita Road, Alondra Boulevard, Dale Street, Commonwealth Avenue, Highland Avenue, Harbor Boulevard, and Douglass Road. At these locations, construction is anticipated to occur for periods of 15 to 30 months for the project.

  Assuming a worst-case scenario with all of the construction equipment operating at a given site over an 8-hour day, the composite noise level during this activity would be 96 dBA L_{eq} at a distance of 50 feet from the construction site. Based on this level, noise-sensitive receivers within 308 feet of the construction site would be exposed to noise levels greater than 80 dBA L_{eq} during daytime hours and residences within 973 feet of the site would be exposed to noise levels greater than 70 dBA L_{eq} during nighttime hours. Noise-sensitive receivers within these distances from the construction site would be affected by noise generated from at-grade rail construction activities that exceeds the recommended FRA construction noise criteria. Noise mitigation would be evaluated for this construction phase.

- Level 4 – Heavy Work Required: This level of activity applies to grade separations at Pioneer Boulevard, Norwalk Boulevard, Los Nietos Road, Cerritos Avenue, Lewis Street, State College Boulevard, and Katella Avenue. At these locations, construction is anticipated to occur for periods of 18 to 36 months for the project.

  Assuming a worst-case scenario with all of the construction equipment operating at a given site over an 8-hour day, the composite noise level during this activity would be 97 dBA L_{eq} at a distance of 50 feet from the construction site. Based on this level, noise-sensitive receivers within 355 feet of the construction site would be exposed to noise levels greater than 80 dBA L_{eq} during daytime hours and residences within 1,123 feet of the site would be exposed to noise levels greater than 70 dBA L_{eq} during nighttime hours. Noise-sensitive receivers within these distances from the construction site would be affected by noise generated from at-grade rail construction activities that exceeds the recommended FRA construction noise criteria. It is estimated that noise impacts could temporarily occur at a total of 138 Category 2 (residential) receivers in the vicinity of these three grade-separation projects during daytime construction. During nighttime construction, it is estimated that noise impacts could temporarily occur at 1,241 residences. Approximately 90 percent of the impacts would be expected to occur at residences near the Pioneer Boulevard grade separation, and no impacts are anticipated at any institutional receivers. Noise mitigation would be evaluated for this construction phase.

6.3.1.6 Water Crossings

The extent of construction for water crossings would vary depending on the complexity of the work required at given locations as indicated below. Typical lists of construction equipment for different activity levels, along with the assumed equipment numbers, noise emission levels, usage factors, and daily hours of operation, are given in Table I-7 of Appendix I.

- Level 1 – Minor Work Required: This level of activity applies to water crossings at Coyote Creek, Carbon Creek and the Los Angeles River (Redondo Junction). At these locations, construction is anticipated to occur for a period of 4 to 6 months for the project.

  Assuming a worst-case scenario with all of the construction equipment operating at a given site over an 8-hour day, the composite noise level during this activity would be 87 dBA L_{eq} at a distance of 50 feet from the construction site. Based on this level, noise-sensitive receivers within 117 feet of the construction site would be exposed to noise levels greater than 80 dBA

L_{eq} during daytime hours and residences within 369 feet of the site would be exposed to noise levels greater than 70 dBA L_{eq} during nighttime hours. Noise-sensitive receivers within these distances from the construction site would be affected by noise generated from at-grade rail construction activities that exceeds the recommended FRA construction noise criteria. Noise mitigation would be evaluated for this construction phase.

- Level 2 – Light Work Required: This level of activity applies to the water crossing at the San Gabriel River. At this location, construction is anticipated to occur for a period of 20 months for the project.

  Assuming a worst-case scenario with all of the construction equipment operating at a given site over an 8-hour day, the composite noise level during this activity would be 102 dBA L_{eq} at a distance of 50 feet from the construction site. Based on this level, noise-sensitive receivers within 637 feet of the construction site would be exposed to noise levels greater than 80 dBA L_{eq} during daytime hours and residences within 2,013 feet of the site would be exposed to noise levels greater than 70 dBA L_{eq} during nighttime hours. Noise-sensitive receivers within these distances from the construction site would be affected by noise generated from at-grade rail construction activities that exceeds the recommended FRA construction noise criteria. Noise mitigation would be evaluated for this construction phase.

- Level 3 – Medium Work Required: This level of activity applies to water crossings at the Rio Hondo Spreading Grounds, the Rio Hondo River, North Fork Coyote Creek, La Mirada Creek, and La Brea Creek. At these locations, construction is anticipated to occur for a period of 12 to 15 months for the project.

  Assuming a worst-case scenario with all of the construction equipment operating at a given site over an 8-hour day, the composite noise level during this activity would be 102 dBA L_{eq} at a distance of 50 feet from the construction site. Based on this level, noise-sensitive receivers within 645 feet of the construction site would be exposed to noise levels greater than 80 dBA L_{eq} during daytime hours and residences within 2,038 feet of the site would be exposed to noise levels greater than 70 dBA L_{eq} during nighttime hours. Noise-sensitive receivers within these distances from the construction site would be affected by noise generated from at-grade rail construction activities that exceeds the recommended FRA construction noise criteria. Noise mitigation would be evaluated for this construction phase.

6.3.1.7 System Sites

System sites include TPSS, traction power paralleling stations, traction power switching stations, and communication towers. At these sites, construction is anticipated to occur for periods of 16 months, 16 to 22 months, 6 months, and 6 to 8 months, respectively. The list of construction equipment for these sites, along with the assumed equipment numbers, noise emission levels, usage factors, and daily hours of operation, are given in Table I-8 of Appendix I.

Assuming a worst-case scenario with all of the construction equipment operating at a given site over an 8-hour day, the composite noise level during this phase of construction would be 95 dBA L_{eq} at a distance of 50 feet from the construction site. Based on this level, noise-sensitive receivers within 288 feet of the construction site would be exposed to noise levels greater than 80 dBA L_{eq} during daytime hours and residences within 910 feet of the site would be exposed to noise levels greater than 70 dBA L_{eq} during nighttime hours. Noise-sensitive receivers within these distances from the construction site would be affected by noise generated from at-grade rail construction activities that exceeds the recommended FRA construction noise criteria. Noise mitigation would be evaluated for this construction phase.

6.3.1.8 Station Construction

For the project, station construction is anticipated to occur over periods of 36 months at ARTIC Station, Norwalk/Santa Fe Springs Station, and Fullerton Station, and over periods of 12 to 15 months at the Commerce and Buena Park Metrolink Stations. Activities during this construction phase would include architectural coatings, station and parking structure construction, demolition, grading, paving, and site preparation. The lists of construction equipment for these activities,

along with the assumed equipment numbers, noise emission levels, usage factors, and daily hours of operation, are given in Table I-9 of Appendix I.

Assuming a worst-case scenario with all of the construction equipment operating at a given site over an 8-hour day, the composite noise level during this phase of construction would range from 95 dBA to 96 dBA L_{eq} at a distance of 50 feet from the construction site. Depending on the activity, noise-sensitive receivers within 280 to 321 feet of the construction site would be exposed to noise levels greater than 80 dBA L_{eq} during daytime hours. Noise-sensitive receivers within 887 to 1,014 feet of the site would be exposed to noise levels greater than 70 dBA L_{eq} during nighttime hours. Noise-sensitive receivers within these distances from the construction site would be affected by noise generated from at-grade rail construction activities that exceeds the recommended FRA construction noise criteria. Noise mitigation would be evaluated for this construction phase.

6.3.2 Construction Vibration Impacts

During construction, some activities may cause ground-borne vibration, most notably pile driving for structural foundations, vibro-compaction for ground improvements, drilling for bored pile viaduct foundations, and excavation for trenching. Construction equipment associated with these activities can produce vibration velocities at 25 feet of 0.644 inch per second (104 VdB) for pile driving, 0.210 inch per second (94 VdB) for vibro-compaction, and 0.089 inch per second (87 VdB) for drilling and excavation.

Table 6-2 provides the approximate distances within which receivers could experience construction-related vibration damage effects. Based on these distances, the construction activity with the greatest potential for vibration damage effects would be pile driving, which could affect structures at distances of up to 30 feet for the least sensitive buildings and at distances of up to 77 feet for the most sensitive buildings. Pile driving is anticipated to occur during construction at the San Gabriel River, Coyote Creek/North Fork, La Mirada Creek, and Brea Creek water crossings. However, the potential for vibration damage is limited to two commercial buildings near the Coyote Creek/North Fork water crossing and two residential buildings near the Brea Creek water crossing that are within 77 feet of these construction sites. These potential vibration impacts will need to be investigated in more detail during project design based on the actual locations of pile-driving activities and vibration sensitivities of the nearby buildings.

Table 6-2 Estimated Impact Distances for Construction Vibration Damage

Building Category[1]	Vibration Criterion (PPV, in/sec)	Approximate Vibration Impact Distance (feet)		
		Pile Driving	Vibro-Compaction	Drilling and Excavation
Category I	0.5	30	15	8
Category II	0.3	42	20	12
Category III	0.2	55	26	15
Category IV	0.12	77	37	21

[1] Refer to Table 4-9 for a description of the categories.
in/sec = inch per second; PPV = peak particle velocity

Construction activities would also have the potential to cause vibration annoyance or interference with the use of sensitive equipment. Table 6-3 provides the approximate distances within which receivers could experience construction-related vibration annoyance effects. The results presented in Table 6-3 indicate that human annoyance or interference by vibration from construction could be expected within a distance of up to 500 feet, depending on the category of land use and type of equipment used.

Table 6-3 Estimated Impact Distances for Construction Vibration Annoyance

Land Use Category[1]	Vibration Criterion Level (VdB)	Approximate Vibration Impact Distance (feet)		
		Pile Driving	Vibro-Compaction	Drilling and Excavation
Category 1	65	500	230	135
Category 2	72	290	135	80
Category 3	75	230	105	65

[1] Refer to Table 3-7 for a description of the categories.
VdB = vibration decibel

6.3.3 Temporary Traffic-Generated Noise from Rerouting Traffic During Construction

This analysis addresses possible additional traffic noise as a result of traffic being rerouted because of local road closures during construction of the project. Construction of the project would result in temporary or permanent closure of portions of the following 19 local roads in the project section, which would require rerouting traffic and other roadway modifications:

- Rosemead Boulevard (State Route 19)
- Pioneer Boulevard
- Norwalk Boulevard
- Los Nietos Road
- Carmenita Road
- Alondra Boulevard
- Stage Road
- Artesia Avenue
- Commonwealth Avenue
- Walnut Avenue
- Orangethorpe Avenue
- La Palma Avenue
- Broadway
- Vermont Avenue
- Ball Road
- Lewis Street
- Cerritos Avenue
- Katella Avenue
- Douglass Road

Rerouted traffic could affect existing noise levels in the noise RSA, as would the construction of needed roadway modifications. Changes in traffic that expose sensitive receptors to noise levels exceeding FHWA and Caltrans noise abatement criteria would be considered noise impacts.

Based on the projected increases in peak-hour traffic volumes on the anticipated detour routes during construction, it is estimated that traffic noise levels along these routes would increase by up to 5 dBA; the actual increases may be lower if the added traffic results in lower vehicle speeds along the routes. According to FHWA and Caltrans noise abatement criteria, a substantial noise increase is considered to occur when the project's predicted worst-hour design-year noise level exceeds the existing worst-hour noise level by 12 dBA or more. Because the estimated increases in traffic noise are only 1 to 5 dBA, there would be no significant noise impacts related to rerouted traffic.

6.4 Operational Traffic Noise

For operational traffic noise, two conditions were assessed for the potential for impact:

- For locations with a significant change in the horizontal or vertical alignment or location of an existing highway or roadway, a traffic noise assessment was conducted using FHWA and Caltrans methodology using the Traffic Noise Model.
- For other locations with less substantial changes in the alignment, or where traffic volumes are proposed to increase as part of the proposed project, a noise assessment was conducted at:
  - Locations where traffic volumes would increase by a substantial amount (at least 12 dBA according to FHWA and Caltrans noise abatement criteria) because of the project, as compared to volumes without the project
  - Locations where roadways were relocated closer to sensitive receptors

For both of these scenarios, a calculation of the increase in noise from either the increase in traffic or change in location (or both combined) was used. Based on the roadway information provided, there are no locations that meet the criteria for a Traffic Noise Model assessment. The only locations with a substantial change in vertical alignment of roadways near noise-sensitive receptors would be grade separations where the roadway is being depressed. This would result in increased shielding for sensitive receptors and slightly lower noise levels relative to those without the grade separation.

Based on the traffic volume data, there would be no locations that meet the increase in noise (12 dBA or more) criterion. Therefore, impacts from traffic noise are not anticipated for the project, and are not considered further in the analysis.

6.5 Annoyance and Startle Effects for Human Noise-Sensitive Receivers from Rapid Onset Rates

At the maximum train speed of 90 mph along the project section, startle effects from rapid onset rates would be limited to locations within 15 to 20 feet of the tracks, which is within the right-of-way and does not contain human noise-sensitive receivers such as residences. Therefore, increased annoyance from startle would not occur.

6.6 Shared Passenger Track Alternatives

6.6.1 Shared Passenger Track Alternative A

6.6.1.1 U.S. Highway 101 to Redondo Junction

Noise Impacts

Construction

Construction noise impacts are discussed in Section 6.3.1, Construction Noise Impacts.

In addition, possible additional traffic noise as a result of traffic being rerouted because of local road closures during construction of the project is addressed in Section 6.3.3, Temporary Traffic-Generated Noise from Rerouting Traffic During Construction. However, because such road closures are not anticipated between US 101 and Redondo Junction, there would be no noise impacts related to rerouted traffic.

Operation

The assessment of noise impacts from HSR operations is summarized in Table 6-4 for residential land uses and in Table 6-5 for institutional land uses. The results include a tabulation of location information for each sensitive receptor or receptor group, the projections of future noise levels, the impact criteria, and whether moderate or severe noise impacts are projected. The results indicate that no noise impacts are projected at locations between US 101 and Redondo Junction. In addition, no sensitive receptors would be affected by changes in noise from project-related relocation of freight tracks within the right-of-way.

Table 6-4 Residential Noise Impact Assessment for U.S. Highway 101 to Redondo Junction

Location	Side of Track	NSA	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Existing Noise Level (dBA)	Project Noise Level (dBA)	Noise Impact Criteria (dBA)		Number of Impacts	
							Mod.	Sev.	Mod.	Sev.
U.S. Hwy 101 to E 1st St	NB	No noise-sensitive receivers.								
U.S. Hwy 101 to E 1st St	SB	No noise-sensitive receivers.								
E 1st St to Whittier Blvd	NB	No noise-sensitive receivers.								
E 1st St to Whittier Blvd	SB	3a	388	50	67	48	62	68	0	0
Whittier Blvd to Redondo Jct	NB	No noise-sensitive receivers.								
Whittier Blvd to Redondo Jct	SB	5a	227	50	67	49	62	68	0	0

dBA = A-weighted decibels; LAUS = Los Angeles Union Station; Mod. = moderate; mph = miles per hour (the speeds vary along the corridor as described in Section 4.2, Categories of High-Speed Rail); NB = northbound; SB = southbound; Sev. = severe

Table 6-5 Institutional Noise Impact Assessment for U.S. Highway 101 to Redondo Junction

Location	Name	Side of Track	NSA	Closest Receiver Distance to Near Track (feet)	Maximum Train Speed (mph)	Existing Noise Level (dBA)	Project Noise Level (dBA)	Noise Impact Criteria (dBA)		Number of Impacts	
								Mod.	Sev.	Mod.	Sev.
U.S. Hwy 101 to E 1st St	Felicitas and Gonzalo Mendez High School	NB	1a	974	45	61	32	64	69	0	0
E 1st St to Whittier Blvd	Monarch Studios	NB	2a	595	50	61	42	59	64	0	0
E 1st St to Whittier Blvd	Ace Mission Studios	NB	2a	762	50	61	40	59	64	0	0
Whittier Blvd to Redondo Jct	Downtown Rehearsal	NB	4a	552	50	61	43	59	64	0	0
Whittier Blvd to Redondo Jct	Corridor Digital Studio	SB	5a	475	50	66	37	61	67	0	0

Location	Name	Side of Track	NSA	Closest Receiver Distance to Near Track (feet)	Maximum Train Speed (mph)	Existing Noise Level (dBA)	Project Noise Level (dBA)	Noise Impact Criteria (dBA)		Number of Impacts	
								Mod.	Sev.	Mod.	Sev.
Whittier Blvd to Redondo Jct	Orbital Studios	SB	5a	712	50	61	33	59	64	0	0
Whittier Blvd to Redondo Jct	Void Studios	SB	5a	965	50	61	29	59	64	0	0
Whittier Blvd to Redondo Jct	Lemon Tree Studios - DTLA	NB	4a	660	50	61	36	59	64	0	0

dBA = A-weighted decibels; LAUS = Los Angeles Union Station; Mod. = moderate; mph = miles per hour (the speeds vary along the corridor as described in Section 4.2); NB = northbound; Sev. = severe

Vibration Impacts

Construction

Construction vibration impacts are discussed in Section 6.3.2, Construction Vibration Impacts.

Operation

The assessment of ground-borne vibration impacts from HSR operations in the project section is summarized in Table 6-6 for residential land uses and in Table 6-7 for institutional land uses. Similarly, the assessment of ground-borne noise impacts from HSR operations in the project section is summarized in Table 6-8 for residential land uses and in Table 6-9 for institutional land uses. The results include a tabulation of location information for each sensitive receptor or receptor group, the projections of future ground-borne vibration or noise levels, the impact criteria, and whether impacts are projected. The results indicate that no ground-borne vibration or noise impacts are projected at residential locations between US 101 and Redondo Junction.

Table 6-6 Residential Vibration Impact Assessment for U.S. Highway 101 to Redondo Junction

Location	Side of Track	VSA	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Vibration Levels (VdB)[1]		Number of Impacts
					Project Levels	FRA Impact Criteria	
U.S. Hwy 101 to E 1st St	NB	No vibration-sensitive receivers.					
U.S. Hwy 101 to E 1st St	SB	No vibration-sensitive receivers.					
E 1st St to Whittier Blvd	NB	No vibration-sensitive receivers.					
E 1st St to Whittier Blvd	SB	3a	388	50	62	72	0
Whittier Blvd to Redondo Jct	NB	No vibration-sensitive receivers.					
Whittier Blvd to Redondo Jct	SB	5a	227	50	64	72	0

[1] Maximum 1/3-octave band vibration velocity level over the frequency range between 8 Hz and 80 Hz.
Because the Los Angeles – San Diego – San Luis Obispo Rail Corridor is a heavily used corridor with a significant increase in the number of vibration events, a standard vibration assessment is conducted, which does not take into consideration the existing vibration levels.
dBA = A-weighted decibels; FRA = Federal Railroad Administration; Hz = Hertz; I- = Interstate; mph = miles per hour (the speeds vary along the corridor as described in Section 4.2); NB = northbound; SB = southbound; VSA = vibration-sensitive area

Table 6-7 Institutional Vibration Impact Assessment for U.S. Highway 101 to Redondo Junction

Location	Name	Side of Track	VSA	Distance to Near Track (feet)	Train Speed (mph)	Vibration Levels (VdB)[1]		Number of Impacts
						Project Levels	FRA Impact Criteria	
U.S. Hwy 101 to E 1st St	Felicitas and Gonzalo Mendez High School	NB	1a	974	45	58	75	0
E 1st St to Whittier Blvd	Monarch Studios	NB	2a	595	50	61	65	0
E 1st St to Whittier Blvd	Ace Mission Studios	NB	2a	762	50	60	65	0
Whittier Blvd to Redondo Jct	Downtown Rehearsal	NB	4a	552	50	61	65	0
Whittier Blvd to Redondo Jct	Corridor Digital Studio	SB	5a	475	50	61	65	0
Whittier Blvd to Redondo Jct	Orbital Studios	SB	5a	712	50	60	65	0
Whittier Blvd to Redondo Jct	Void Studios	SB	5a	965	50	59	65	0

Location	Name	Side of Track	VSA	Distance to Near Track (feet)	Train Speed (mph)	Vibration Levels (VdB)[1]		Number of Impacts
						Project Levels	FRA Impact Criteria	
Whittier Blvd to Redondo Jct	Lemon Tree Studios - DTLA	NB	4a	660	50	60	65	0

[1] Maximum 1/3-octave band vibration velocity level over the frequency range between 8 Hz and 80 Hz.
Because the Los Angeles – San Diego – San Luis Obispo Rail Corridor is a heavily used corridor with a significant increase in the number of vibration events, a standard vibration assessment is conducted, which does not take into consideration the existing vibration levels.
FRA = Federal Railroad Administration; Hz = Hertz; mph = miles per hour (the speeds vary along the corridor as described in Section 4.2); NB = northbound; SB = southbound; VdB = vibration decibels; VSA = vibration-sensitive area

Table 6-8 Residential Ground-Borne Noise Impact Assessment for U.S. Highway 101 to Redondo Junction

Location	Side of Track	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Ground-Borne Noise Levels (dBA)		Number of Impacts
				Project Levels	FRA Impact Criteria	
U.S. Hwy 101 to E 1st St	NB	No sensitive receivers.				
U.S. Hwy 101 to E 1st St	SB	No sensitive receivers.				
E 1st St to Whittier Blvd	NB	No sensitive receivers.				
E 1st St to Whittier Blvd	SB	No sensitive receivers.				
Whittier Blvd to Redondo Jct	NB	No sensitive receivers.				
Whittier Blvd to Redondo Jct	SB	No sensitive receivers.				

FRA = Federal Railroad Administration; I = Interstate; mph = miles per hour (the speeds vary along the corridor as described in Section 4.2); NB = northbound; SB = southbound; VdB = vibration decibels

Table 6-9 Institutional Ground-Borne Noise Impact Assessment for U.S. Highway 101 to Redondo Junction

Location	Name	Side of Track	VSA	Distance to Near Track (feet)	Train Speed (mph)	Ground-Borne Noise Levels (dBA)		Number of Impacts
						Project Levels	FRA Impact Criteria	
E 1st St to Whittier Blvd	Monarch Studios	NB	2a	595	50	0	25	0
E 1st St to Whittier Blvd	Ace Mission Studios	NB	2a	762	50	0	25	0
Whittier Blvd to Redondo Jct	Downtown Rehearsal	NB	4a	552	50	0	25	0

Location	Name	Side of Track	VSA	Distance to Near Track (feet)	Train Speed (mph)	Ground-Borne Noise Levels (dBA)		Number of Impacts
						Project Levels	FRA Impact Criteria	
Whittier Blvd to Redondo Jct	Corridor Digital Studio	SB	5a	475	50	0	25	0
Whittier Blvd to Redondo Jct	Orbital Studios	SB	5a	712	50	0	25	0
Whittier Blvd to Redondo Jct	Void Studios	SB	5a	965	50	0	25	0
Whittier Blvd to Redondo Jct	Lemon Tree Studios - DTLA	NB	4a	660	50	0	25	0

dBA = A-weighted decibels; FRA = Federal Railroad Administration; mph = miles per hour (the speeds vary along the corridor as described in Section 4.2); SB = southbound

6.6.1.2 Redondo Junction to Fullerton Junction

Noise Impacts

Construction

Construction noise impacts are discussed in Section 6.3.1.

In addition, possible additional traffic noise as a result of traffic being rerouted because of local road closures during construction of the project is addressed in Section 6.3.3. Construction of the project would result in temporary or permanent closure of nine local roads between Redondo Junction and Fullerton Junction, which would require rerouting traffic and other roadway modifications.

Based on the projected increases in peak-hour traffic volumes on the anticipated detour routes during construction, it is estimated that traffic noise levels along these routes would increase by at most 1 to 5 dBA; the actual increases may be lower if the added traffic results in lower vehicle speeds along the routes. According to FHWA and Caltrans noise abatement criteria, a substantial noise increase is considered to occur when the project's predicted worst-hour design-year noise level exceeds the existing worst-hour noise level by 12 dBA or more. Because the estimated increases in traffic noise are only 1 to 5 dBA, there would be no significant noise impacts related to rerouted traffic.

Operation

The assessment of noise impacts from HSR operations in the project section is summarized in Table 6-10 for residential land uses and in Table 6-11 for institutional land uses. The results include a tabulation of future noise levels, the impact criteria, and whether moderate or severe noise impacts are projected.

The results indicate that noise impacts are projected at the following residential locations between Redondo Junction and Fullerton Junction:

- **Rio Hondo Channel to Rosemead Boulevard (Pico Rivera):** In this area, moderate noise impacts are projected at 14 single-family residences and severe noise impacts are projected at 3 single-family residences, all on the southbound side of the tracks. These impacts would be caused by the proximity of the receivers to the proposed track and the speed of the train.
- **Brea Creek to Dale Street (Buena Park):** In this area, moderate noise impacts are projected at four residences in a multifamily building on the northbound side of the tracks. These impacts would be caused by the proximity of the receivers to the proposed track and the speed of the train.
- **Euclid Street to S Richman Avenue (Fullerton):** In this area, moderate noise impacts are projected at four single-family residences on the southbound side of the tracks. These impacts would be caused by the proximity of the receivers to the proposed track and the speed of the train.

With the intermediate station design options, noise levels would be reduced in the vicinity of Norwalk/Santa Fe Springs Station and Fullerton Station because of lower train speeds. However, the noise impacts are projected to be the same.

The noise impact locations are depicted on the figures in Appendix E, Noise Impacts.

Finally, the noise impact of project-related relocation of freight tracks within the right-of-way near sensitive receptors was evaluated at two locations in the project section. On the side where the tracks are being shifted away from sensitive receptors, there would be a small decrease in noise. On the side where the tracks are being shifted closer to sensitive receptors, there would be a small increase in noise (approximately 1 dB based on the average track distance for the closest receptors). However, this would not change the impact determination at these locations.

Table 6-10 Residential Noise Impact Assessment for Redondo Junction to Fullerton Junction

Location	Side of Track	NSA	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Existing Noise Level (dBA)	Project Noise Level (dBA)	Noise Impact Criteria (dBA)		Number of Impacts	
							Mod.	Sev.	Mod.	Sev.
Redondo Jct to I-710	NB	No noise-sensitive receivers.								
Redondo Jct to I-710	SB	No noise-sensitive receivers.								
I-710 to I-5	NB	No noise-sensitive receivers.								
I-710 to I-5	SB	No noise-sensitive receivers.								
I-5 to Greenwood Ave	NB	2b	570	90	74	41	65	72	0	0
I-5 to Greenwood Ave	SB	No noise-sensitive receivers.								
Greenwood Ave to Rio Hondo Channel	NB	3b	121	90	74	58	65	72	0	0
Greenwood Ave to Rio Hondo Channel	SB	No noise-sensitive receivers.								
Rio Hondo Channel to Rosemead Blvd	NB	No noise-sensitive receivers.								
Rio Hondo Channel to Rosemead Blvd	SB	4b	26	79	67	69	62	67	14	3
Rosemead Blvd to Passons Blvd	NB	5b	113	79	75	58	65	73	0	0
Rosemead Blvd to Passons Blvd	SB	6b	308	79	67	46	62	67	0	0
Passons Blvd to I-605	NB	7b	126	70	82	56	65	73	0	0
Passons Blvd to I-605	SB	8b	278	70	67	51	62	67	0	0
I-605 to Norwalk Blvd	NB	9b	71	70	82	61	65	75	0	0
I-605 to Norwalk Blvd	SB	No noise-sensitive receivers.								
Norwalk Blvd to Telegraph Rd	NB	No noise-sensitive receivers.								
Norwalk Blvd to Telegraph Rd	SB	No noise-sensitive receivers.								
Telegraph Rd to Lakeland Rd	NB	No noise-sensitive receivers.								
Telegraph Rd to Lakeland Rd	SB	10b	854	79	63	43	59	65	0	0
Lakeland Rd to Imperial Hwy	NB	No noise-sensitive receivers.								

Location	Side of Track	NSA	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Existing Noise Level (dBA)	Project Noise Level (dBA)	Noise Impact Criteria (dBA)		Number of Impacts	
							Mod.	Sev.	Mod.	Sev.
Lakeland Rd to Imperial Hwy	SB	No noise-sensitive receivers.								
Imperial Hwy to Foster Rd	NB	No noise-sensitive receivers.								
Imperial Hwy to Foster Rd	SB	12b	101	45	68	60	62	68	0	0
Foster Rd to La Canada Verde Creek	NB	No noise-sensitive receivers.								
Foster Rd to La Canada Verde Creek	SB	No noise-sensitive receivers.								
La Canada Verde Creek to Valley View Ave	NB	13b	595	79	68	39	63	68	0	0
La Canada Verde Creek to Valley View Ave	SB	No noise-sensitive receivers.								
Valley View Ave to La Mirada Creek	NB	14b	104	79	68	59	63	68	0	0
Valley View Ave to La Mirada Creek	SB	No noise-sensitive receivers.								
La Mirada Creek to Alondra Blvd	NB	15b	104	79	76	59	65	74	0	0
La Mirada Creek to Alondra Blvd	SB	No noise-sensitive receivers.								
Alondra Blvd to Coyote Creek	NB	16b	99	79	70	59	64	69	0	0
Alondra Blvd to Coyote Creek	SB	No noise-sensitive receivers.								
Coyote Creek to Stanton Ave	NB	17b	295	79	72	51	65	71	0	0
Coyote Creek to Stanton Ave	SB	18b	130	79	68	57	63	68	0	0
Stanton Ave to Artesia Ave	NB	19b	29	79	72	67	65	71	4	0
Stanton Ave to Artesia Ave	SB	20b	109	75	64	58	60	65	0	0
Artesia Ave to Brookhurst St	NB	No noise-sensitive receivers.								
Artesia Ave to Brookhurst St	SB	21b	184	79	71	45	65	70	0	0
Brookhurst St to Euclid St	NB	22b	131	79	67	57	62	68	0	0
Brookhurst St to Euclid St	SB	23b	38	79	68	62	63	68	0	0

Location	Side of Track	NSA	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Existing Noise Level (dBA)	Project Noise Level (dBA)	Noise Impact Criteria (dBA)		Number of Impacts	
							Mod.	Sev.	Mod.	Sev.
Euclid St to S Harbor Blvd	NB	24b	99	79	74	58	65	72	0	0
Euclid St to S Harbor Blvd	SB	25b	62	79	60	62	58	63	4	0
S Harbor Blvd to Fullerton Jct	NB	26b	164	70	74	54	65	72	0	0
S Harbor Blvd to Fullerton Jct	SB	27b	82	70	75	59	65	73	0	0

Numbers may not add up because of rounding.
dBA = A-weighted decibels; I- = Interstate; Mod. = moderate; mph = miles per hour (the speeds vary along the corridor as described in Section 4.2); NB = northbound; SB = southbound; Sev. = severe

Table 6-11 Institutional Noise Impact Assessment for Redondo Junction to Fullerton Junction

Location	Name	Side of Track	NSA	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Existing Noise Level (dBA)	Project Noise Level (dBA)	Noise Impact Criteria (dBA)		Number of Impacts	
								Mod.	Sev.	Mod.	Sev.
I-710 to I-5	Immediate Medical Center	NB	1b	485	90	73	47	70	77	0	0
Passons Blvd to I-605	Plaza de la Raza/ Maizeland School	NB	7b	347	70	60	42	63	68	0	0
I-605 to Norwalk Blvd	Our Lady of Perpetual Help	NB	9b	627	70	61	34	63	69	0	0
I-605 to Norwalk Blvd	Los Nietos Middle School	NB	9b	410	70	61	42	63	69	0	0
Lakeland Rd to Imperial Hwy	PIH Health Urgent Care Center - Santa Fe Springs	SB	11b	712	45	58	39	62	67	0	0
Imperial Hwy to Foster Rd	John H. Glenn High School	SB	12b	547	45	58	42	62	67	0	0
Valley View Ave to La Mirada Creek	Neff Park	NB	14b	530	79	60	39	63	68	0	0

Location	Name	Side of Track	NSA	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Existing Noise Level (dBA)	Project Noise Level (dBA)	Noise Impact Criteria (dBA)		Number of Impacts	
								Mod.	Sev.	Mod.	Sev.
Coyote Creek to Stanton Ave	Jesus' Hands Montessori Preschool	SB	18b	445	79	61	42	63	69	0	0
Stanton Ave to Artesia Ave	Praise Chapel of Buena Park	SB	20b	204	75	70	34	69	74	0	0
Brookhurst St to Euclid St	One Spirit Church	SB	23b	593	79	70	35	69	74	0	0
Brookhurst St to Euclid St	Pacific Drive Elementary School	SB	23b	650	79	70	39	69	74	0	0
Brookhurst St to Euclid St	Hunt Branch Library	SB	23b	149	79	70	55	69	74	0	0
Brookhurst St to Euclid St	Grace Korean Ministries	SB	23b	257	79	70	51	69	74	0	0
Euclid St to S Harbor Blvd	Vietnamese Muslim Community	SB	25b	372	79	57	43	61	67	0	0
Euclid St to S Harbor Blvd	Saint Mary's Catholic Church	NB	24b	500	79	57	41	61	67	0	0
Euclid St to S Harbor Blvd	Independence Park	SB	25b	326	79	57	49	61	67	0	0
S Harbor Blvd to Fullerton Jct	Pure Water Church	SB	27b	468	70	57	38	61	67	0	0
S Harbor Blvd to Fullerton Jct	Maverick Theater[1]	SB	27b	87	70 (25)	57	58 (53)	61	67	0	0
S Harbor Blvd to Fullerton Jct	Vineyard Fullerton Church[1]	SB	27b	70	70 (25)	57	57 (54)	61	67	0	0

Location	Name	Side of Track	NSA	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Existing Noise Level (dBA)	Project Noise Level (dBA)	Noise Impact Criteria (dBA)		Number of Impacts	
								Mod.	Sev.	Mod.	Sev.
S Harbor Blvd to Fullerton Jct	STAGEStheatre	NB	26b	511	55	57	37	61	67	0	0
S Harbor Blvd to Fullerton Jct	Alt Timelines Video Productions	NB	26b	595	70	61	39	58	64	0	0

[1] Numbers in parentheses reflect different values for the Fullerton Station area at these receivers.
dBA = A-weighted decibels; I- = Interstate; Mod. = moderate; mph = miles per hour (the speeds vary along the corridor as described in Section 4.2); NB = northbound; SB = southbound; Sev. = severe

Vibration Impacts

Construction

Construction vibration impacts are discussed in Section 6.3.2.

Operation

The assessment of ground-borne vibration impacts from HSR operations in the project section is summarized in Table 6-12 for residential land uses and in Table 6-13 for institutional land uses. In addition, the assessment of ground-borne noise impacts is summarized in Table 6-14 for residential land uses and in Table 6-15 for institutional land uses. The results include a tabulation of location information for each sensitive receptor or receptor group, the projections of future ground-borne vibration or noise levels, the impact criteria, and whether impacts are projected.

The results indicate that ground-borne vibration impacts are projected at the following residential locations between Redondo Junction and Fullerton Junction:

- **Rio Hondo Channel to Rosemead Boulevard (Pico Rivera):** Twenty-eight vibration impacts are projected in this area at single-family residences on the southbound side of the tracks. These impacts would result from the proximity of the receivers to the proposed track and the speed of the train.
- **Brea Creek to Dale Street (Buena Park):** In this area, vibration impacts are projected at 14 residences in four multifamily building on the northbound side of the tracks. These impacts would be caused by the proximity of the receivers to the proposed track and the speed of the train.

No ground-borne noise impacts are projected between Redondo Junction and Fullerton Junction.

With the optional intermediate HSR station options, vibration levels would be reduced in the vicinity of Norwalk/Santa Fe Springs Station and Fullerton Station because of lower train speeds. Therefore, vibration impacts are projected to be similar to those of the Shared Passenger Track Alternatives.

The vibration impact locations are depicted on the figures in Appendix F, Vibration Impacts.

Table 6-12 Residential Vibration Impact Assessment for Redondo Junction to Fullerton Junction

Location	Side of Track	VSA	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Vibration Levels (VdB)[1]		Number of Impacts
					Project Levels	FRA Impact Criteria	
Redondo Jct to I-710	NB	No vibration-sensitive receivers.					
Redondo Jct to I-710	SB	No vibration-sensitive receivers.					
I-710 to I-5	NB	No vibration-sensitive receivers.					
I-710 to I-5	SB	No vibration-sensitive receivers.					
I-5 to Greenwood Ave	NB	2b	570	90	47	72	0
I-5 to Greenwood Ave	SB	No vibration-sensitive receivers.					
Greenwood Ave to Rio Hondo Channel	NB	3b	121	90	54	72	0
Greenwood Ave to Rio Hondo Channel	SB	No vibration-sensitive receivers.					
Rio Hondo Channel to Rosemead Blvd	NB	No vibration-sensitive receivers.					
Rio Hondo Channel to Rosemead Blvd	SB	4b	26	79	80	72	28
Rosemead Blvd to Passons Blvd	NB	5b	113	79	72	72	0
Rosemead Blvd to Passons Blvd	SB	6b	308	79	66	72	0
Passons Blvd to I-605	NB	7b	126	70	70	72	0
Passons Blvd to I-605	SB	8b	278	70	65	72	0
I-605 to Norwalk Blvd	NB	9b	71	70	66	72	0
I-605 to Norwalk Blvd	SB	No vibration-sensitive receivers.					
Norwalk Blvd to Telegraph Rd	NB	No vibration-sensitive receivers.					
Norwalk Blvd to Telegraph Rd	SB	No vibration-sensitive receivers.					
Telegraph Rd to Lakeland Rd	NB	No vibration-sensitive receivers.					
Telegraph Rd to Lakeland Rd	SB	10b	854	79	57	72	0
Lakeland Rd to Imperial Hwy	NB	No vibration-sensitive receivers.					

Location	Side of Track	VSA	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Vibration Levels (VdB)[1]		Number of Impacts
					Project Levels	FRA Impact Criteria	
Lakeland Rd to Imperial Hwy	SB	No vibration-sensitive receivers.					
Imperial Hwy to Foster Rd	NB	No vibration-sensitive receivers.					
Imperial Hwy to Foster Rd	SB	12b	101	45	47	72	0
Foster Rd to La Canada Verde Creek	NB	No vibration-sensitive receivers.					
Foster Rd to La Canada Verde Creek	SB	No vibration-sensitive receivers.					
La Canada Verde Creek to Valley View Ave	NB	13b	595	79	58	72	0
La Canada Verde Creek to Valley View Ave	SB	No vibration-sensitive receivers.					
Valley View Ave to La Mirada Creek	NB	14b	104	79	57	72	0
Valley View Ave to La Mirada Creek	SB	No vibration-sensitive receivers.					
La Mirada Creek to Alondra Blvd	NB	15b	104	79	57	72	0
La Mirada Creek to Alondra Blvd	SB	No vibration-sensitive receivers.					
Alondra Blvd to Coyote Creek	NB	16b	99	79	57	72	0
Alondra Blvd to Coyote Creek	SB	No vibration-sensitive receivers.					
Coyote Creek to Stanton Ave	NB	17b	295	79	65	72	0
Coyote Creek to Stanton Ave	SB	18b	130	79	70	72	0
Stanton Ave to Artesia Ave	NB	19b	29	79	80	72	14
Stanton Ave to Artesia Ave	SB	20b	109	75	63	72	0
Artesia Ave to Brookhurst St	NB	No vibration-sensitive receivers.					
Artesia Ave to Brookhurst St	SB	21b	184	79	54	72	0
Brookhurst St to Euclid St	NB	22b	131	79	57	72	0
Brookhurst St to Euclid St	SB	23b	38	79	68	72	0
Euclid St to S Harbor Blvd	NB	24b	99	79	60	72	0

Location	Side of Track	VSA	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Vibration Levels (VdB)[1]		Number of Impacts
					Project Levels	FRA Impact Criteria	
Euclid St to S Harbor Blvd	SB	25b	62	79	65	72	0
S Harbor Blvd to Fullerton Jct	NB	26b	164	70	54	72	0
S Harbor Blvd to Fullerton Jct	SB	27b	82	70	58	72	0

[1] Maximum 1/3-octave band vibration velocity level over the frequency range between 8 Hz and 80 Hz.
Because the Los Angeles – San Diego – San Luis Obispo Rail Corridor is a heavily used corridor with a significant increase in the number of vibration events, a standard vibration assessment is conducted, which does not take into consideration the existing vibration levels.
dBA = A-weighted decibels; FRA = Federal Railroad Administration; Hz = Hertz; I- = Interstate; mph = miles per hour (the speeds vary along the corridor as described in Section 4.2); NB = northbound; SB = southbound; VSA = vibration-sensitive area

Table 6-13 Institutional Vibration Impact Assessment for Redondo Junction to Fullerton Junction

Location	Name	Side of Track	VSA	Distance to Near Track (feet)	Train Speed (mph)	Vibration Levels (VdB)[1]		Number of Impacts
						Project Levels	FRA Impact Criteria	
I-710 to I-5	Immediate Medical Center	NB	1b	485	90	47	75	0
Passons Blvd to I-605	Maizeland School	NB	7b	347	70	64	75	0
I-605 to Norwalk Blvd	Our Lady of Perpetual Help	NB	9b	627	70	60	75	0
I-605 to Norwalk Blvd	Los Nietos Middle School	NB	9b	410	70	62	75	0
Lakeland Rd to Imperial Hwy	PIH Health Urgent Care Center - Santa Fe Springs	SB	11b	712	45	43	75	0
Imperial Hwy to Foster Rd	John H. Glenn High School	SB	12b	547	45	43	75	0
Coyote Creek to Stanton Ave	Jesus' Hands Montessori Preschool	SB	18b	445	79	66	75	0
Stanton Ave to Artesia Ave	Praise Chapel of Buena Park	SB	20b	204	75	53	75	0
Brookhurst St to Euclid St	One Spirit Church	SB	23b	593	79	42	75	0
Brookhurst St to Euclid St	Pacific Drive Elementary School	SB	23b	650	79	41	75	0

Location	Name	Side of Track	VSA	Distance to Near Track (feet)	Train Speed (mph)	Vibration Levels (VdB)[1]		Number of Impacts
						Project Levels	FRA Impact Criteria	
Brookhurst St to Euclid St	Hunt Branch Library	SB	23b	149	79	55	75	0
Brookhurst St to Euclid St	Grace Korean Ministries	SB	23b	257	79	50	75	0
Euclid St to S Harbor Blvd	Vietnamese Muslim Community	SB	24b	372	79	47	75	0
Euclid St to S Harbor Blvd	Saint Mary's Catholic Church	NB	25b	500	79	50	75	0
S Harbor Blvd to Fullerton Jct	Pure Water Church	SB	27b	468	70	49	75	0
S Harbor Blvd to Fullerton Jct	Maverick Theater[2]	SB	27b	87	70 (25)	58 (49)	75	0
S Harbor Blvd to Fullerton Jct	Vineyard Fullerton Church[2]	SB	27b	70	70 (25)	61 (52)	75	0
S Harbor Blvd to Fullerton Jct	STAGEStheatre	NB	26b	511	55	46	75	0
S Harbor Blvd to Fullerton Jct	Alt Timelines Video Productions	NB	26b	595	70	48	65	0

[1] Maximum 1/3-octave band vibration velocity level over the frequency range between 8 Hz and 80 Hz
[2] Numbers in parentheses reflect different values for the Fullerton Station option at these receivers.
Because the Los Angeles – San Diego – San Luis Obispo Rail Corridor is a heavily used corridor with a significant increase in the number of vibration events, a standard vibration assessment is conducted, which does not take into consideration the existing vibration levels.
FRA = Federal Railroad Administration; Hz = Hertz; mph = miles per hour (the speeds vary along the corridor as described in Section 4.2); NB = northbound; SB = southbound; VdB = vibration decibels; VSA = vibration-sensitive area

Table 6-14 Residential Ground-Borne Noise Impact Assessment for Redondo Junction to Fullerton Junction

Location	Side of Track	VSA	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Ground-Borne Noise Levels (dBA)		Number of Impacts
					Project Levels	FRA Impact Criteria	
I-10 to I-710	NB	No sensitive receivers.					
I-10 to I-710	SB	No sensitive receivers.					
I-710 to I-5	NB	No sensitive receivers.					
I-710 to I-5	SB	No sensitive receivers.					
I-5 to Greenwood Ave	NB	No sensitive receivers.					

Location	Side of Track	VSA	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Ground-Borne Noise Levels (dBA)		Number of Impacts
					Project Levels	FRA Impact Criteria	
I-5 to Greenwood Ave	SB	No sensitive receivers.					
Greenwood Ave to Rio Hondo Channel	NB	No sensitive receivers.					
Greenwood Ave to Rio Hondo Channel	SB	No sensitive receivers.					
Rio Hondo Channel to Rosemead Blvd	NB	No sensitive receivers.					
Rio Hondo Channel to Rosemead Blvd	SB	No sensitive receivers.					
Rosemead Blvd to Passons Blvd	NB	No sensitive receivers.					
Rosemead Blvd to Passons Blvd	SB	No sensitive receivers.					
Passons Blvd to I-605	NB	No sensitive receivers.					
Passons Blvd to I-605	SB	No sensitive receivers.					
I-605 to Norwalk Blvd	NB	No sensitive receivers.					
I-605 to Norwalk Blvd	SB	No sensitive receivers.					
Norwalk Blvd to Telegraph Rd	NB	No sensitive receivers.					
Norwalk Blvd to Telegraph Rd	SB	No sensitive receivers.					
Telegraph Rd to Lakeland Rd	NB	No sensitive receivers.					
Telegraph Rd to Lakeland Rd	SB	No sensitive receivers.					
Lakeland Rd to Imperial Hwy	NB	No sensitive receivers.					
Lakeland Rd to Imperial Hwy	SB	No sensitive receivers.					
Imperial Hwy to Foster Rd	NB	No sensitive receivers.					
Imperial Hwy to Foster Rd	SB	No sensitive receivers.					
Foster Rd to La Canada Verde Creek	NB	No sensitive receivers.					
Foster Rd to La Canada Verde Creek	SB	No sensitive receivers.					
La Canada Verde Creek to Valley View Ave	NB	No sensitive receivers.					

Location	Side of Track	VSA	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Ground-Borne Noise Levels (dBA)		Number of Impacts
					Project Levels	FRA Impact Criteria	
La Canada Verde Creek to Valley View Ave	SB	No sensitive receivers.					
Valley View Ave to La Mirada Creek	NB	No sensitive receivers.					
Valley View Ave to La Mirada Creek	SB	No sensitive receivers.					
La Mirada Creek to Alondra Blvd	NB	No sensitive receivers.					
La Mirada Creek to Alondra Blvd	SB	No sensitive receivers.					
Alondra Blvd to Coyote Creek	NB	No sensitive receivers.					
Alondra Blvd to Coyote Creek	SB	No sensitive receivers.					
Coyote Creek to Stanton Ave	NB	No sensitive receivers.					
Coyote Creek to Stanton Ave	SB	No sensitive receivers.					
Stanton Ave to Artesia Ave	NB	19b	29	79	6	35	0
Stanton Ave to Artesia Ave	SB	No sensitive receivers.					
Artesia Ave to Brookhurst St	NB	No sensitive receivers.					
Artesia Ave to Brookhurst St	SB	21b	184	79	1	35	0
Brookhurst St to Euclid St	NB	No sensitive receivers.					
Brookhurst St to Euclid St	SB	No sensitive receivers.					
Euclid St to S Harbor Blvd	NB	No sensitive receivers.					
Euclid St to S Harbor Blvd	SB	No sensitive receivers.					
S Harbor Blvd to Fullerton Jct	NB	No sensitive receivers.					
S Harbor Blvd to Fullerton Jct	SB	No sensitive receivers.					

FRA = Federal Railroad Administration; I = Interstate; mph = miles per hour (the speeds vary along the corridor as described in Section 4.2); NB = northbound; SB = southbound; VdB = vibration decibels

Table 6-15 Institutional Ground-Borne Noise Impact Assessment for Redondo Junction to Fullerton Junction

Location	Name	Side of Track	VSA	Distance to Near Track (feet)	Train Speed (mph)	Ground-Borne Noise Levels (dBA)		Number of Impacts
						Project Levels	FRA Impact Criteria	
Stanton Ave to Artesia Ave	Praise Chapel of Buena Park	SB	20b	204	75	0	43	0
S Harbor Blvd to Fullerton Jct	STAGEStheatre	NB	26b	511	55	0	43	0
S Harbor Blvd to Fullerton Jct	Alt Timelines Video Productions	NB	26b	595	70	0	25	0
S Harbor Blvd to Fullerton Jct	Maverick Theater[1]	SB	27b	87	70 (25)	18 (9)	43	0

[1] Numbers in parentheses reflect different values for the Fullerton Station area at this receiver.
dBA = A-weighted decibels; FRA = Federal Railroad Administration; mph = miles per hour (the speeds vary along the corridor as described in Section 4.2); SB = southbound

6.6.1.3 Fullerton Junction to ARTIC

Noise Impacts

Construction

Construction noise impacts are discussed in Section 6.3.1.

In addition, possible additional traffic noise as a result of traffic being rerouted because of local road closures during construction of the project is addressed in Section 6.3.3. Construction of the project would result in temporary or permanent closure of nine local roads between Fullerton Junction and ARTIC, which would require rerouting traffic and other roadway modifications.

Based on the projected increases in peak-hour traffic volumes on the anticipated detour routes during construction, it is estimated that traffic noise levels along these routes would increase by up to 4 dBA; the actual increases may be lower if the added traffic results in lower vehicle speeds. According to FHWA and Caltrans noise abatement criteria, a substantial noise increase is considered to occur when the project's predicted worst-hour design-year noise level exceeds the existing worst-hour noise level by 12 dBA or more. Because the estimated increases in traffic noise are only 0 to 4 dBA, there would be no significant noise impacts related to rerouted traffic.

Operation

The assessment of noise impacts from HSR operations is summarized in Table 6-16 for residential land uses and in Table 6-17 for institutional land uses. The results include a tabulation of location information for each sensitive receptor or receptor group, the projections of future noise levels, the impact criteria, and whether moderate or severe noise impacts are projected.

Table 6-16 Residential Noise Impact Assessment for Fullerton Junction to ARTIC

Location	Side of Track	NSA	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Existing Noise Level (dBA)	Project Noise Level (dBA)	Noise Impact Criteria (dBA)		Number of Impacts	
							Mod.	Sev.	Mod.	Sev.
Fullerton Jct to E Orangethorpe Ave	NB	1c	380	55	68	42	63	68	0	0
Fullerton Jct to E Orangethorpe Ave	SB	2c	48	55	75	59	65	73	0	0
E Orangethorpe Ave to E La Palma Ave	NB	3c	60	79	69	62	64	69	0	0
E Orangethorpe Ave to E La Palma Ave	SB	No noise-sensitive receivers.								
E La Palma Ave to E Wilhelmina St	NB	4c	59	79	61	62	58	64	82	0
E La Palma Ave to E Wilhelmina St	SB	5c	137	79	61	51	58	64	0	0
E Wilhelmina St to Lincoln Ave	NB	6c	21	90	61	69	58	64	3	38
E Wilhelmina St to Lincoln Ave	SB	7c	33	90	61	63	58	64	14	0
Lincoln Ave to E Santa Ana St	NB	8c	42	90	61	65	58	64	39	18
Lincoln Ave to E Santa Ana St	SB	9c	208	90	61	54	58	64	0	0
E Santa Ana St to E Vermont Ave	NB	10c	50	90	61	64	58	64	57	0
E Santa Ana St to E Vermont Ave	SB	11c	30	90	62	64	59	64	226	0
E Vermont Ave to E Cerritos Ave	NB	12c	396	70	71	48	65	70	0	0
E Vermont Ave to E Cerritos Ave	SB	No noise-sensitive receivers.								
E Cerritos Ave to ARTIC	NB	No noise-sensitive receivers.								
E Cerritos Ave to ARTIC	SB	14c	180	70	71	54	65	70	0	0

ARTIC = Anaheim Regional Transportation Intermodal Center; dBA = A-weighted decibels; Mod. = moderate; mph = miles per hour (the speeds vary along the corridor as described in Section 4.2); NB = northbound; SB = southbound; Sev. = severe

Table 6-17 Institutional Noise Impact Assessment for Fullerton Junction to ARTIC

Location	Name	Side of Track	NSA	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Existing Noise Level (dBA)	Project Noise Level (dBA)	Noise Impact Criteria (dBA)		Number of Impacts	
								Mod.	Sev.	Mod.	Sev.
E Orangethorpe Ave to E La Palma Ave	Recording Connection Audio Institute	NB	3c	544	79	65	38	66	71	0	0
E Santa Ana St to E Vermont Ave	Thomas Jefferson Elementary	SB	11c	658	90	67	35	67	72	0	0
E Vermont Ave to E Cerritos Ave	Martinez Granite	NB	12c	462	90	67	43	67	72	0	0
E Cerritos Ave to ARTIC	City National Grove of Anaheim	SB	14c	431	20	67	42	67	72	0	0
E Cerritos Ave to ARTIC	Saddleback Church Anaheim	SB	14c	80	20	67	54	67	72	0	0
E Cerritos Ave to ARTIC	Tru One Records & Rehearsals	NB	13c	373	70	67	41	67	72	0	0
E Cerritos Ave to ARTIC	Iglesia Adventista Del 7mo Dia Hispana Emmanuel	SB	14c	461	70	67	41	67	72	0	0
E Cerritos Ave to ARTIC	Magnolia Park	SB	14c	642	70	68	37	68	73	0	0

ARTIC = Anaheim Regional Transportation Intermodal Center; dBA = A-weighted decibels; Mod. = moderate; mph = miles per hour (the speeds vary along the corridor as described in Section 4.2); NB = northbound; SB = southbound; Sev. = severe

The results indicate that noise impacts are projected at the following residential locations between Fullerton Junction and ARTIC:

- **E La Palma Avenue to E Wilhelmina Street (Anaheim):** In this area, moderate noise impacts are projected at 82 residences in 13 multifamily buildings on the northbound side of the tracks. The impacts would result from the proximity of the receivers to the proposed track and the speeds of the train.
- **E Wilhelmina Street to E Sycamore Street (Anaheim):** In this area, moderate noise impacts are projected at three single-family residences and severe noise impacts are projected at two single-family residences, all on the northbound side of the tracks. The impacts would result from the proximity of the receivers to the proposed track and the speeds of the train.
- **E Sycamore Street to Lincoln Avenue (Anaheim):** In this area, moderate noise impacts are projected at 14 single-family residences on the southbound side of the tracks and severe noise impacts are projected at 36 residences in 12 multifamily buildings on the northbound side of the tracks. The impacts would result from the proximity of the receivers to the proposed track and the speeds of the train.
- **Lincoln Avenue to E Santa Ana Street (Anaheim):** In this area, moderate noise impacts are projected at 39 residences and severe noise impacts are projected at 18 residences. The 18 severe impacts are projected at three multifamily buildings and the 39 moderate impacts are projected at a combination of 11 single-family residences and four multifamily buildings on the northbound side of the tracks. The impacts would result from the proximity of the receivers to the proposed track and the speeds of the train.
- **E Santa Ana Street to Vermont Avenue (Anaheim):** In this area, moderate noise impacts are projected at 57 multifamily residences in 23 buildings on the northbound side of the tracks and at 226 multifamily residences in 14 buildings on the southbound side of the tracks. These impacts would result from the proximity of the receivers to the proposed track and the speeds of the train.

The noise impact locations are depicted on the figures in Appendix E.

Finally, no sensitive receptors in this area would be affected by changes in noise from project-related relocation of freight tracks within the right-of-way.

Vibration Impacts

Construction

Construction vibration impacts are discussed in Section 6.3.2.

Operation

The assessment of ground-borne vibration impacts from HSR operations in this area is summarized in Table 6-18 for residential land uses and in Table 6-19 for institutional land uses. In addition, the assessment of ground-borne noise impacts for institutional land uses is summarized in Table 6-20. The results include a tabulation of location information for each sensitive receptor or receptor group, the projections of future vibration levels, the impact criteria, and whether impacts are projected. The results indicate that ground-borne vibration impacts are projected at the following residential locations between Fullerton Junction and ARTIC:

- **E Orangethorpe Avenue to E La Palma Avenue (Anaheim):** Thirteen vibration impacts are projected in this area at single-family residences on the northbound side of the tracks. These impacts would result from the proximity of the receivers to the proposed track and the speed of the train.
- **E La Palma Avenue to E Wilhelmina Street (Anaheim):** Vibration impacts are projected at 72 residences in 12 multifamily buildings in this area on the northbound side of the tracks.

These impacts would result from the proximity of the receivers to the proposed track and the speed of the train.

- **E Wilhelmina Street to Lincoln Avenue (Anaheim):** In this area, 39 vibration impacts are projected on the northbound side of the tracks at a combination of three single-family residences and 12 multifamily buildings and on the southbound side of the tracks at 11 single-family residences. These impacts would result from the proximity of the receivers to the proposed track and the speed of the train.
- **Lincoln Avenue to E Santa Ana Street (Anaheim):** In this area, 57 vibration impacts are projected on the northbound side of the tracks at a combination of 11 single-family residences and seven multifamily buildings. These impacts would result from the proximity of the receivers to the proposed track and the speed of the train.
- **E Santa Ana Street to Vermont Avenue (Anaheim):** In this area, vibration impacts are projected at 57 residences in 23 multifamily residences on the northbound side of the tracks and vibration impacts are projected at 226 residences in 14 multifamily buildings on the southbound side of the tracks. These impacts would result from the proximity of the receivers to the proposed track and the speed of the train.

No ground-borne noise impacts are projected between Fullerton Junction and ARTIC.

The vibration impact locations are depicted on the figures in Appendix F.

6.6.2 Shared Passenger Track Alternative B

6.6.2.1 Construction Noise and Vibration

Construction impacts for Shared Passenger Track Alternative B would be the same as those of Shared Passenger Track Alternative A and are discussed in Section 6.3.1 for noise and in Section 6.3.2 for vibration.

6.6.2.2 Operational Noise and Vibration

Operational noise and vibration impacts for Shared Passenger Track Alternative B would be similar to those of Shared Passenger Track Alternative A and are discussed in Section 6.6.1, Shared Passenger Track Alternative A. The alternatives differ only in the LMF site and, because there is no noise- or vibration-sensitive land use near either of these sites, the impacts are expected to be the same for both alternatives.

Table 6-18 Residential Vibration Impact Assessment for Fullerton Junction to ARTIC

Location	Side of Track	VSA	Closest Receiver(s) Distance to Near Track (feet)	Maximum Train Speed (mph)	Vibration Levels (VdB)[1]		Number of Impacts
					Project Levels	FRA Impact Criteria	
Fullerton Jct to E Orangethorpe Ave	NB	1c	380	55	48	72	0
Fullerton Jct to E Orangethorpe Ave	SB	2c	48	55	63	72	0
E Orangethorpe Ave to E La Palma Ave	NB	3c	60	79	73	72	13
E Orangethorpe Ave to E La Palma Ave	SB	No vibration-sensitive receivers.					
E La Palma Ave to E Wilhelmina St	NB	4c	59	79	74	72	72
E La Palma Ave to E Wilhelmina St	SB	5c	137	79	67	72	0
E Wilhelmina St to Lincoln Ave	NB	6c	21	90	85	72	39
E Wilhelmina St to Lincoln Ave	SB	7c	33	90	81	72	11
Lincoln Ave to E Santa Ana St	NB	8c	42	90	78	72	57
Lincoln Ave to E Santa Ana St	SB	9c	208	90	64	72	0
E Santa Ana St to E Vermont Ave	NB	10c	50	90	77	72	57
E Santa Ana St to E Vermont Ave	SB	11c	30	90	82	72	226
E Vermont Ave to E Cerritos Ave	NB	12c	396	70	60	72	0
E Vermont Ave to E Cerritos Ave	SB	No vibration-sensitive receivers.					
E Cerritos Ave to ARTIC	NB	No vibration-sensitive receivers.					
E Cerritos Ave to ARTIC	SB	14c	180	70	63	72	0

[1] Maximum 1/3-octave band vibration velocity level over the frequency range between 8 Hz and 80 Hz.
Because the Los Angeles – San Diego – San Luis Obispo Rail Corridor is a heavily used corridor with a significant increase in the number of vibration events, a standard vibration assessment is conducted, which does not take into consideration the existing vibration levels.
ARTIC = Anaheim Regional Transportation Intermodal Center; FRA = Federal Railroad Administration; Hz = Hertz ; mph = miles per hour (the speeds vary along the corridor as described in Section 4.2); NB = northbound; SB = southbound; VdB = vibration decibels; VSA = vibration-sensitive area

Table 6-19 Institutional Vibration Impact Assessment for Fullerton Junction to ARTIC

Location	Name	Side of Track	VSA	Distance to Near Track (feet)	Train Speed (mph)	Vibration Levels (VdB)[1]		Number of Impacts
						Project Levels	FRA Impact Criteria	
E Orangethorpe Ave to E La Palma Ave	Recording Connection Audio Institute	NB	3c	544	79	60	65	0
E Santa Ana St to E Vermont Ave	Thomas Jefferson Elementary	SB	11c	658	90	60	75	0
E Vermont Ave to E Cerritos Ave	Martinez Granite	NB	12c	462	90	61	75	0
E Cerritos Ave to ARTIC	City National Grove of Anaheim	SB	14c	431	20	49	75	0
E Cerritos Ave to ARTIC	Saddleback Church Anaheim	SB	14c	80	20	59	75	0
E Cerritos Ave to ARTIC	Tru One Records & Rehearsals	NB	13c	373	70	60	75	0
E Cerritos Ave to ARTIC	Iglesia Adventista Del 7mo Dia Hispana Emmanuel	SB	14c	461	70	59	75	0

[1] Maximum 1/3-octave band vibration velocity level over the frequency range between 8 Hz and 80 Hz.
Because the Los Angeles – San Diego – San Luis Obispo Rail Corridor is a heavily used corridor with a significant increase in the number of vibration events, a standard vibration assessment is conducted, which does not take into consideration the existing vibration levels.
ARTIC = Anaheim Regional Transportation Intermodal Center; FRA = Federal Railroad Administration; Hz = Hertz; mph = miles per hour (the speeds vary along the corridor as described in Section 4.2); SB = southbound; VdB = vibration decibels; VSA = vibration-sensitive area

Table 6-20 Institutional Ground-Borne Noise Impact Assessment for Fullerton Junction to ARTIC

Location	Name	Side of Track	VSA	Distance to Near Track (feet)	Train Speed (mph)	Ground-Borne Noise Levels (dBA)		Number of Impacts
						Project Levels	FRA Impact Criteria	
E Cerritos Ave to ARTIC	Tru One Records & Rehearsals	NB	13c	373	70	16	25	0
E Cerritos Ave to ARTIC	City National Grove of Anaheim	SB	14c	431	20	3	25	0

ARTIC = Anaheim Regional Transportation Intermodal Center; dBA = A-weighted decibels; FRA = Federal Railroad Administration; mph = miles per hour (the speeds vary along the corridor as described in Section 4.2); NB = northbound; SB = southbound; VSA = vibration-sensitive area

6.7 Station Site

6.7.1 Noise Impacts

6.7.1.1 Construction

High-Speed Rail and Passenger Rail Station Facilities

ARTIC High-Speed Rail Platform and Station Facilities

Construction noise impacts for ARTIC are discussed in Section 6.3.1.

High-Speed Rail Station Options

High-Speed Rail Station Option: Norwalk/Santa Fe Springs

Construction noise impacts with inclusion of the Norwalk/Santa Fe Springs HSR Station Option are discussed in Section 6.3.1.

High-Speed Rail Station Option: Fullerton

Construction noise impacts with inclusion of the Fullerton HSR Station Option are discussed in Section 6.3.1.

6.7.1.2 Operation

High-Speed Rail Station Facilities

ARTIC High-Speed Rail Platform and Station Facilities

Based on the FTA noise impact screening procedure, noise impacts are not anticipated from operations in the vicinity of the ARTIC site.

High-Speed Rail Station Options

High-Speed Rail Station Option: Norwalk/Santa Fe Springs

Based on the FTA noise impact screening procedure, noise impacts are not anticipated from operations in the vicinity of Norwalk/Santa Fe Springs HSR Station Option.

High-Speed Rail Station Option: Fullerton

Based on the FTA noise impact screening procedure, noise impacts are not anticipated from operations in the vicinity of the Fullerton HSR Station Option.

6.7.2 Vibration Impacts

6.7.2.1 Construction

Construction vibration impacts are discussed in Section 6.3.2.

6.7.2.2 Operation

Vibration impacts are not anticipated from operations in the vicinity of a station site.

6.8 Maintenance Facility and Freight Yards

6.8.1 Noise Impacts

6.8.1.1 Construction

Construction noise impacts are discussed in Section 6.3.1.

6.8.1.2 Operation

Based on the FTA noise impact screening procedure, noise impacts are not anticipated from operations in the vicinity of a maintenance facility or freight yards with improvements associated with the Shared Passenger Track Alternatives.

6.8.2 Vibration Impacts

6.8.2.1 Construction

Construction vibration impacts are discussed in Section 6.3.2.

6.8.2.2 Operation

Vibration impacts are not anticipated from operations in the vicinity of a maintenance facility or freight yards with improvements associated with the Shared Passenger Track Alternatives.

6.9 Traction Power Substation

6.9.1 Construction

Construction noise and vibration impacts are discussed in Section 6.3, Rail Corridor Construction Impacts.

6.9.2 Operation

Based on the FTA noise impact screening procedure, noise impacts are not anticipated from operations in the vicinity of a traction power substation.

6.10 Electric Power Utility Improvements

6.10.1 Noise Impacts

6.10.1.1 Construction

Construction noise impacts are discussed in Section 6.3.1.

6.10.1.2 Operation

Based on the FTA noise impact screening procedure, noise impacts are not anticipated from operations in the vicinity of electric power utility improvements.

6.10.2 Vibration Impacts

6.10.2.1 Construction

Construction vibration impacts are discussed in Section 6.3.2.

6.10.2.2 Operation

Vibration impacts are not anticipated from operations in the vicinity of electric power utility improvements.

6.11 Cumulative Impacts

The RSA for noise and vibration is within the estimated impact distance (up to 700 feet), as discussed in Section 4.1, Definition of Resource Study Area. The project section alignment is within existing railroad and highway routes that have high noise levels caused by traffic and train operations. Measured noise exposure levels (L_{dn}) ranged from 60 dBA to 82 dBA at locations along the project alignment. Sources of existing ground vibration along the project alignment include passenger and freight trains.

6.11.1 No Project Alternative

Because cumulative noise exposure refers to the noise exposure of the project section in combination with other past, present, and reasonably foreseeable future projects, there would be no cumulative impacts under the No Project Alternative.

6.11.2 Shared Passenger Track Alternatives

In general, noise levels would increase in the future as a result of increases in population and accompanying development as well as potential transportation projects. Overall, community

exposure to noise would increase as traffic levels increase. The noise analysis compares project section conditions with the existing conditions, which is conservative because noise is expected to be higher in the future with population growth and expanded highways. However, highway or rail improvements would need to double their capacity to noticeably increase noise levels for the average person (i.e., an increase of 3 dBA). This is not expected to occur, based on the projections of increases in Metrolink, Amtrak, BNSF, and UPRR operations in the corridor. Project-related construction noise, construction vibration, and operational vibration are expected to be highly localized and are therefore not anticipated to contribute to significant noise impacts. Overall, the project section's contribution to significant cumulative construction and operational noise and vibration impacts is not anticipated to be cumulatively considerable.

This section presents potential cumulative impacts based on current knowledge of the project section. Subsequent to this technical report, the Authority will further refine the cumulative impacts described herein, and present the information in Section 3.19 of the Draft EIR/EIS.

Cumulative impacts are those resulting from past, present, and reasonably foreseeable future actions, combined with the potential noise and vibration impacts of this project section. A list of related projects was reviewed as part of this cumulative impact analysis, and those cumulative projects that fall within the RSA boundary were considered conjointly with the proposed project. Cumulative noise and vibration impacts are discussed in greater detail in Section 3.19 of the Draft EIR/EIS.

7 PROJECT IMPACT AVOIDANCE AND MINIMIZATION FEATURES

The Shared Passenger Track Alternatives incorporate standardized HSR features to avoid and minimize impacts. These features are referred to as impact avoidance and minimization features. The Authority would apply these measures during project design and construction to avoid or reduce impacts. Because the project section is in a shared corridor with existing passenger and freight service, the property owner would also be responsible for ensuring the impact avoidance and minimization features are implemented during construction and operation. The Authority would coordinate with the property owner to obtain a memorandum of understanding to ensure the impact avoidance and minimization features are implemented.

The following impact avoidance and minimization feature will be implemented to avoid or minimize adverse impacts on noise and vibration.

7.1 NV-IAMF#1: Noise and Vibration

Prior to construction, the Authority-designated contractor shall prepare and submit to the Authority a noise and vibration technical memorandum documenting how the FTA and FRA guidelines for minimizing construction noise and vibration impacts will be employed when work is being conducted within 1,000 feet of sensitive receptors. Typical construction practices contained in the FTA and FRA guidelines for minimizing construction noise and vibration impacts include the following:

- Build noise barriers, such as temporary walls or piles on excavated material, between noisy activities and noise sensitive resources.
- Route truck traffic away from residential streets, when possible.
- Build walled enclosures around especially noisy activities or around clusters of noisy equipment.
- Combine noisy operations so that they occur in the same period.
- To reduce vibration, phase demolition, earthmoving, and ground-impacting operations so as not to occur in the same time period. Unlike noise, the total vibration level produced could be substantially less when each vibration source operates separately.
- Avoid impact pile driving where possible in vibration-sensitive areas.

8 REFERENCES

8.1 Abbreviations for Acts and Codes

CFR	Code of Federal Regulations
Cal. Code Regs.	California Code of Regulations

8.2 References Cited

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8.3 Persons and Agencies Consulted

None.

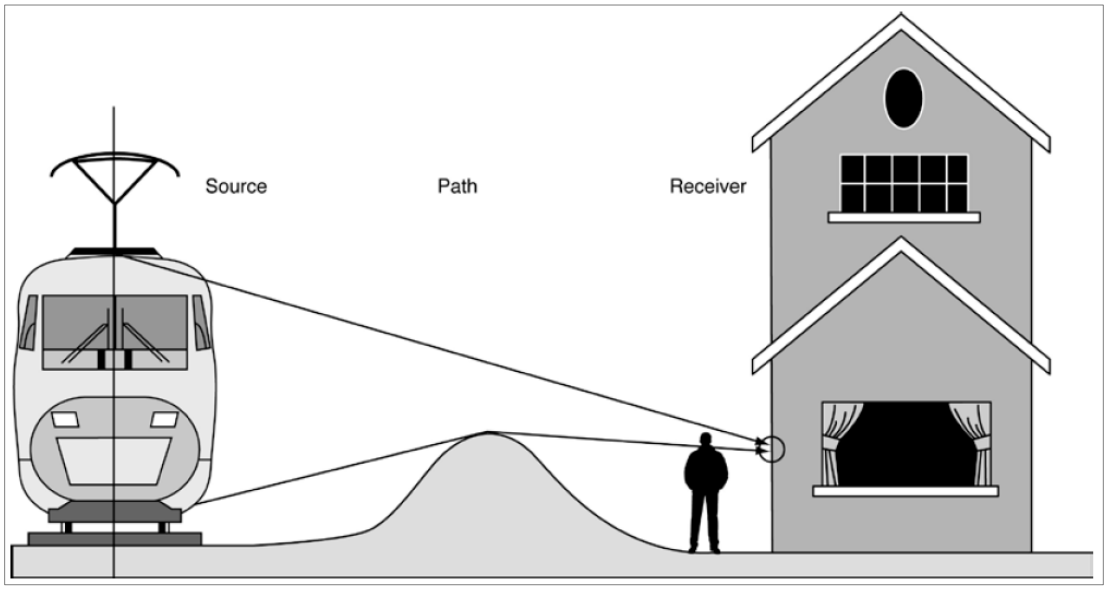
9 PREPARER QUALIFICATIONS

Project Role	Name, Credential	Qualifications
Cross-Spectrum Acoustics, Inc.		
Noise and Vibration Principal-in-Charge	Lance Meister	28 years' experience BS, Civil Engineering, Temple University
Noise and Vibration Discipline Lead	David Towers, PE	50 years' experience MS, Mechanical Engineering, Purdue University BS, Mechanical Engineering, Columbia University
Principal Noise and Vibration Specialist	Scott Edwards	12 years' experience BS, Acoustical Engineering, University of Hartford
Senior Noise and Vibration Specialist	Joelle Suits	8 years' experience MS, Mechanical Engineering, University of Texas at Austin BS, Mechanical Engineering, University of Colorado at Colorado Springs
ICF		
Quality Assurance/ Quality Control	David Buehler	35 years' experience BS, Civil Engineering, California State University, Sacramento Licensed Professional Civil Engineer in California Licensed Professional Acoustical Engineer in Oregon Board Certified Member of the Institute of Noise Control Engineering
Quality Assurance/ Quality Control	Debra Einstein Leight	23 years' experience B.A., Environmental Analysis and Design, University of California, Irvine
STV Incorporated		
QA/QC Reviewer	Rex Lloyd	36 years' experience B.S. Geography, University of Maryland, College Park
QA/QC Reviewer	Deborah Connor	17 years' experience Bachelors of Urban and Regional Planning, California State Polytechnic University, Pomona

APPENDIX A: FUNDAMENTAL CONCEPTS OF NOISE AND VIBRATION FOR HIGH-SPEED TRAINS

A1 Basics of Noise for High-Speed Trains

Noise from high-speed trains can be evaluated in terms of a Source-Path-Receiver framework, as illustrated on Figure A-1, in which the source of noise is a train moving on its tracks. The path describes the intervening course between the source and the receiver, wherein the noise levels are reduced by distance, topographical and built obstacles, reflections from surfaces, atmospheric effects, and other factors. At each receiver, the noise from all sources and source paths combines and composes the noise environment at that location.



Source: FRA 2012

Figure A-1 Source-Path-Receiver Framework

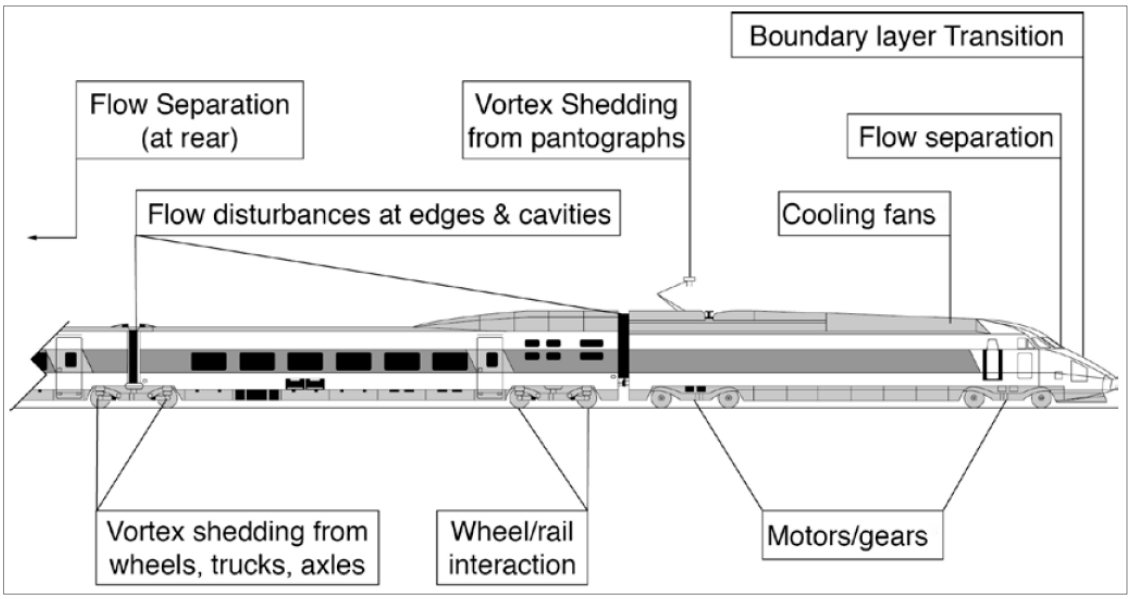
The noise from a train moving on its tracks is produced by several individual noise-generating mechanisms, each with its own characteristics (in terms of location, intensity, frequency content, directivity, and speed dependence) that depend on the train type. The most common train types include freight, commuter rail, light rail, and high-speed rail. Conventional train noise sources include locomotives, wheel/rail interaction, and audible warning devices at grade crossings, including train horns and warning bells.

For high-speed rail, train noise characteristics are speed dependent. For speeds below about 40 miles per hour (mph) (64 kilometers per hour [kph]), referred to as Regime I by Federal Railroad Administration guidance, noise emissions are dominated by the propulsion units, cooling fans, and under-car and top-of-car auxiliary equipment, such as compressors and air conditioning units.

In the speed range from 60 mph to about 150 mph (98 kph to 241 kph), referred to as Regime II, mechanical noise, resulting from wheel/rail interaction and structural vibrations, dominates the noise emission from trains. In the resource study area, existing trains seldom exceed 79 mph (127 kph); therefore, this speed range is the top end of noise characteristics for trains with which most people are familiar.

The aerodynamic noise component begins to be an important factor when the train speed exceeds about 160 mph (referred to as Regime III). Aerodynamic noise is generated from high-velocity airflow over the train. For a conventional steel-wheeled train, the components of

aerodynamic noise are generated by unsteady flow separations at the front and rear of the train and on structural elements of the train (mainly in the regions encompassing the trucks, the pantograph, inter-coach gaps, and discontinuities along the surface), and a turbulent boundary layer generated over the entire surface of the train. The distribution of noise sources on a typical high-speed train is depicted on Figure A-2.



Source: FRA 2012

Figure A-2 High-Speed Train Noise Sources

Noise from trains also depends on the type and configuration of the track structure. Typical noise levels refer to conventional rail operations at grade on ballast and tie track. For trains on elevated structures, train noise is increased, partially because of the loss of sound absorption by the ground and partially because of extra sound radiation from the bridge structure. Moreover, the sound from trains on elevated structures spreads about twice as far as it does from at-grade operations of the same train, because the sound source is higher above the ground and, therefore, is less affected by ground attenuation and shielding.

Horns are an example of a train noise source that is dominant at any train speed. Audible warning devices at grade crossings, including train horns and warning bells, are a common feature of conventional trains and a vital safety component of railroad operations. People living near railroad tracks often find horns to be annoying.

Another source of potential annoyance is wheel squeal that is produced by wheel-rail interaction, particularly on a curve where the radius of curvature is smaller than 100 times the truck length. According to the predecessor to the Federal Transit Administration, a typical truck length for freight trains of about 5.5 feet (1.7 meters) and radius of curvature greater than 560 feet (170 meters) would not be expected to produce wheel squeal. Wheel squeal is normally an issue with transit systems where small-radius curves often occur. Freight trains and modern high-speed train tracks are typically designed to minimize this occurrence by limiting track curvature and incorporating design features such as canting at the curve to reduce wheel flange contact with the rail.

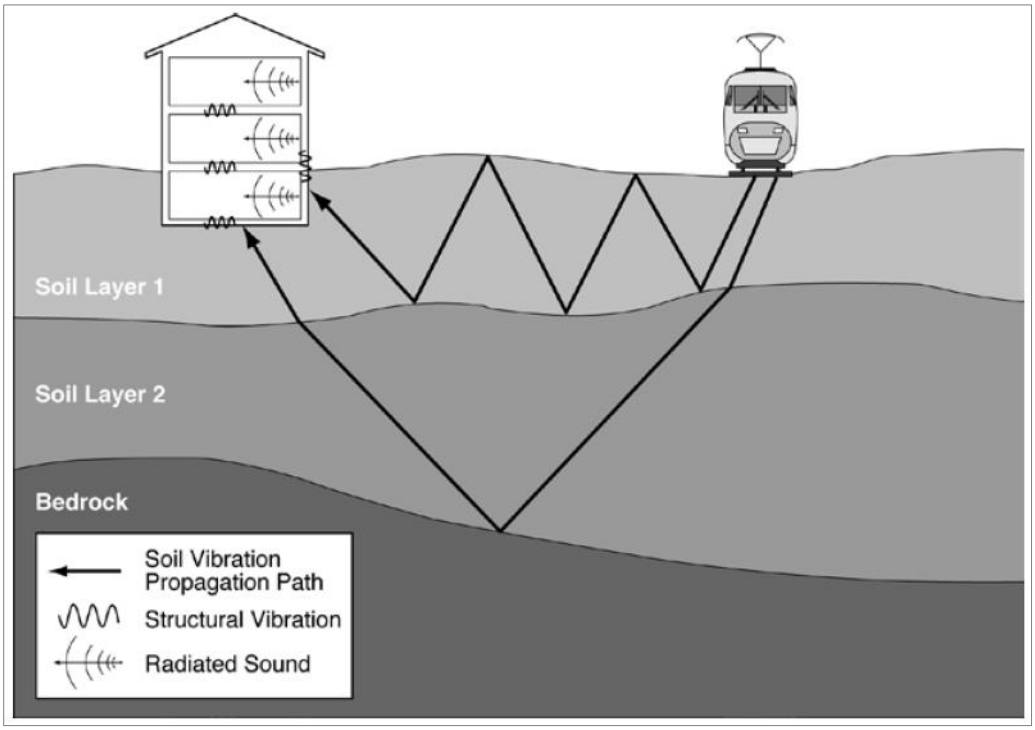
A2 Basics of Vibration for High-Speed Trains

The interaction of steel wheels rolling on steel rails causes vibration that is transmitted through the ground and into nearby buildings. Of concern to many building occupants is that the resulting building vibration could damage the building structure. In fact, the vibration from steel wheel/steel

rail systems is almost always well below the vibration thresholds used to protect even fragile historic buildings from minor cosmetic damage. However, there are several different ways in which the building vibration may be intrusive and annoying to building occupants. First, the vibratory motion of room surfaces may be felt. Second, the vibration may cause rattling of dishes and bric-a-brac on shelves, items hanging on walls, or windows. Third, the surfaces put into motion by ground-borne vibration will radiate sound that may be audible as a low-frequency rumbling noise that sometimes is akin to distant thunder.

The amount of energy generated by the wheels rolling on the track and then transmitted into the ground depends on factors such as the smoothness of the wheels and rails, the vehicle suspension system, and the track support system. The same speed-dependent vibration generation mechanisms are common to conventional and high-speed trains. Vibration levels increase with speed although the rate of the increase varies. A common assumption for high-speed trains is that the vibration levels are proportional to 20 times the logarithm of speed. For example, when train speed increases from 75 mph (120 kph) to 125 mph (200 kph), the expected increase in ground-borne vibration is 4.4 vibration decibels if all other conditions are the same.

As with noise, a Source-Path-Receiver relationship exists for vibration. Vibration experienced at the receiver is a function of the magnitude of the source and the path that the vibration takes to get to the receiver, as depicted on Figure A-3. High-frequency vibration decays more rapidly than low-frequency vibration as the vibrational energy passes through the ground. Soil conditions have a strong influence on the attenuation of ground-borne vibration. For the purposes of high-speed rail assessments, vibration is reported in terms of vibration velocity level or vibration decibels, which is the maximum root mean square vibration velocity level using a decibel reference of 1 micro-inch per second (1×10−6 inch per second).



Source: FRA 2012

Figure A-3 Typical Vibration Propagation Paths

References

Federal Railroad Administration (FRA). 2012. *High-Speed Ground Transportation Noise and Vibration Impact Assessment*. Final Report DOT/FRA/ORD-12/15. September. www.fra.dot.gov/eLib/Details/L04090 (accessed August 2016).

APPENDIX B: LOCAL REGULATIONS

This appendix gives information on local noise policies considered from each jurisdiction within the resource study area. The information provided does not include the entirety of noise policies but includes other information that may have some relevance to the Los Angeles to Anaheim Project Section such as fixed noise sources, transportation noise sources, and construction noise. When available, general noise and vibration policies are reported as well as the Noise Elements of the applicable general plans.

B1 City of Los Angeles

B1.1 Municipal Code

Table B-1 Sound Level A Decibels

Zone	Presumed Ambient Noise Level (dbA)	
	Day	Night
A1, A2, RA, RE, RS, RD, RW1, RW2, R1, R2, R3, R4, and R5	50	40
P, PB, CR, C1, C1.5, C2, C4, C5, and CM	60	55
M1, MR1, and MR2	65	65
M2 and M3	70	70

Source: City of Los Angeles 2025
dbA = A-weighted decibels

In Table B-1, daytime levels are to be used from 7:00 a.m. to 10:00 p.m. and nighttime levels from 10:00 p.m. to 7:00 a.m.

B2 City of Vernon

The following information is extracted or summarized from the *City of Vernon General Plan* (City of Vernon 2023) and Noise Ordinance of the Code of the City of Vernon (City of Vernon 2024).

B2.1 General Plan

The General Plan Noise Element focuses on identifying significant noise sources and establishing goals, policies, and programs with possible approaches for protecting the business community and people living in Vernon from excessive noise. Similarly, the general plan addresses and predicts the future noise levels.

In 2007, the city conducted a noise study to quantify the existing conditions. Noise sources considered were arterial roadways and freeways such as Interstate 170 and street systems, freight on-line rail operations, activities from six primarily rail lines, and other spur lines and activities at the BNSF Railway rail yard, as well as at the Union Pacific Railroad rail yard in Commerce.

Industrial noise sources are considered because Vernon is predominantly industrial with few noise-sensitive areas. The only noise-sensitive land uses within the city are spread between residential units and the Vernon City Elementary School. Residences largely are clustered in four areas: on Vernon Avenue at Furlong Place, on Vernon Avenue between Downey Road and Alcoa Avenue, on Fruitland Avenue West of Downey Road, and on Fifty-Second Place east of Atlantic Boulevard.

Vernon adopted a noise standard as presented on Figure B-1, which seeks to protect communities and guide land use. The metrics used refer to Community Noise Equivalent Level (CNEL).

Land Use Category	CNEL, dB						
	50	55	60	65	70	75	80
Residential - Multi-family, Duplex	A	A	B	B	B	C	C
Schools, Churches	A	A	B	C	C	C	D
Office Building, Research & Development, Professional Offices, City Office Building	A	A	A	B	B	C	C
Commercial Retail, Banks, Restaurants	A	A	A	A	B	B	C
Service Station, Auto Dealership, Manufacturing, Warehousing, Wholesale, Utilities	A	A	A	A	B	B	B
Agriculture	A	A	A	A	A	A	A

A **CLEARLY COMPATIBLE**

Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional contruction without any special noise insulation requirements.

B **NORMALLY COMPATIBLE**

New construction or development should be undertaken only after detailed analysis of the noise reduction requirements is made and needed noise insulation features in the design are determined. Conventional construction, with closed windows and fresh air supply systems or air conditioning, will normally suffice.

C **NORMALLY INCOMPATIBLE**

New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in the design.

D **CLEARLY INCOMPATIBLE**

New construction or development should generally not be undertaken.

Source: City of Vernon General Plan, Figure N-3
CNEL = Community Noise Equivalent Level; dB = decibels

Figure B-1 Land Use Compatibility Guidelines for Development

The Noise Element projects noise contours for year 2030 taking into account volume increases in regional traffic and rail activity. With regard to land use, the policy provides for continued industrial land use and provisions for commercial use. Land use policy limits the construction of any new housing and community facilities, as they are noise-sensitive. Regarding the elementary school and the existing residences, the city and the businesses work together to control noise levels.

The Noise Element addresses goals and policies designed to ensure that businesses and residents work together to avoid any potential violations of noise standards. The policies aim to

review, plan, and provide appropriate design of rail corridors in order to avoid impacts and minimize negative noise effects.

B2.2 Municipal Code

The Code of the City of Vernon, Chapter 26. Zoning, Article 4. Zones, Permitted Uses, Development Standards, and Site Planning Standards. Sec. 26.4.1-7.

B2.2.1 Vibration Standard

> *…cumulatively with existing Vibrations of all new and existing equipment of all businesses on the Lot, the steady ground Vibration inherently and recurrently generated shall not exceed four hundredths of one inch (0.04) per second particle velocity when measured at any point along the Lot line of the Lot on which the source of the Vibration is located. The cumulative effect of Vibrations in excess of four hundredths (0.04) of one inch measured at any point along the Lot line on which the source of the Vibration is located shall be permitted only with a Conditional Use Permit.*

B2.2.2 Noise Standards

Table B-2 outlines the maximum allowable noise levels for Vernon. The following noise standards apply to all lots within the designated noise zones, measured cumulatively with existing noise from all businesses on the lot.

Table B-2 Noise Standards

Noise Zone	Time Interval	Allowable Exterior Noise
Lots located within 1/10 of a mile of any residence or school located in Vernon or abutting communities	10:00 p.m. to 7:00 a.m. 7:00 a.m. to 10:00 p.m.	60 dBA 65 dBA
All other lots	Any time	75 dBA

Source: The Code of the City of Vernon, Table 26.4.1-7(b)(2)
dBA = A-weighted decibels

> *(ii) No Person, in any location within the City, shall create an, or allow the creation of, on any Lot owned, leased, occupied or otherwise controlled by such Person which causes the cumulative level when measured at any point along the Lot line of the Lot on which the source of the noise is located to exceed:*
>
> *(A) The applicable for a cumulative period of more than thirty (30) minutes in any hour; or*
>
> *(B)The applicable plus five (5) dBA for a cumulative period of more than fifteen (15) minutes in any one hour; or*
>
> *(C) The applicable plus ten (10) dBA for a cumulative period of more than five (5) minutes in any hour; or*
>
> *(D) The applicable plus fifteen (15) dBA for a cumulative period of more than one (1) minute in any hour; or*
>
> *(iii) In the event the ambient level exceeds any of the limit categories set forth in subsections (A), (B), or (C) of subsection 2(ii) of this Section, the cumulative period applicable to such category shall be increased to reflect the ambient level, plus 5 dBA.*
>
> *(iv) If a Lot is located on a boundary between two (2) different zones, the level applicable to the quieter zone shall apply.*

(v) If the source is continuous and cannot reasonably be discontinued or stopped for a time period whereby the ambient level can be determined, the measured level obtained while the source is in operation shall be compared directly to the Lot's designated zone for the time of day the level is measured.

(vi) Any source in excess of the set forth herein shall be permitted only with a Conditional Use Permit.

B3 City of Commerce

The following information is extracted or summarized from the *City of Commerce 2020 General Plan* (City of Commerce 2008) and Noise Ordinance (City of Commerce 2024).

B3.1 General Plan

The Safety Element contains standards and policies that discuss maximum allowable noise levels for land uses affected by existing and future transportation noise sources and requirements for projects affecting noise-sensitive land uses, and establishes criteria and enforces standards to control noise levels from both mobile and stationary sources as a means to minimize excessive noise exposure to city residents.

B3.1.1 Noise Control Standards

The City of Commerce adheres to a number of ordinances that regulates noise levels in the city.

- *Section 5.24.010 of the Municipal Code regulates the noise from sound trucks used for advertising. This section of the city's Municipal Code prohibits sound levels from speakers on vehicles to be audible from a distance of 200 feet.*
- *Section 8.04.840 of the Municipal Code is concerned with nuisance noise caused by domestic animals.*
- *Section 9.04.020 prohibits unreasonable loud noise and considers the making of loud noise as "disorderly conduct."*
- *The city's Noise Control Ordinance, together with the General Plan, establishes exterior noise standards for a wide range of land uses in the city. Residential uses, hospitals, schools, and churches are considered "noise-sensitive," and the following standards apply: between the hours of 7:00 p.m. and 10:00 p.m., external ambient noise levels must not exceed 60 dBA; between the hours of 10:00 p.m. and 7:00 a.m., external ambient noise levels must not exceed 50 dBA.*

Nonresidential land uses follow noise standards. External existing noise levels must not exceed 75 decibels (dB) between 7:00 am and 10:00 pm. or 65 dB during the nighttime hours of 10:00 pm to 7:00 am.

The noise ordinance prohibits the generation of noise during specific time periods.

- *The noise standards may not be exceeded by 5 dBA for more than 15 minutes in any given hour;*
- *The noise standards may not be exceeded by 10 dBA for more than 5 minutes in any given hour;*
- *The noise standards may not be exceeded by 15 dBA for more than one minute in any given hour; and,*
- *The noise standards may not be exceeded by 20 dBA for any period of time.*

Noise and Land Use Compatibility Standards

Land Use	Desirable Maximum (dBA)	Maximum Acceptable (dBA)
Low-Density Residential	55	65
Medium-Density Residential	60	65
High-Density Residential	65	70
Schools	60	70
Office Commercial	65	75
Industrial	70	75

Source: City of Commerce 2020 General Plan, Table 3.
dBA = A-weighted decibels

B3.1.2 Municipal Code

Regulations regarding noise are codified in the Commerce Municipal Code in the following sections.

Local Noise Ordinance

A. It is the policy of the city to prohibit unnecessary, excessive, and annoying noises from all sources subject to its police power, as certain noise levels are detrimental to the health and welfare of individuals. Therefore, any individual or organization that creates, maintains, causes, or allows to be created, caused, or maintained, any noise or vibration in a manner prohibited by or not in conformity with the provisions of this subsection, shall be considered to be creating a public nuisance and shall be punishable as such.

B. Any sound level measurement made pursuant to the provisions of this subsection shall be measured with a sound level meter using the "A" weighting scale at slow response or at a fast response for impulsive sounds.

C. Precise noise measurements shall be taken throughout the city at specified locations. These measurements shall be established as the ambient levels for the areas in which the measurements are taken. The ambient levels established by the precise measurements shall be published periodically and utilized for determinations of violations of this subsection.

D. The location selected for measuring exterior noise levels shall be at any point on the receptor property, and at least four feet above the ground and five feet from the nearest structure or wall. Interior noise measurements shall be made within the receptor dwelling unit, at a point at least four feet from the wall, ceiling, or floor nearest the noise source with windows and doors closed.

E. No person shall, at any location within the city, create nor allow the creation of noise on property owned, leased, occupied, or otherwise controlled by such person, that causes the noise level when measured on any property to exceed the ambient noise level or the noise standards set forth in Table 19.19.160A, whichever is greater.

F. Increases in permitted noise levels prescribed in Table 19.19.160A may be permitted in accordance with the standards outline in Table 19.19.160B.

Table 19.19.160A Noise Standards

Zone	Time	Allowable Noise Level - dBA
Residential	7 a.m. - 7 p.m. (day)	55
Residential	7 p.m. - 10 p.m. (evening)	50
Residential	10 p.m. - 7 a.m. (night)	45
Commercial	7 a.m. - 10 p.m. (day/evening)	65
Commercial	10 p.m. - 7 a.m. (night)	55
Industrial	Anytime	70

Source Commerce Municipal Code, Table 19.19.160A
dBA = A-weighted decibels

Table 19.19.160B Permitted Increases in Noise Levels

Permitted Increase (dBA)	Duration of Increase (cumulative minutes/hour)
5	15
10	5
15	1
20	Less than one minute

Source: Commerce Municipal Code, Table 19.19.160B
dBA = A-weighted decibels

G. If the receptor property of a noise is located on the boundary between two different noise zones, the lower noise level standard applicable to the quieter zone shall apply.

H. If a noise source is continuous and cannot be reasonably discontinued for sufficient time in which to determine the ambient noise level, the measured noise level obtained while the source is in operation shall be compared directly to the noise level standards in Table 19.19.160B.

I. No person shall, at any location within the city, create any noise, nor shall any person allow the creation of any noise on property owned, leased, occupied, or otherwise controlled by such person that causes the noise level when measured within any receptor dwelling unit to exceed the noise standards outlined in Table 19.19.160C.

Table 19.19.160C Permitted Increases in Interior Noise Levels

Allowable (dBA)	Time (cumulative minutes per hour)
45	Anytime
+5	1 minute
10	Less than one minute

Source: Commerce Municipal Code, Table 19.19.160B
dBA = A-weighted decibels

J. In the event the ambient noise level exceeds the noise standards set forth in Table 19.19.160C, the levels in the allowable column shall be increased to reflect the actual ambient noise level.

K. The following acts, or the causing thereof, are declared to be in violation of this subsection:

1. *No person shall, within any residential zone in the city, use or operate any radio receiving set, musical instrument, phonograph, tape player, compact disk player, television set, or other machine or device that produces, reproduces, or amplifies sound, between the hours of ten p.m. and seven a.m. such that it exceeds the exterior noise standards set forth in subsection L of this section.*
2. *No person shall create any noise on any street, sidewalk, or public place adjacent to any school, institution of learning, or church while the same is in use or adjacent to any hospital, that exceeds the interior noise standards set forth in subsection L of this section.*
3. *No person or organization within any residential zone, or within a radius of five hundred feet of a residential zone, shall operate equipment or perform any outside construction or repair work on buildings, structures, or projects, or operate any pile driver, steam shovel, pneumatic hammer, derrick, steam, electric hoist, or other construction type device between the hours of ten p.m. and seven a.m., unless a permit has been obtained from the city.*
4. *No person within any residential zone shall repair, rebuild, or test any motor vehicle between the hours of ten p.m. and seven a.m. in a manner that exceeds the noise levels set forth in subsection L of this section.*
5. *No person or organization shall use or operate for any noncommercial purpose any loudspeaker, public address system, or similar device between the hours of ten p.m. and seven a.m. in a manner that exceeds the noise levels set forth in subsection L of this section.*
6. *No person or organization shall use or operate for any commercial purpose any loudspeaker, public address system, or similar device in a manner that creates noise in any residential zone in excess of the noise levels set forth in subsection L of this section.*
7. *Loading, unloading, opening, closing, or other handling of boxes, crates, containers, building materials, garbage cans, or similar objects between the hours of ten p.m. and seven a.m. in such a manner as to cause noise in excess of the noise standards in any residential zone is unlawful.*

L. The city shall order an immediate halt to any sound that exposes any person to continuous sound levels in excess of those shown in Table 19.19.160D or Table 19.19.160E. Within ten working days following issuance of such an order, the community development director or his designee may apply to the appropriate court for an injunction to replace the order. No order shall be issued if the only persons exposed to sound levels in excess of those listed in Table 19.19.160D and Table 19.19.160E are exposed as a result of trespass; invitation upon private property by the person causing or permitting the sound; or employment by the person or a contractor of the person causing or permitting the sound.

Table 19.19.160D Continuous Sound Levels (Measured at 50 feet)

Sound Level Limit (dBA)	Duration
90	8 hours
95	4 hours

Sound Level Limit (dBA)	Duration
100	2 hours
105	1 hour
110	30 minutes

Source: Commerce Municipal Code, Table 19.19.160D
dBA = A-weighted decibels

Table 19.19.160E Impulsive Sound Levels (Measured at 50 feet)

Sound Level Limit (dbA)	Number of Repetitions (per 24-hour period)
145	1
135	10
125	100

Source: Commerce Municipal Code, Table 19.19.160E
dBA = A-weighted decibels

M. Any person subject to an order pursuant to this section shall comply with such order until the sound is brought into compliance with the order, as determined by the noise control officer; or a judicial order has superseded the noise control officer order.

9.04.020 - Unnecessary noises.

No person shall make, cause, suffer or permit to be made upon any premises owned, occupied, or controlled by him any unnecessary noises or sounds which are physically annoying to persons of ordinary sensitiveness or which are so harsh or so prolonged or unnatural or unusual in their use, time or place as to occasion physical discomfort to the inhabitants of any neighborhood.

B3.2 Vibration Ordinance

Vibration may disturb the conduct of certain activities and create discomfort for some individuals. To minimize the disturbance and inconvenience from vibrations, the following performance standards shall apply to all uses:

A. No use shall cause or create ground vibration that is harmful or injurious to the use or development of surrounding properties.

B. No person or use shall create, maintain, or cause ground vibration that is perceptible without instruments to a person of normal sensitivity at any point on a property that is adjacent to the property of the vibration source.

B4 City of Montebello

The following information is extracted or summarized from the *City of Montebello General Plan* Noise Element (City of Montebello 2024a) and Noise Ordinance (City of Montebello 2024b).

B4.1 General Plan

The Noise Element focuses on identifying significant noise sources and establishing guidelines for community noise levels that are acceptable for the community. The element establishes goals and mitigation approaches for protecting the community living in Montebello from excessive noise.

For residential land uses, residential areas must be generally quiet. The Noise Element indicates that residences adjacent to freeways and/or roadways are likely exposed to noise greater than

65 dB CNEL. For this reason, implementation of the noise ordinance is necessary to ensure that noise remains at an acceptable level for all residents.

The Noise Element also includes limits on construction noise at noise-sensitive land uses. It indicates that a construction noise level close to 100 dBA at a distance of 50 feet and about 80 dBA at a distance of 500 feet will have minimal effects for 2 or 3 months of activity during daytime hours. Heavy construction should be limited to between 7 a.m. and 6 p.m. during the weekdays, and minimal activity should occur on the weekends.

B4.2 Municipal Code

Noise Standard

A. 1. Every use shall be so operated that the noise inherent and recurrently generated does not exceed the following levels at the lot line of the lot on which the use is located:

Adjacent Zone	Maximum Noise Level: 7 a.m. to 10 p.m.	Maximum Noise Level: 10 p.m. to 7 a.m.
Residential	65 dBA	60 dBA
Commercial	70 dBA	70 dBA
Industrial	75 dBA	75 dBA

dBA = A-weighted decibels

2. Every use in the C-R and C-1 zones shall be so operated that the noise inherently and recurrently generated does not exceed sixty dBA between seven a.m. and nine p.m. and fifty-five dBA between ten p.m. and seven a.m. when adjacent to a residential zone.

B. It is unlawful for any person or any property to create any noise, or to allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, which causes the noise level when measured on any other property, to exceed:

1. The noise standard for a cumulative period of more than thirty minutes in any hour; or

2. The noise standard plus five dBA for cumulative period of more than fifteen minutes in any hour; or

3. The noise standard plus ten dBA for a cumulative period of more than five minutes in any hour; or

4. The noise standard plus fifteen dBA for a cumulative period of more than one minute in any hour; or

5. The noise standard plus twenty dBA for any period of time.

C. For the purpose hereof, the peak decibel reading for a noise with a fluctuating noise level (such as live or recorded music) shall be considered as noise level for the entire cumulative period of the noise. Likewise, the time between repetitive intermittent noises (such as banging, pounding, or hammering) shall be included in the cumulative period of the noise.

B5 City of Pico Rivera

The following information is extracted or summarized from the *City of Pico Rivera General Plan* (City of Pico Rivera 2014) and Noise Ordinance (City of Pico Rivera 2025).

B5.1 General Plan

The Noise Element contains standards and policies that discuss maximum allowable noise levels for land uses affected by existing and future transportation noise sources and requirements for projects affecting noise-sensitive land uses. The Noise Element establishes goals, policies, and implementation actions to control noise levels from both mobile and stationary sources as a means to minimize excessive noise exposure to city residents.

The Noise Element contains the maximum allowable environmental noise levels, as presented in Table B-3, in regard to land use compatibility.

Furthermore, the Noise Element discusses the existing significant noise sources such as freeways, mayor roadways, and rail lines.

Table B-3 Maximum Allowable Environmental Noise Standards

Land Use	Hours of Day	
	Exterior Noise Level From Property Line Ldn/CNEL, dB	Interior Noise Level[1] Ldn/CNEL, dB
Residential (Low Density, Multifamily, Mixed-Use)	65	45
Transient Lodging (Motels/Hotels)	65	45
Schools, Libraries, Churches, Hospitals/Medical Facilities, Nursing Homes, Museums	70	45
Theaters, Auditoriums	70	N/A
Playgrounds, Parks	75	N/A
Golf Courses, Riding Stables, Water Recreation	75	N/A
Office Buildings, Business Commercial and Professional	70	N/A
Industrial, Manufacturing, and Utilities	75	N/A

Source: City of Pico Rivera General Plan Noise Element, Table 11-1

[1] This noise exposure maximum requires window and doors to remain closed to achieve the acceptable interior noise level and will necessitate the use of an air conditioning unit or exterior noise level reduction measures such as a block wall and double-pane windows.

The noise level standard is the maximum decibel level that may be imposed upon the referenced land use.

Where a proposed use is not specifically listed on this table, the use shall comply with the noise exposure standards for the nearest similar use as determined by the Planning Director.

CNEL = Community Noise Equivalent Level; dB = decibel; Ldn = day-night sound level; N/A = not applicable

B5.1.1 Construction Noise

From the Pico Rivera Noise Element, Policy 11.3-1, Construction Noise:

> *Construction Noise. Minimize construction-related noise and vibration by limiting construction activities within 500 feet of noise-sensitive uses from 7:00 A.M. to 7:00 P.M. seven days a week; after hour permission shall be granted by City staff, Planning Commission, or the City Council.*
>
> *- Require proposed development adjacent to occupied noise sensitive land uses to implement a construction-related noise mitigation plan. This plan would depict the location of construction equipment storage and maintenance areas, and document methods to be employed to minimize noise impacts on adjacent noise sensitive land uses.*
>
> *-Require that construction equipment utilize noise reduction features (e.g., mufflers and engine shrouds) that are no less effective than those originally installed by the manufacturer.*

-Require that haul truck deliveries be subject to the same hours specified for construction. Additionally, the plan shall denote any construction traffic haul routes where heavy trucks would exceed 100 daily trips (counting those both to and from the construction site). To the extent feasible, the plan shall denote haul routes that do not pass sensitive land use.

B5.1.2 Vibration Standard

The Noise Element also contains environmental impact criteria for vibration, as presented in Table B-4.

Table B-4 Groundborne Vibration Impact Criteria for General Assessment

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

Source: City of Pico Rivera General Plan Noise Element, Table 11-2
Vibration levels are measured in or near the vibration-sensitive use.
[1] "Frequent Events" are defined as more than 70 vibration events of the same source per day.
[2] "Occasional Events" are defined as between 30 and 70 vibration events of the same source per day.
[3] "Infrequent Events" are defined as fewer than 30 vibration events of the same source per day.
[4] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels.
VdB = vibration decibels

B5.4 Municipal Code

From the Pico Rivera Municipal Code, Chapter 8.40, Noise.

A. No person shall make, cause or suffer, or permit to be made, upon any premises owned, occupied or controlled by him, any unnecessary noises or sounds which are physically annoying to persons of ordinary sensitiveness, or which are so harsh or so prolonged or unnatural or unusual in their use, time or place as to occasion physical discomfort to the inhabitants of any neighborhood."

B. When any loud or unruly assemblage occurs or is held, and the city's law enforcement agency is required to respond to the scene in response to citizen complaints, and the senior peace officer at the scene determines that there is a threat to the public peace, health, safety or general welfare, then that senior peace officer shall notify the owner of the property and/or the person in charge of the property where the assemblage exists, and/or the person responsible for said assemblage, that such person or persons, or in the case of a minor, the parents and/or guardians of such minor, shall be held personally liable for the cost of providing additional law enforcement personnel on special security assignment over and above the normal services provided by the law enforcement agency in response to such assemblage. Such person or persons shall be given a first warning, in the form of notification by the senior peace officer that the first police response shall be deemed to be the normal police services provided. Such notice may include a written notice, receipt of which is signed by the owner, responsible person or person in charge. The police personnel necessarily utilized after

such first warning to control the threat to the public peace, health, safety or general welfare shall be deemed to be on special security assignment over and above the normal services provided and the owner of the property and/or the person in charge of the property where such assemblage occurs, and/or the person responsible for the cost of such special security assignment in an amount determined upon a cost accounting basis by the city. The cost of such special security assignment shall include damage to city property and/or injuries to city personnel. A fee charged will not be in excess of five hundred dollars for a single incident. The city reserves its legal options to elect any other legal remedies when said costs or damage exceed five hundred dollars.

C. *The city council declares that loud or unruly assemblages described in subsection B of this section are a public nuisance. The cost of abating such public nuisance, including police services, may be made a lien upon the property where the nuisance is located, and/or collected as a special assessment against the property at the same time and in the same manner as ordinary municipal taxes are collected. Prior to the recordation of the lien, or the collection of the charge in the manner of a municipal tax, the property owner shall be entitled to a hearing before the city council upon at least ten days prior written notice. Notice shall be given in accordance with Government Code Section 38773.1.*

B6 City of Santa Fe Springs

The following information is extracted or summarized from the *Re-Imagine Santa Fe Springs 2040 General Plan* Noise Element (City of Santa Fe Springs 2022).

The Noise Element focuses on identifying significant noise sources and establishing goals, policies, and noise control measures for protecting the business community and residents in Santa Fe Springs from excessive noise.

Santa Fe Springs adopted a noise land use compatibility guidelines as presented in Table B-5, which aim to protect communities and guide land use. The metrics used refer to CNEL.

Table B-5 Noise Land Use Compatibility Guidelines

Noise Receptor (Land Use)	Maximum Exterior Noise Level from Property Line (dB CNEL)
Residential (Low Density, Multifamily, Mobile Home Parks, Mixed-Use, Housing Developments, Emergency Shelters/Low-Barrier Navigation Centers, Residential Care Facilities)	65; 70 for mixed-use development
Transient Lodging (Motels/Hotels)	70
Schools, Libraries, Churches, Hospitals/Medical Facilities, Nursing Homes, Community Care Facilities, Museums	65
Theaters, Auditoriums	70
Playgrounds, Parks	70
Office Buildings, Business Commercial and Professional	70
Industrial, Manufacturing, and Utilities	75

Source: Re-Imagine Santa Fe Springs 2040 General Plan Noise Element, Table N-1
The noise level standard is the maximum level that may be imposed upon the referenced land use. For a proposed use not listed on the table, the city uses the noise exposure standards for the nearest similar use.
Noise standards for interior noise levels are established by various state and federal regulations, including Title 24 of the California Health and Safety Code and occupational health and safety regulations.

CNEL = Community Noise Equivalent Level; dB = decibels

The goals and policies aim to develop measures to address transportation noise effects on neighborhoods and encourage, when possible, mitigation such as barriers and realignments. The Noise Element also states that the most effective method to control noise effects from nontransportation noise sources is through application of the noise ordinance.

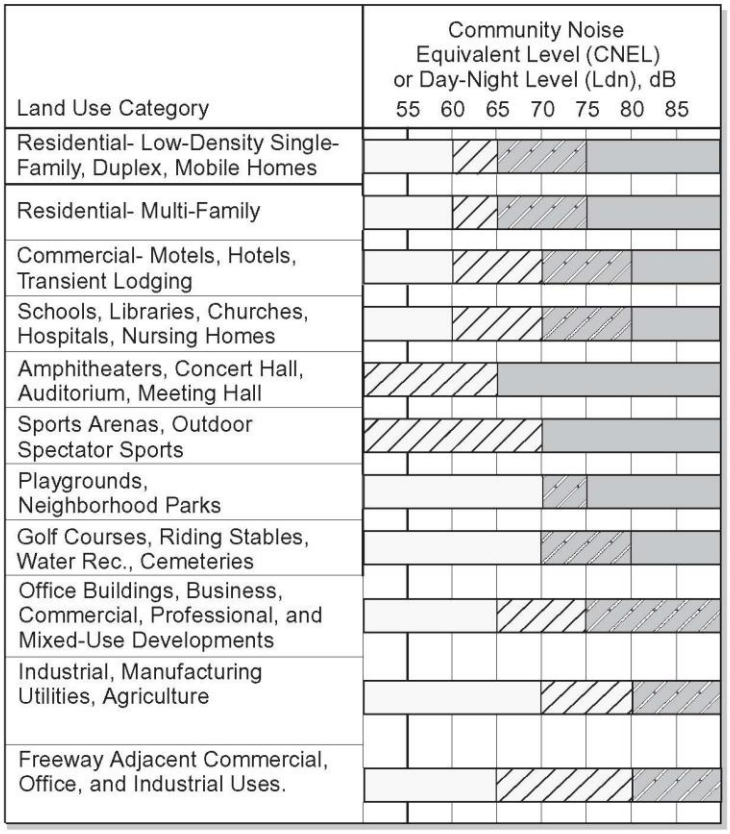
B7 City of La Mirada

The following information is extracted or summarized from the *City of La Mirada General Plan* Safety and Community Services Element (City of La Mirada 2003).

The general plan contains standards and policies that addresses maximum allowable noise levels for land uses affected by existing transportation noise sources. The general plan also discusses the requirements for projects with noise-sensitive land uses. The city's primary goal with regard to community noise is to minimize the exposure of residents to unhealthful or excessive noise levels.

For existing development along arterial roadways and rail lines, the city implements programs to reduce the effect of these transportation corridors. Residential development along Alondra Boulevard, La Mirada Boulevard, Rosecrans Avenue, Valley View, Imperial Highway, and Beach Boulevard lie within the 70 dB CNEL contour.

The Safety and Community Services Element establishes noise land use compatibility guidelines. These guidelines, presented on Figure B-2, are based on cumulative noise criteria for outdoor noise.



Nature of the noise environment where the CNEL or Ldn level is:

Below 55 dB
Relatively quiet suburban or urban areas, no arterial streets within 1 block, no freeways within 1/4 mile.

55-65 dB
Most somewhat noisy urban areas, near but not directly adjacent to high volumes of traffic.

65-75 dB
Very noisy urban areas near arterials, freeways or airports.

75+ dB
Extremely noisy urban areas adjacent to freeways or under airport traffic patterns. Hearing damage with constant exposure outdoors.

Normally Acceptable
Specific land use is satisfactory, based on the assumption that any building is of normal conventional construc-tion, without any special

Conditionally Acceptable
New construction or development should be undertaken only after a detailed analysis of noise reduction require-ments is made and needed noise insulation features included in design. Conventional construction, but with closed windows and fresh air supply systems

Normally Unacceptable
New construction or development should generally be discour-aged. If new construc-tion or development does proceed, a de-tailed analysis of noise reduction requirements must be made and needed noise insulation features included in design.

Clearly Unacceptable
New construction or development should generally not be undertaken.

The Community Noise Equivalent Level (CNEL) and Day-Night Noise Level (Ldn) are measures of the 24-hour noise environment. They represent the constant A-weighted noise level that would be measured if all the sound energy received over the day were averaged. In order to account for the greater sensitivity of people to noise at night, the CNEL weighting includes a 5-decibel penalty on noise between 7:00 p.m. and 10:00 p.m. and a 10-decibel penalty on noise between 10:00 p.m. and 7:00 a.m. of the next day. The Ldn includes only the 10-decibel weighting for late-night noise events. For practical purposes, the two measures are equivalent for typical urban noise environments.

Source: City of La Mirada General Plan, Figure SCS-6
CNEL = Community Noise Equivalent Level; dB = decibels; Ldn = day-night sound level

Figure B-2 Land Use Compatibility Criteria for Development

B8 City of Buena Park

The following information is extracted or summarized from the *Buena Park 2035 General Plan* (City of Buena Park 2022).

B8.1 General Plan

The Noise Element outlines several goals and policies concerned with noise-sensitive land uses and reducing noise-related effects from transportation noise sources. The Noise Element establishes noise land use compatibility guidelines. These guidelines, presented in Table B-6, are based on cumulative noise criteria for outdoor noise.

Table B-6 Land Use Compatibility Criteria

Land Use Category	CNEL			
	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Residential-Low Density, Single-Family, Duplex, Mobile Homes	50–60	55–70	70–75	75–85
Residential – Multiple Family	50–65	60–70	70–75	70 –85
Transient Lodging – Motel, Hotels	50–65	60–70	70–80	80–85
Schools, Libraries, Churches, Hospitals, Nursing Homes	50–70	60–70	70–80	80–85
Auditoriums, Concert Halls, Amphitheaters	N/A	50–70	N/A	65–85
Sports Arenas, Outdoor Spectator Sports	N/A	50–75	N/A	70–85
Playgrounds, Neighborhood Parks	50–70	N/A	67.5–77.5	72.5–85
Golf Courses, Riding Stables, Water Recreation, Cemeteries	50–70	N/A	70–80	80–85
Office Buildings, Business Commercial and Professional	50–70	67.5–77.5	75–85	N/A
Industrial, Manufacturing, Utilities, Agriculture	50–75	70–80	75–85	N/A

Source: Buena Park 2035 General Plan, Table N-2
Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features have been included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice.
Normally Unacceptable: New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise-insulation features must be included in the design.
Clearly Unacceptable: New construction or development should generally not be undertaken.
CNEL = Community Noise Equivalent Level; NA = not applicable

B8.1.1 Noise Standards

The City of Buena Park's regulations with respect to noise are included in Chapter 8.28 of the Municipal Code, also known as the Noise Ordinance. Construction-related and operational noise restrictions are discussed below:

Construction Noise. Section 8.28.040 of the City of Buena Park Noise Ordinance regulates construction noise. The Noise Ordinance prohibits noise generated by construction activities between the hours of 8:00 PM and 7:00 AM Monday through Saturday, and at any time on Sundays. The Noise Ordinance does not include specific noise level limits for construction activities.

Operational Noise. Within the City of Buena Park, the Noise Ordinance governs operational noise generated between two properties and does not regulate noise from transportation sources, such as traffic, aircraft, and railways. Section 8.28.010 of the Noise Ordinance establishes the ordinance through the adoption of the Title 4, Division 6 of the Orange County Code. Section 4-6-5 and Section 4-6-6 of the Orange County Code sets exterior and interior level limits for residential properties, respectively. The Orange County Code does not set noise level limits for other land uses, such as commercial or industrial uses. The City-adopted exterior noise level limits between properties are presented in Table N-3, City of Buena Park Exterior and Interior Noise Limits.

Table N-3 City of Buena Park Exterior and Interior Noise Limits

Land Use	Noise Level (dBA) at Property Line	Time Period
Exterior Noise Limits		
Residential	55	7:00 a.m.–10:00 p.m.
	50	10:00 p.m.–7:00 a.m.
Interior Noise Limits		
Residential	50	7:00 a.m.–10:00 p.m.
	45	10:00 p.m.–7:00 a.m.

Source: Buena Park 2035 General Plan, Table N-3
dBA = A-weighted decibels

Section 4-6-5 of the Orange County Code further restricts noise levels by 5 dBA when the "offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof". Section 4-6-5 states, in part:

It shall be unlawful for any person...to create any noise, or to allow the creation of any noise on property owned, leased, occupied, or otherwise controlled by such person, when the foregoing causes the noise level, when measured on any other residential property...to exceed:

1) The noise standard for a cumulative period of more than thirty (30) minutes in any hour; or

2) The noise standard plus five (5) dB(A) for a cumulative period of more than fifteen (15) minutes in any hour; or

3) The noise standard plus ten (10) dB(A) for a cumulative period of more than five (5) minutes in any hour; or

4) The noise standard plus fifteen (15) dB(A) for a cumulative period of more than one (1) minute in any hour; or"

5) The noise standard plus twenty (20) dB(A) for any period of time.

Section 4-6-5(c) further allows correction to the noise level standard depending on the measured ambient noise levels. Section 4-6-6 sets forth interior noise levels limits for residential properties, which are shown in Table N-3. Section 4-6-6 states, in part:

It shall be unlawful for any person...to create any noise, or to allow the creation of any noise on property owned, leased, occupied, or otherwise controlled by such person, when the foregoing causes the noise level, when measured within any other dwelling unit on any residential property...to exceed:

1) The interior noise standard for a cumulative period of more than five (5) minutes in any hour; or

2) The interior noise standard plus five (5) dB(A) for a cumulative period of more than one (1) minute in any hour; or

3) The interior noise standard plus ten (10) dB(A) for any period of time.

B8.1.2 Vibration Standards

The existing vibration environment, similar to that of the noise environment, is dominated by transportation-related vibration from roadways and rail lines in the City. Heavy truck traffic on local and regional roadway networks can generate groundborne vibration, which varies considerably depending on vehicle type, weight, and pavement conditions. However, groundborne vibration levels generated from vehicular traffic are not typically perceptible outside of the right-of-way for major roadways and smart streets with a large capacity of heavy vehicle traffic. Railroad operation and transit systems, such as freight trains and Metrolink operations, are an additional potentially substantial source of groundborne vibration that occurs within the City.

Transportation and construction activities can generate varying degrees of ground-borne vibration, depending on the construction procedure and the construction equipment used. Operation of construction equipment generates vibrations that spread through the ground and diminish in amplitude with distance from the source. The effect on buildings located in the vicinity of a construction site often varies depending on soil type, ground strata, and construction characteristics of the receiver building(s). The results from vibration can range from no perceptible effects at the lowest vibration levels, to low rumbling sounds and perceptible vibration at moderate levels, to slight damage at the highest levels. Ground-borne vibrations from construction activities rarely reach levels that damage structures.

The City does not have regulatory standards for construction or operational vibration sources. The Federal Transit Administration (FTA) and Caltrans have published guidelines for the analysis of groundborne noise and vibration relating to transportation and construction-induced vibration. Caltrans guidelines recommend that a standard of 0.2 in/sec PPV not be exceeded for the protection of normal residential buildings, and that 0.08 in/sec PPV not be exceeded for the protection of old or historically significant structures.

B9 City of Fullerton

The following information is extracted or summarized from the Fullerton Municipal Code (City of Fullerton 2025).

In order to control unnecessary, excessive and annoying sounds emanating from incorporated areas of the city, it shall be the policy of the city to prohibit such sounds generated from all sources as specified in this chapter except that noise regulated by any penal statute or ordinance and those activities that have been preempted by state or federal law.

Specified noise levels have been determined to be detrimental to the public health, welfare and safety and contrary to public interest; therefore, creating, maintaining, causing or allowing to create, maintain or cause any noise in a manner prohibited by or not in conformity with the provisions of this chapter is a public nuisance and shall be punishable as such.

The following noise standards, unless otherwise specifically indicated, shall apply to all property within the Residential Noise Zone:

Allowable Interior Noise Level	Time Period
Not to exceed 55 dB(A)	7:00 a.m. - 10:00 p.m.
Not to exceed 45 dB(A)	10:00 p.m. - 7:00 a.m.
Not to exceed 55 dB(A)	7:00 a.m. - 10:00 p.m.
Not to exceed 50 dB(A)	10:00 p.m. - 7:00 a.m.

dB(A) = A-weighted decibels

Noise standards for a sensitive use:

1. A "sensitive use" for the purpose of this chapter means any private or public school, hospital, residential care facility for the elderly, and religious institution.

2. It shall be unlawful for any person at any location within the incorporated area of the city to create any noise that causes the noise level at any sensitive use, while the same is in operation to exceed the noise limits as specified for the Residential Noise Zone, notwithstanding the sensitive use may be located outside of the Residential Noise Zone.

C. It shall be unlawful for any person at any location within the incorporated area of the city to create any noise which can be classified as being continuous, reoccurring, predictable, or whose operation of noise-generating capabilities can be stopped or started at a specified time, or to allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, which causes the noise level, when measured on the property, either incorporated or unincorporated, to exceed:

1. The noise standard for a cumulative period of more than 30 minutes in any hour;

2. The noise standard plus 5 dB(A) for a cumulative period of more than 15 minutes but less than 30 minutes in any hour;

3. The noise standard plus 10 dB(A) for a cumulative period of more than 5 minutes but less than 15 minutes in any hour;

4. The noise standard plus 15 dB(A) for a cumulative period of more than one minute but less than five minutes in any hour;

5. The noise standard plus 20 dB(A) for a cumulative period of less than one minute in an hour.

D. In the event the ambient noise level exceeds any of the five noise limit categories listed in Subsection C, the cumulative period applicable to the category shall be increased to reflect the ambient noise level.

The following activities shall be exempt from the noise level standards specified by this chapter:

1. School bands, school athletic and school entertainment events.

2. Outdoor gatherings, public dances, shows and sporting and entertainment events provided the events are conducted pursuant to a permit and/or license issued by the city.

3. Activities conducted on public parks, public playgrounds and public or private school grounds.

4. Any mechanical device, apparatus or equipment used, related to or connected with the use of machinery, vehicles, or work due to an emergency.

5. All mechanical devices, apparatus or equipment which are utilized for the protection or salvage of agricultural crops during periods of potential or actual frost damage or other adverse weather conditions.

6. Mobile noise sources associated with agricultural pest control through pesticide application.

7. Noise from vehicular traffic on public streets.

The following activities shall be exempt from the noise level standards specified by this chapter provided they take place between the hours of 7 a.m. and 8 p.m. on any day except Sunday or a City-recognized holiday.

1. Noise sources associated with construction, repair, remodeling, or grading of any real property;

2. Mobile noise sources associated with agricultural operations;

3. Noise sources associated with the maintenance of real property, including normal maintenance and repair by city and utility crews.

B. Installation of air conditioning, refrigeration and pool equipment shall be certified to be within the provisions of this chapter for night and day operation noise levels.

B10 City of Anaheim

The following information is extracted or summarized from the *City of Anaheim General Plan* (City of Anaheim 2025).

B10.1 General Plan

Anaheim is affected by different sources of noise, including vehicular traffic, entertainment facilities, sports events, commercial and industrial activity, and periodic activities such as construction and aircraft travel.

The Noise Element focuses on identifying significant noise sources and establishing goals, policies, and noise control measures for protecting the business community and residents in Anaheim from excessive environmental noise levels in the community. The control of noise is an essential component in creating a safe, compatible, and productive environment.

Anaheim has a number of transportation-related noise sources such as arterial highways, roadways, helicopters, and railroad operations. These sources are the major contributors of noise levels in Anaheim. Strategies to reduce their effect on the community noise environment are a fundamental part of the Noise Element. Although local government has little direct control of transportation noise at the source, as these levels are set by state and federal agencies, the city does have some control over transportation noise that exceeds state or federal standards through the enforcement of the Municipal Code.

B10.1.1 Noise Ordinance

The City of Anaheim has the authority to set land use noise standards and place restrictions on private activities that generate excessive or intrusive noise. The applicable standards for these activities are specified in the Anaheim Municipal Code. The Municipal Code limits sound levels for stationary sources of noise radiated for extended periods from any premises in excess of 60 decibels at the property line. Sound created by construction or building repair of any premises within the City is also exempt from the applications of the Municipal Code during the hours of 7:00 a.m. and 7:00 p.m.

Traffic sounds, sound created by emergency activities and sound created by governmental units are exempt from the applications of the Municipal Code. To

this end, for land use planning, the City's Noise Element has adopted the State of California Interior and Exterior Noise Standards.

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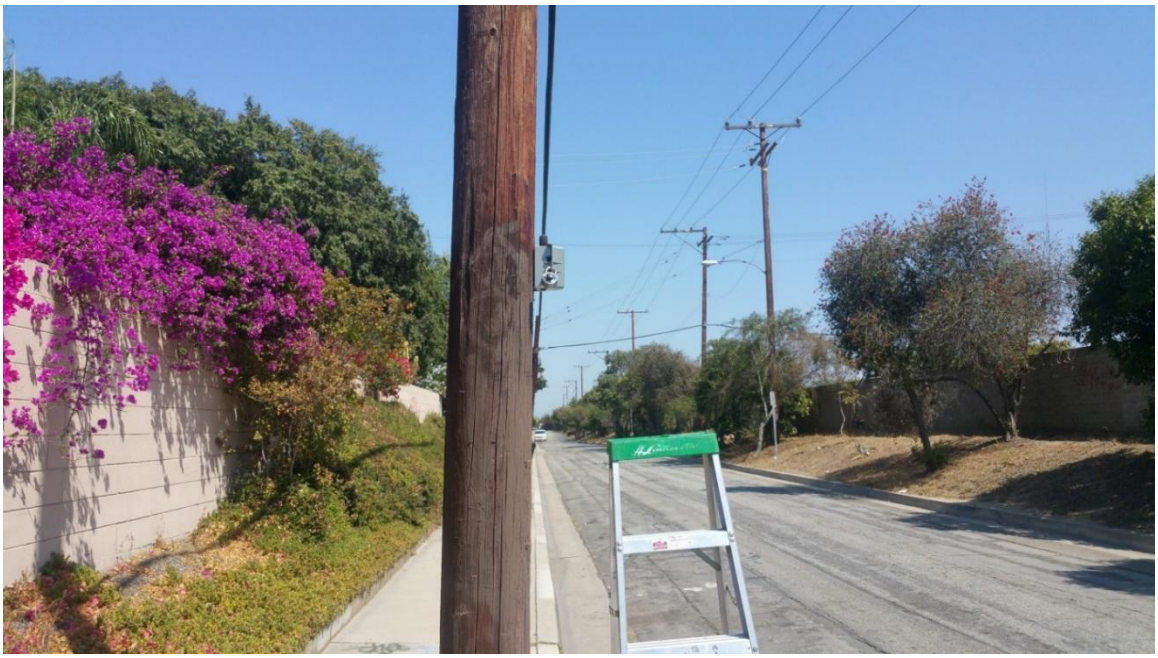
APPENDIX C: NOISE AND VIBRATION MEASUREMENT SITE PHOTOGRAPHS



Noise Measurement Site LT-1: 2140 E 7th Place – Los Angeles Union Station to Redondo Junction



Noise Measurement Site LT-2: 2308 Bedessen Avenue – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-3: 1498 Carob Way – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-4: 8743 Warvale Street – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-5: 7560 Serapis Avenue – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-6: 7805 Hasty Avenue – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-7: 10481 Cascade Circle – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-8: 11437 Burke Street – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-9: 12657 Civic Center Drive – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-10: Hayden Avenue – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-11: 14354 San Ardo Drive – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-12: Stage Road – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-13: 7756 Granada Drive – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-14: 7632 Tulare Street – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-15: 5751 Stanton Avenue – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-16: 5622 Cajon Avenue – Redondo Junction and Fullerton Junction



Noise Measurement Site LT-17: 139 N Pritchard Avenue – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-18: 1812 Gregory Avenue – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-19: 207 S Basque Avenue – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-20: 201 Chestnut Place – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-21: 311 S Highland Avenue – Redondo Junction to Fullerton Junction



Noise Measurement Site LT-22: Metro Court Building – Redondo Junction to Fullerton Junction



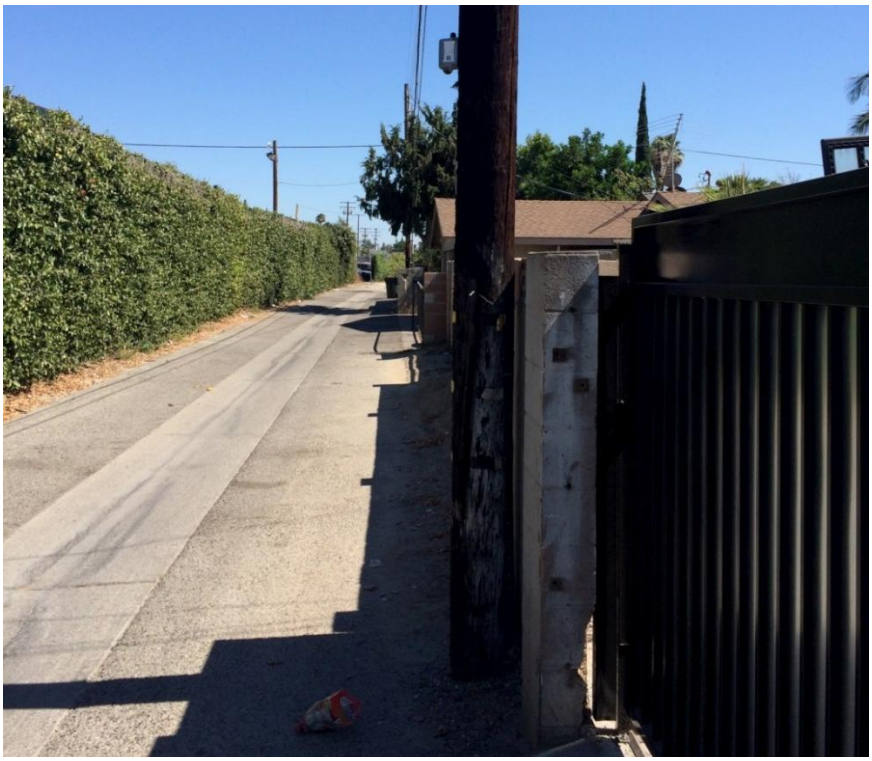
Noise Measurement Site LT-24: 145 S Princeton Avenue – Fullerton Junction to ARTIC



Noise Measurement Site LT-25: 801 E Balsam Avenue – Fullerton Ave to ARTIC



Noise Measurement Site LT-26: 759 N Mavis Street – Fullerton Junction to ARTIC



Noise Measurement Site LT-27: 712 N Pauline Street – Fullerton Junction to ARTIC



Noise Measurement Site LT-28: 198 N Vintage Lane – Fullerton Junction to ARTIC



Noise Measurement Site LT-29: 385 Vine Street – Fullerton Junction to ARTIC



Noise Measurement Site LT-30: 696 E Water Street – Fullerton Junction to ARTIC



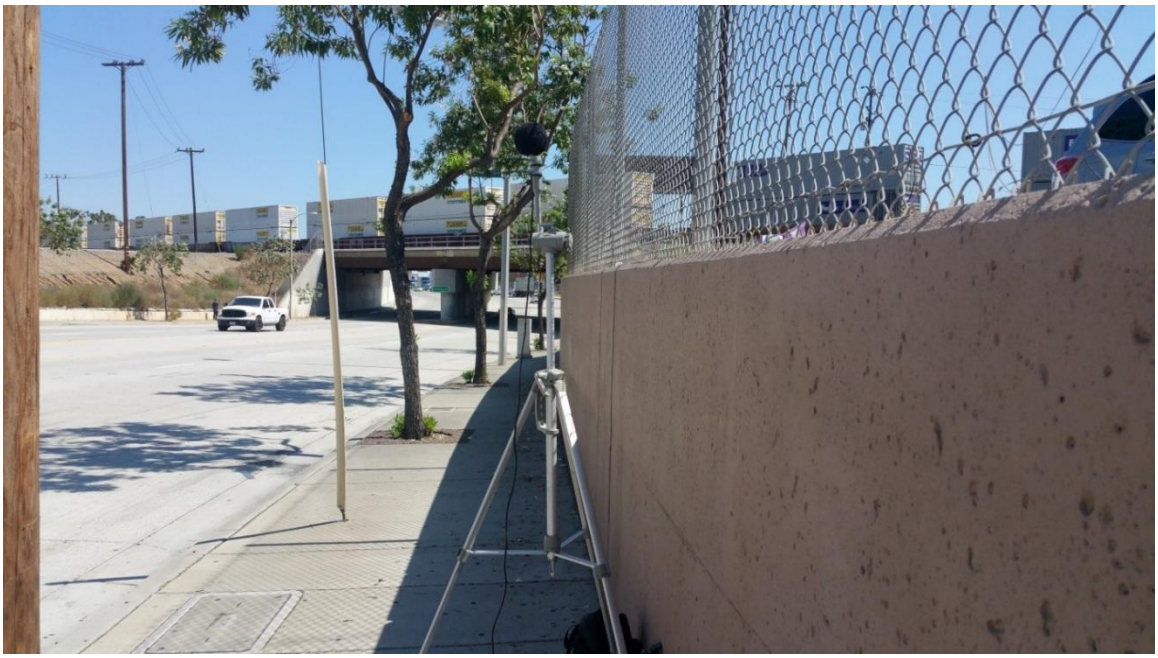
Noise Measurement Site LT-31: Marriot Towne Place Suites – Fullerton Junction to ARTIC



Noise Measurement Site ST-1: 2444 E 8th Street – Los Angeles Union Station to Redondo Junction



Noise Measurement Site ST-2: 2556 E Olympic Boulevard – Los Angeles Union Station to Redondo Junction



Noise Measurement Site ST-3: 6630 Telegraph Road – Redondo Junction to Fullerton Junction



Noise Measurement Site ST-4: Praise Chapel Orange County – Redondo Junction to Fullerton Junction



Noise Measurement Site ST-5: Kingdom Hall – Redondo Junction to Fullerton Junction



Noise Measurement Site ST-6: 7601 Cord Avenue – Redondo Junction to Fullerton Junction



Noise Measurement Site ST-7: 8600 S Alburtis Avenue – Redondo Junction to Fullerton Junction



Noise Measurement Site ST-8: 13031 Shoemaker Avenue – Redondo Junction to Fullerton Junction



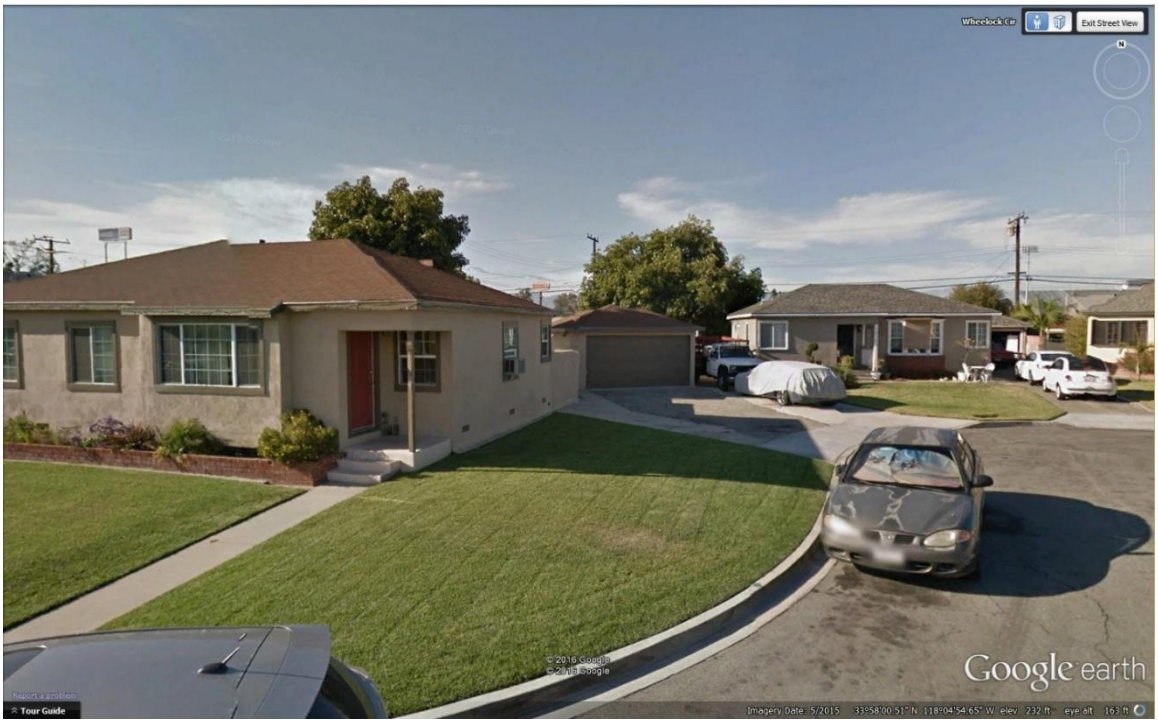
Noise Measurement Site ST-9: 100 S Richman Avenue – Redondo Junction to Fullerton Junction



Noise Measurement Site ST-10: 1300 S Lewis Street – Fullerton Junction to ARTIC



Noise Measurement Site ST-11: 9016 Rivera Road – Redondo Junction to Fullerton Junction



Noise Measurement Site ST-12: 10701 Wheelock Circle – Redondo Junction to Fullerton Junction



Noise Measurement Site ST-13: 1830 Commonwealth Avenue – Redondo Junction to Fullerton Junction



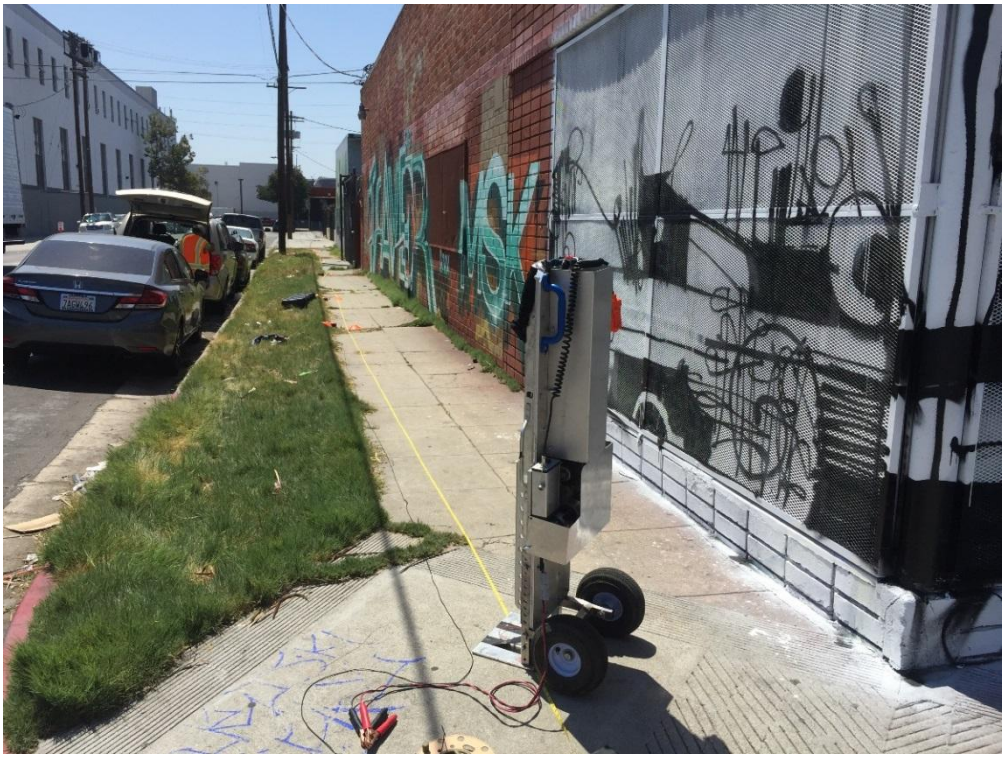
Noise Measurement Site ST-14: 828 N Panline – Fullerton Junction to ARTIC



Noise Measurement Site ST-15: 140 S Citrus Avenue – Redondo Junction to Fullerton Junction



Vibration Propagation Measurement Site VP-A: Leroy Street and Bolero Lane – Los Angeles Union Station to Redondo Junction



Vibration Propagation Measurement Site VP-1: Mateo Street and Violet Street – Los Angeles Union Station to Redondo Junction



Vibration Propagation Measurement Site VP-2: Sycamore Street and Montebello Boulevard – Redondo Junction to Fullerton Junction



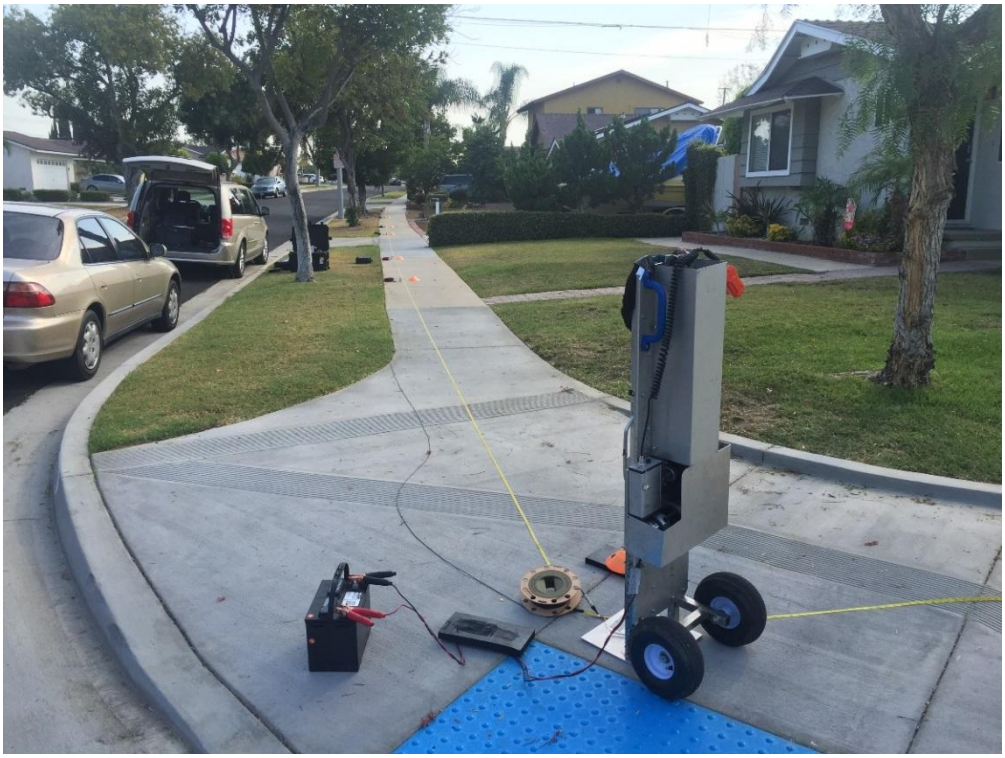
Vibration Propagation Measurement Site VP-3: Rivera Road and Lindell Avenue – Redondo Junction to Fullerton Junction



Vibration Propagation Measurement Site VP-4: Rivera Road and Millergrove Drive – Redondo Junction to Fullerton Junction



Vibration Propagation Measurement Site VP-5: Arrey Avenue and Ross Street – Redondo Junction to Fullerton Junction



Vibration Propagation Measurement Site VP-6: San Ardo Drive and Vanada Road – Redondo Junction to Fullerton Junction



Vibration Propagation Measurement Site VP-7: Fullerton Avenue and Pacific Avenue – Redondo Junction to Fullerton Junction



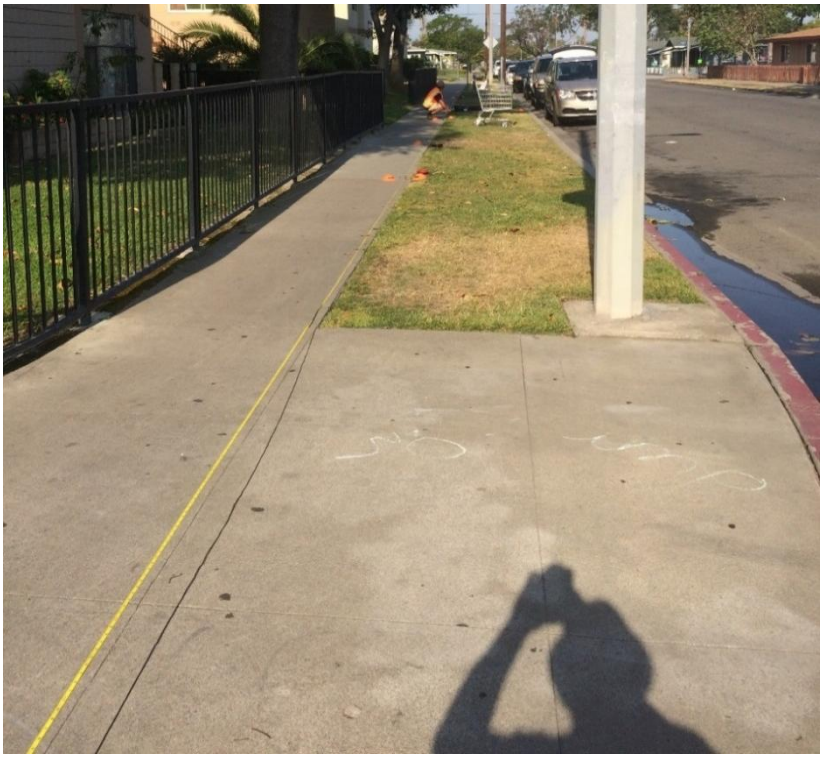
Vibration Propagation Measurement Site VP-8: Franklin Street and Stanton Avenue – Redondo Junction to Fullerton Junction



Vibration Propagation Measurement Site VP-9: S Orange Avenue and W Williamson Avenue – Redondo Junction to Fullerton Junction

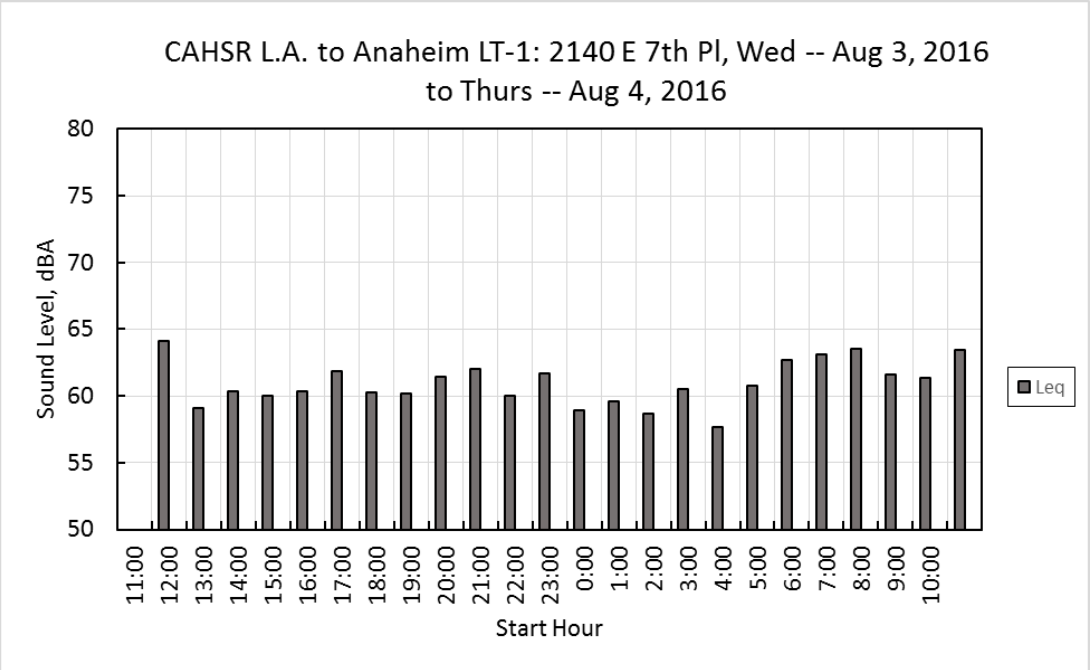


Vibration Propagation Measurement Site VP-10: Truslow Avenue and Lawrence Avenue – Redondo Junction to Fullerton Junction

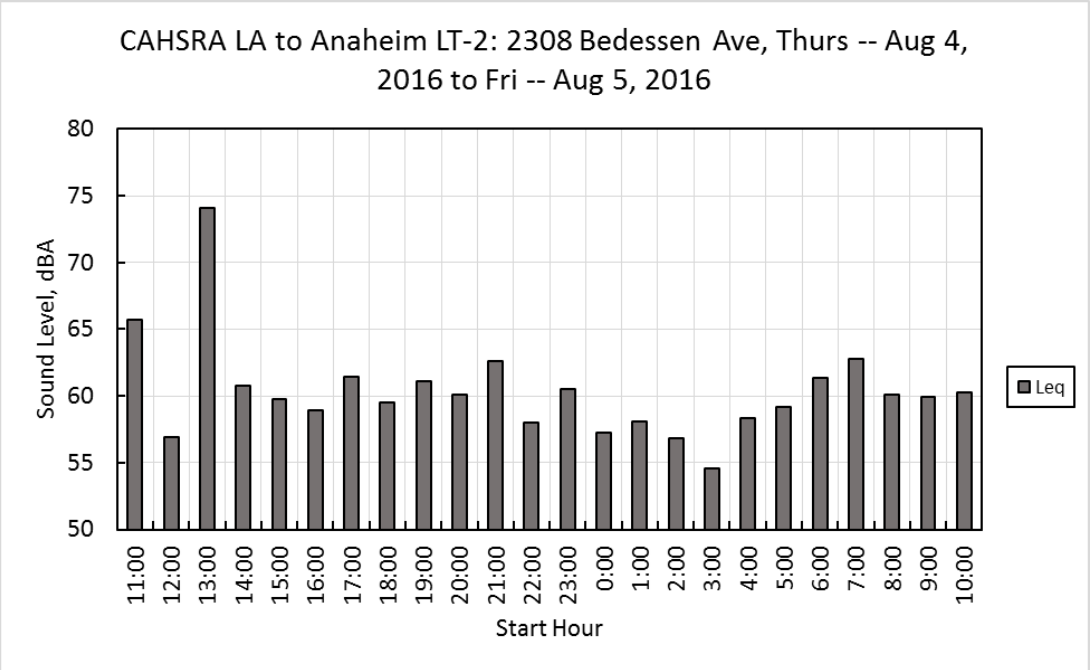


Vibration Propagation Measurement Site VP-11: E Wilhelmina Street and N Pauline Street – Fullerton Junction to ARTIC

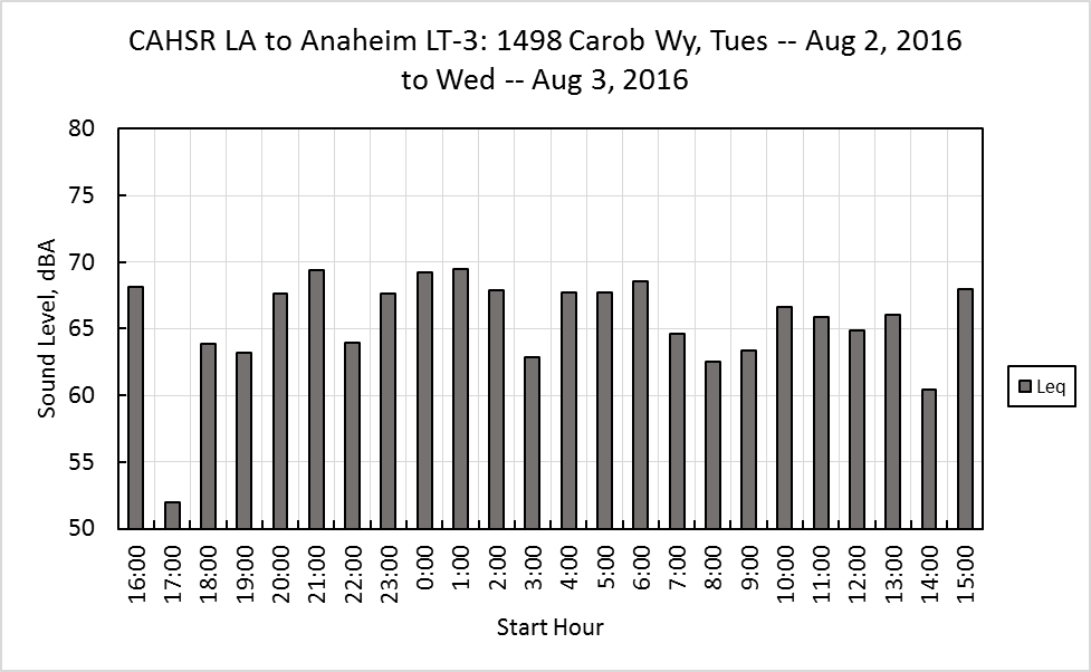
APPENDIX D: FIELD NOISE MEASUREMENT DOCUMENTATION AND DETAIL



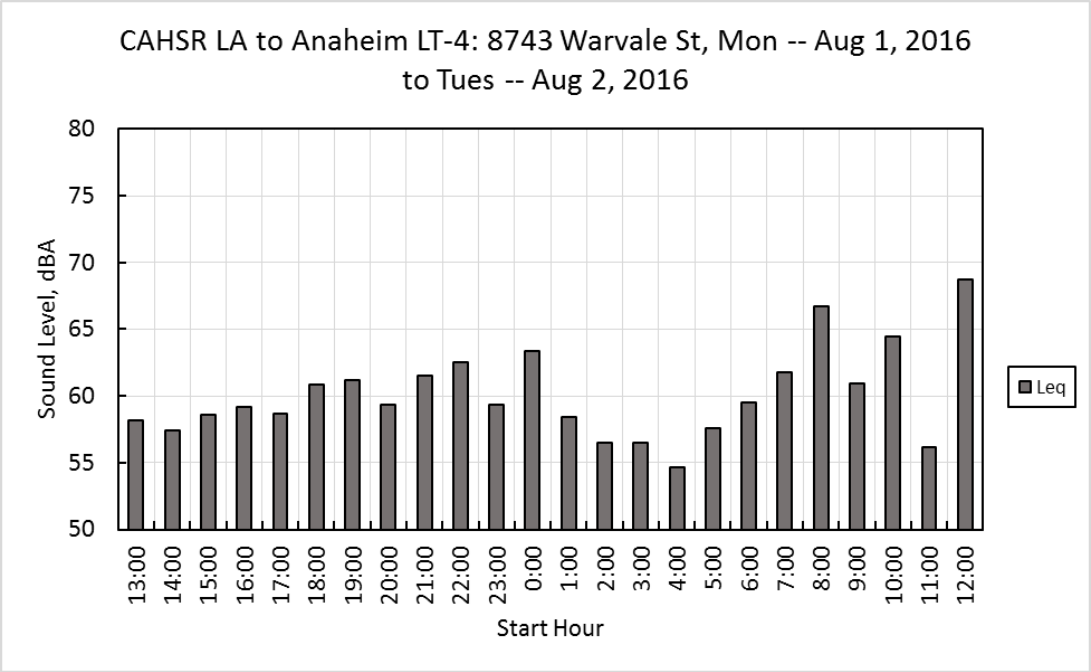
Long-Term Measurement Data – Site LT-1



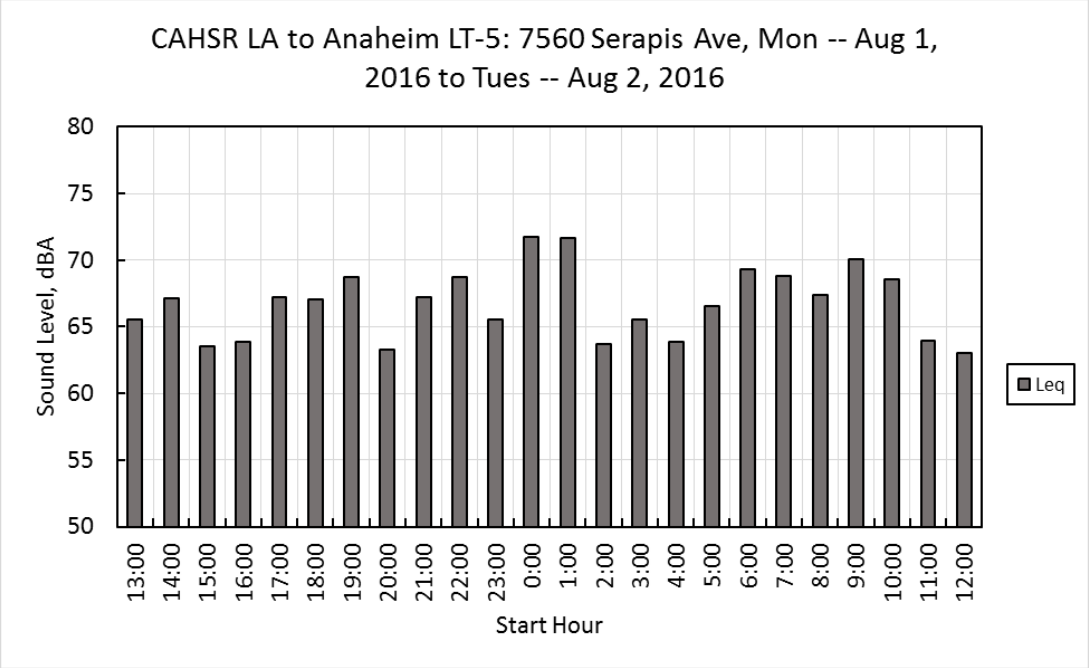
Long-Term Measurement Data – Site LT-2



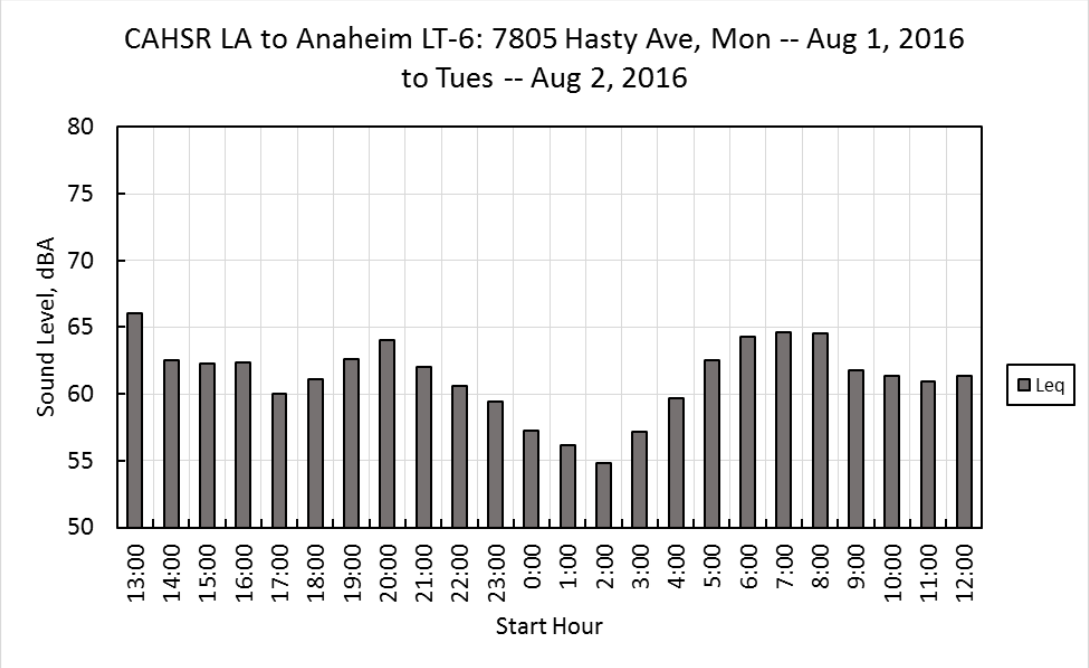
Long-Term Measurement Data – Site LT-3



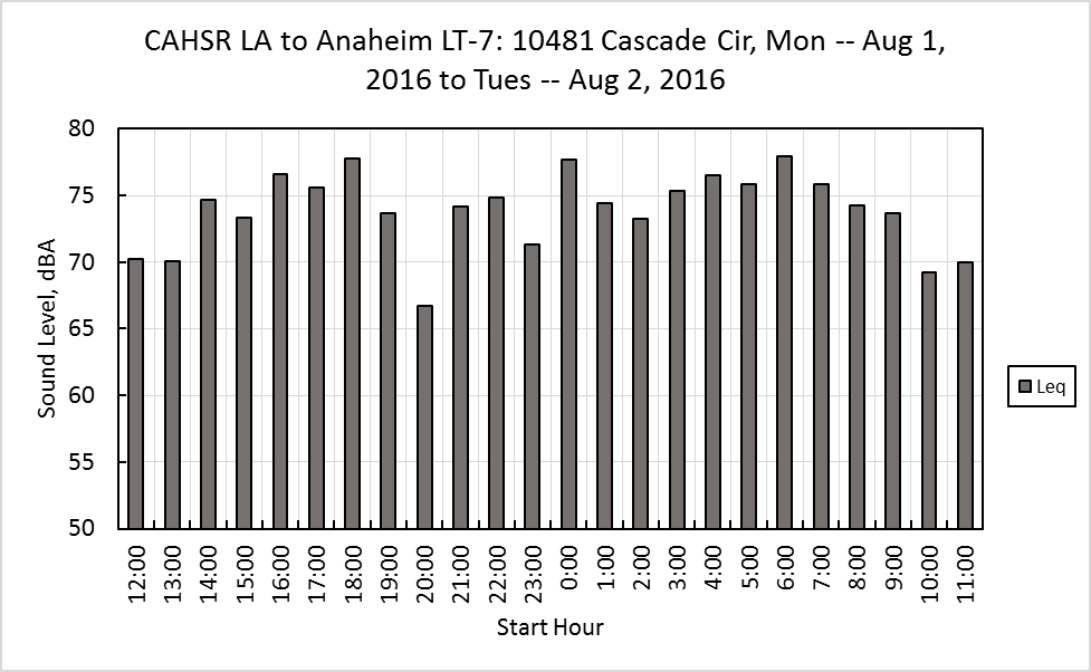
Long-Term Measurement Data – Site LT-4



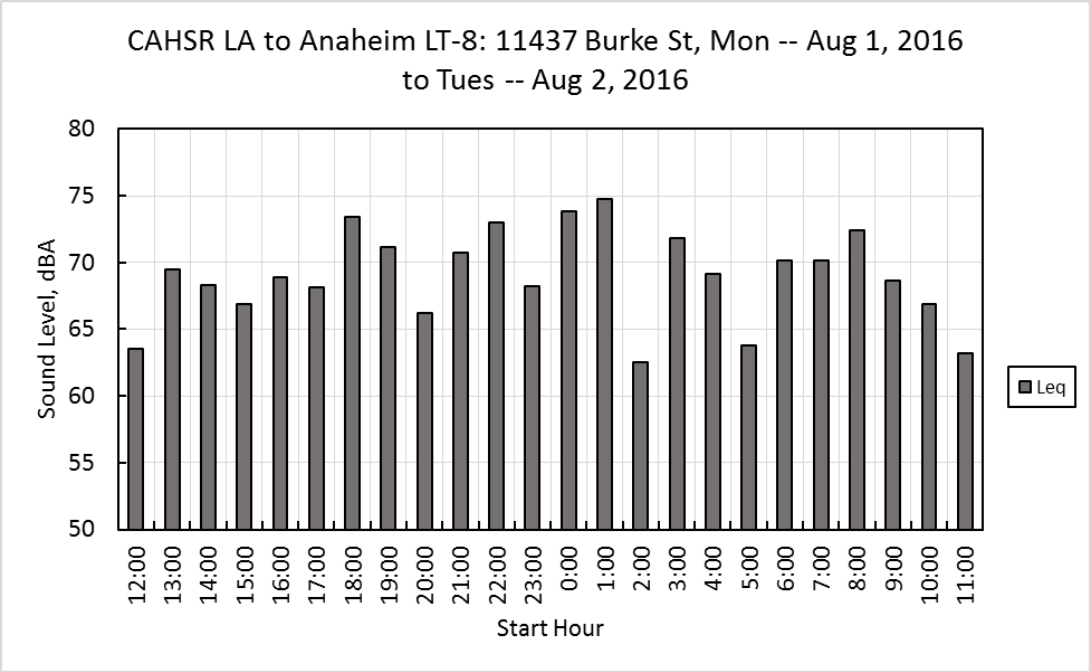
Long-Term Measurement Data – Site LT-5



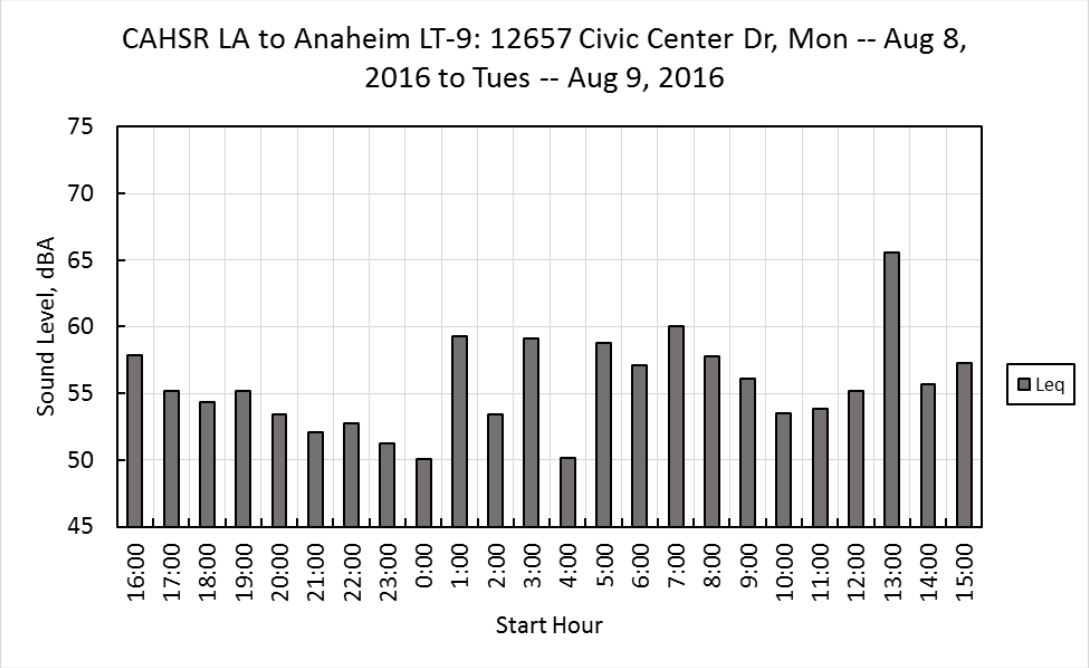
Long-Term Measurement Data – Site LT-6



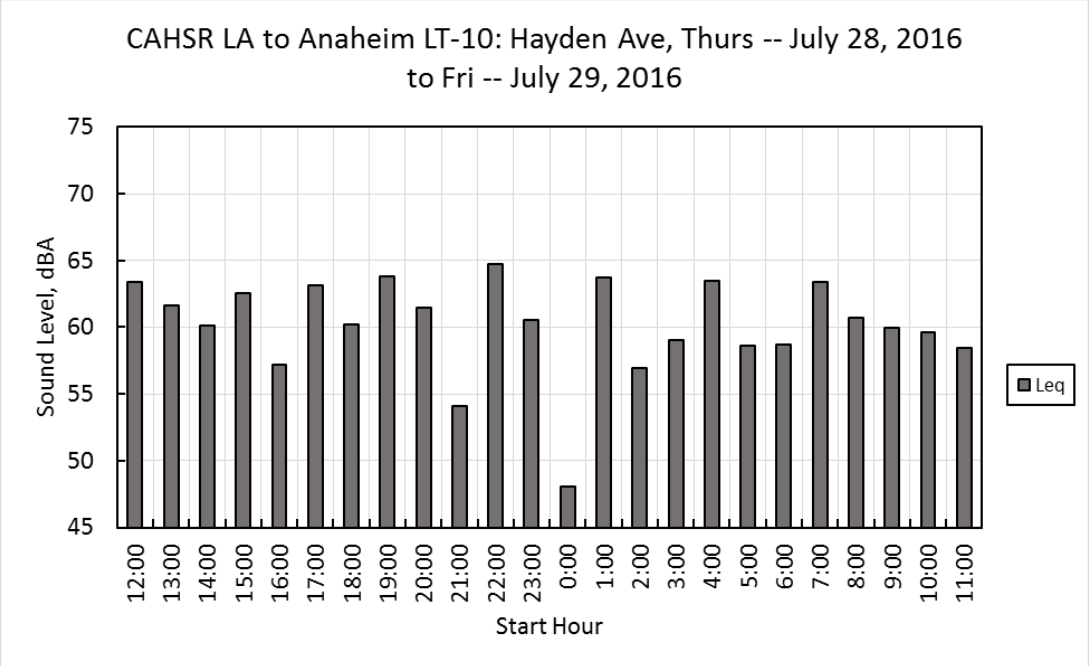
Long-Term Measurement Data – Site LT-7



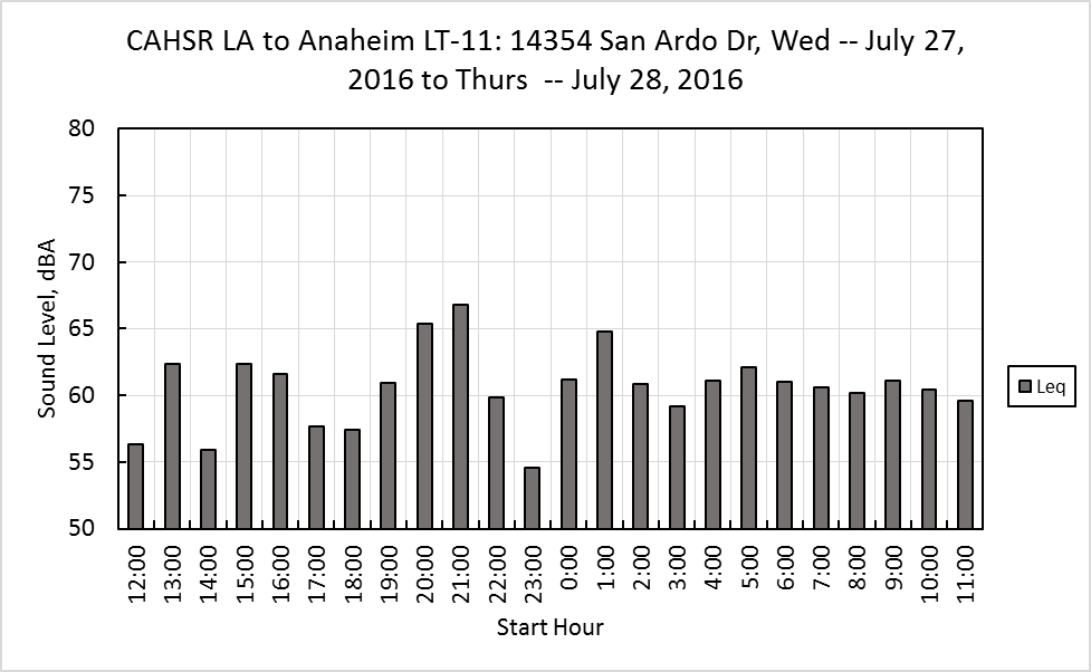
Long-Term Measurement Data – Site LT-8



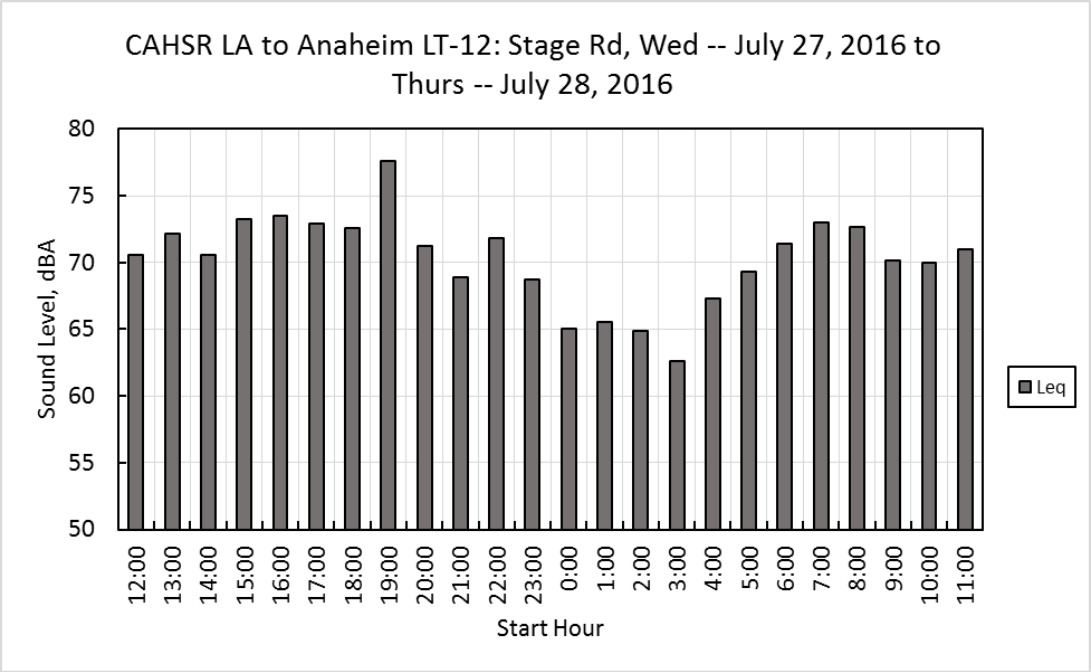
Long-Term Measurement Data – Site LT-9



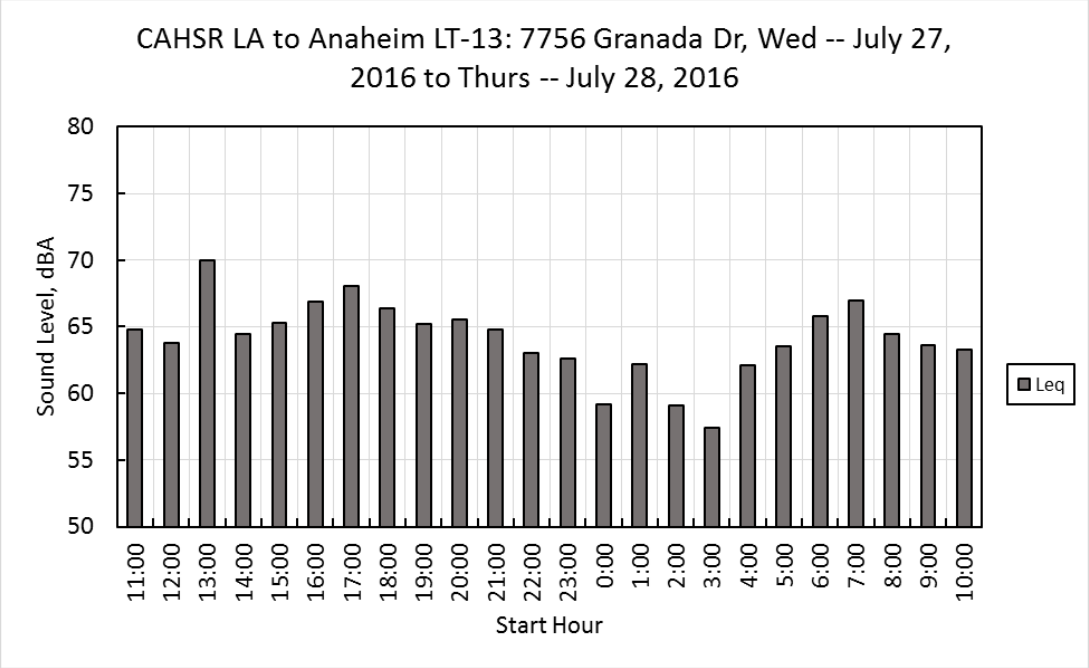
Long-Term Measurement Data – Site LT-10



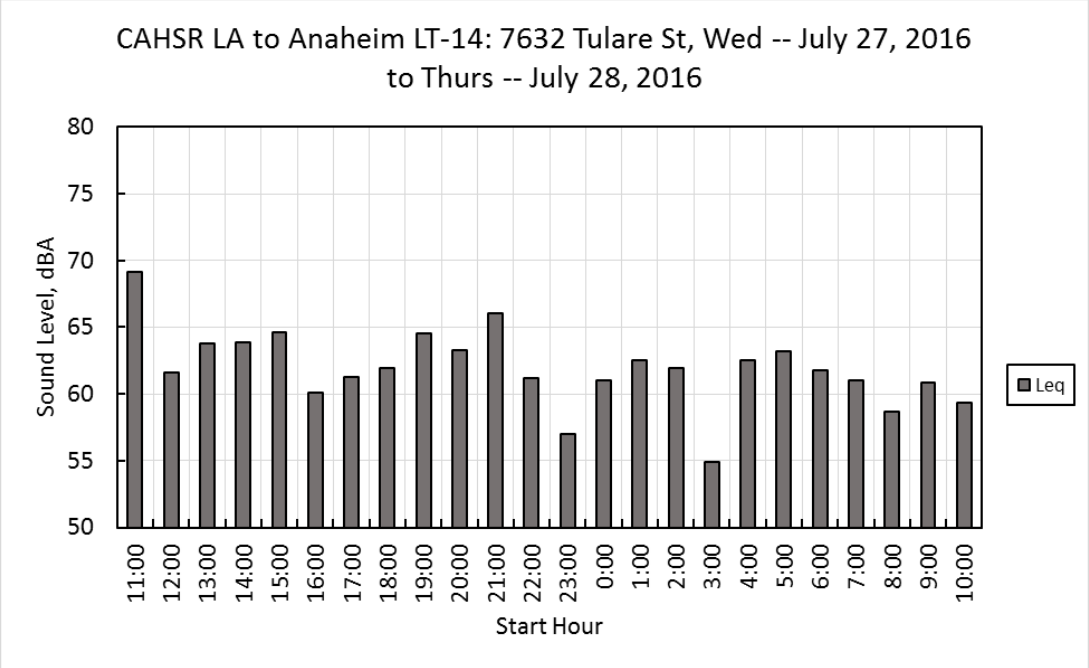
Long-Term Measurement Data – Site LT-11



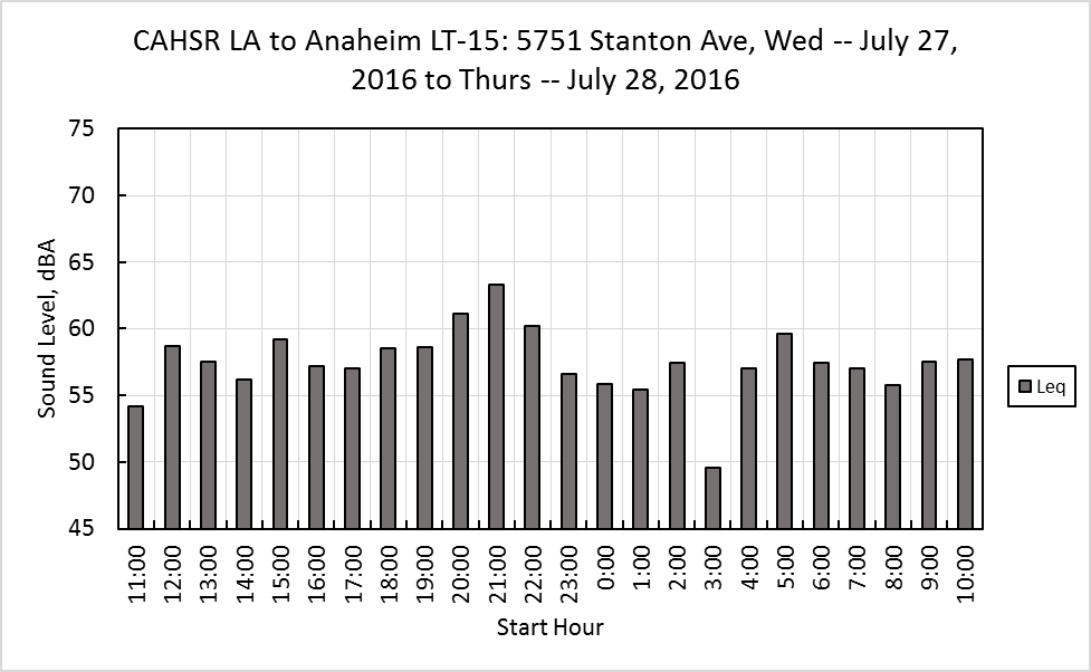
Long-Term Measurement Data – Site LT-12



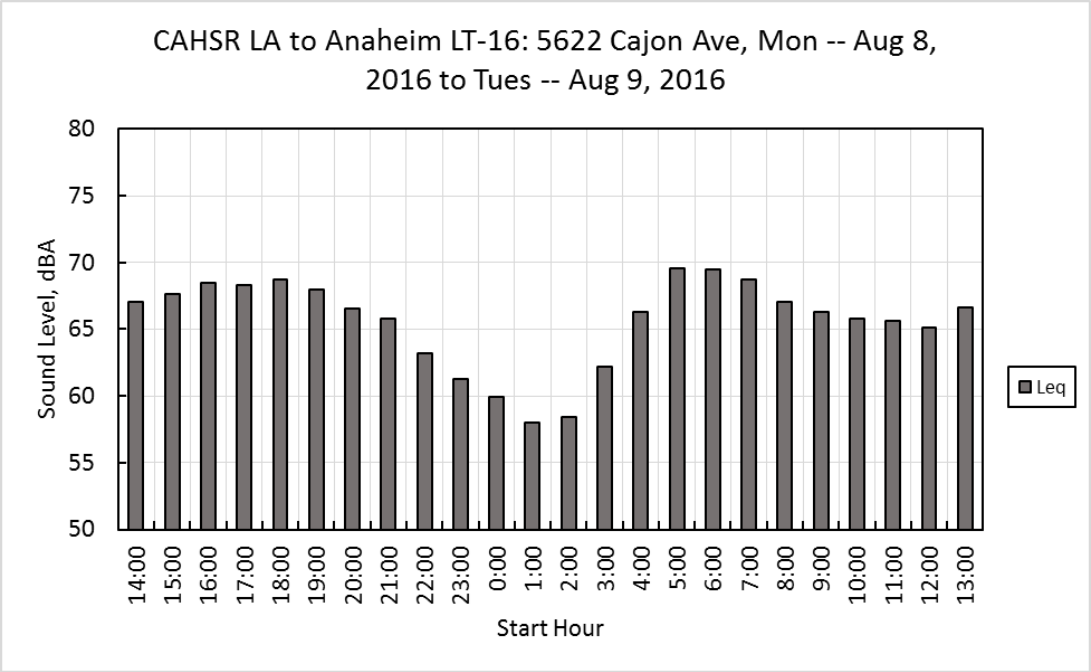
Long-Term Measurement Site – Site LT-13



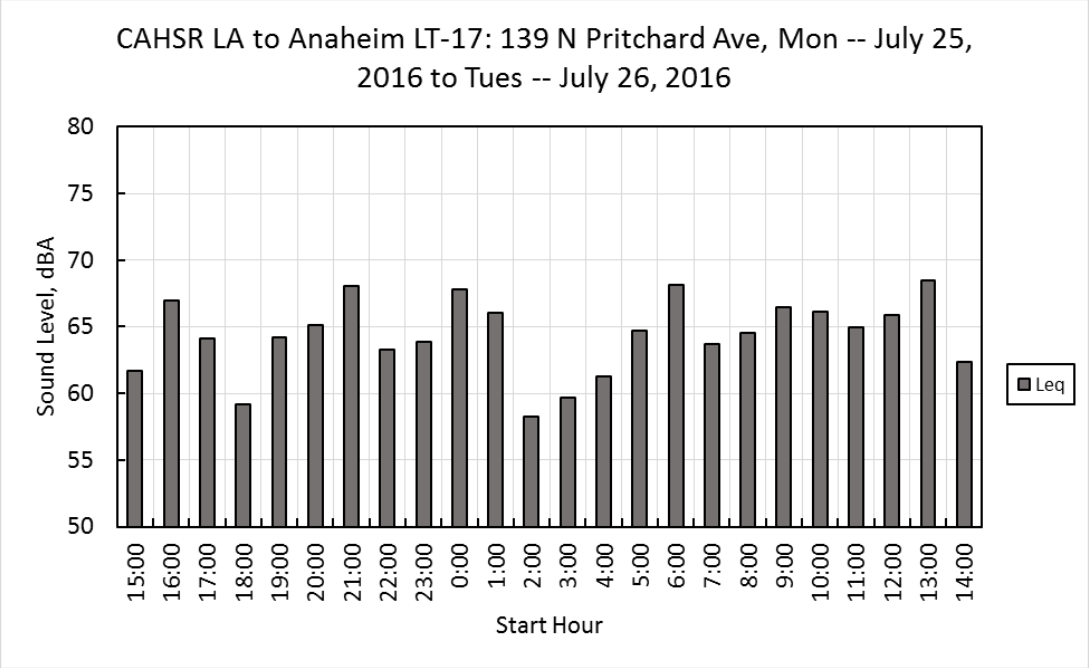
Long-Term Measurement Site – Site LT-14



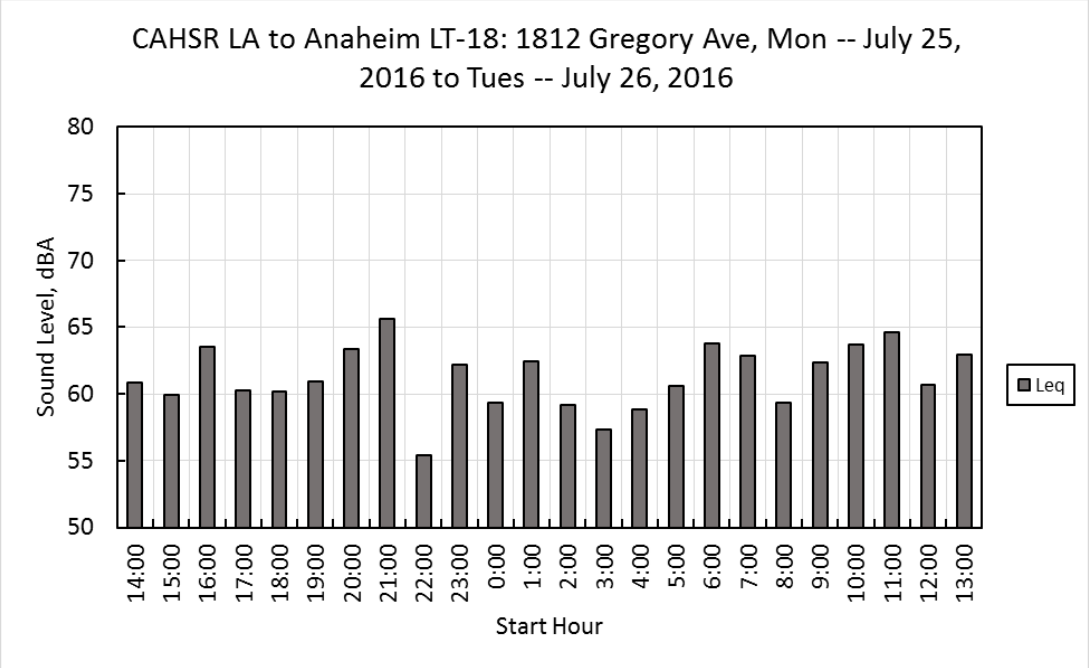
Long-Term Measurement Data – Site LT-15



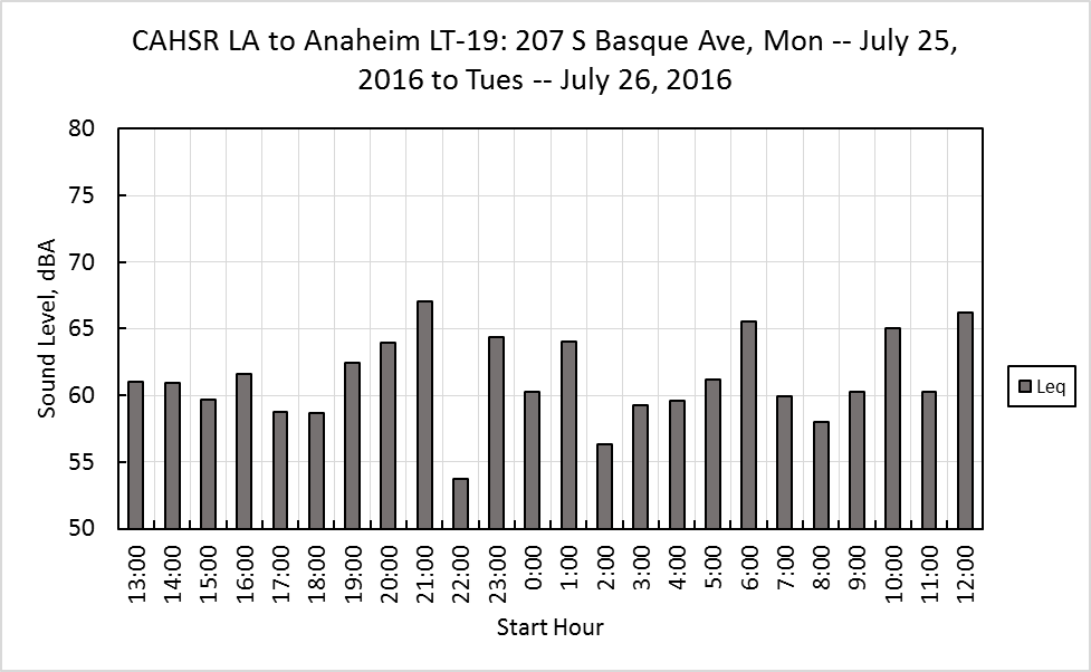
Long-Term Measurement Data – Site LT-16



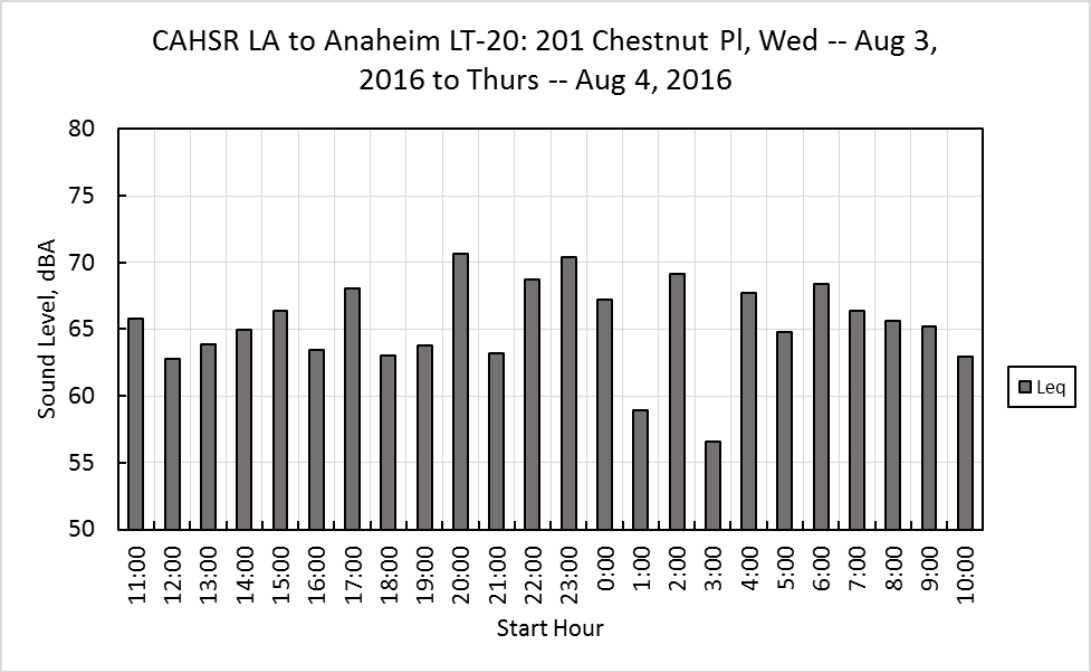
Long-Term Measurement Data – Site LT-17



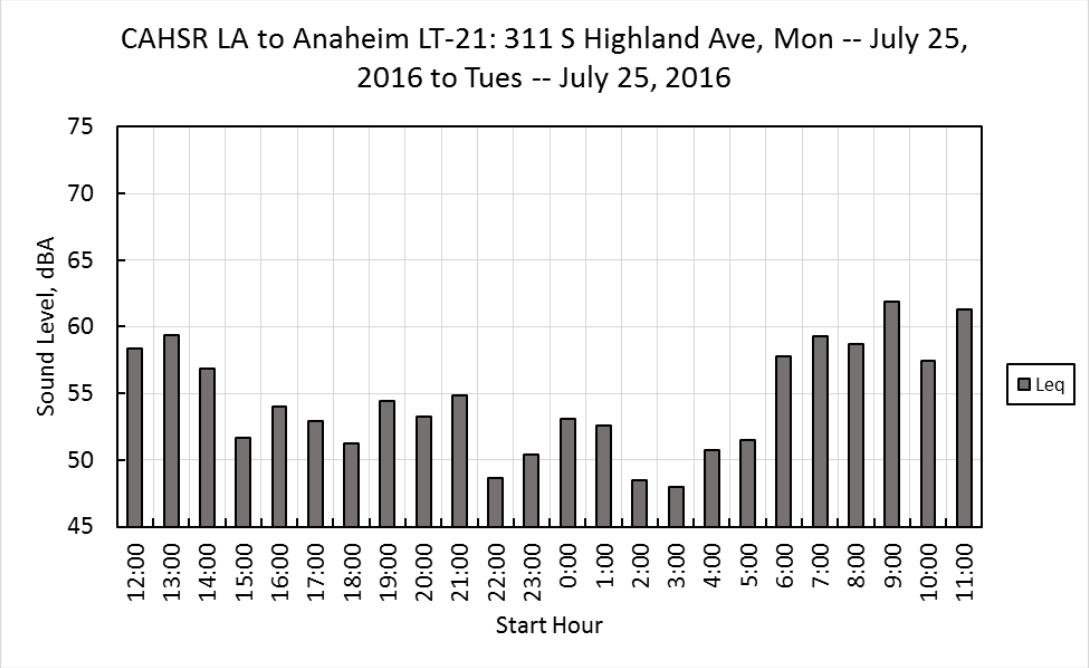
Long-Term Measurement Data – Site LT-18



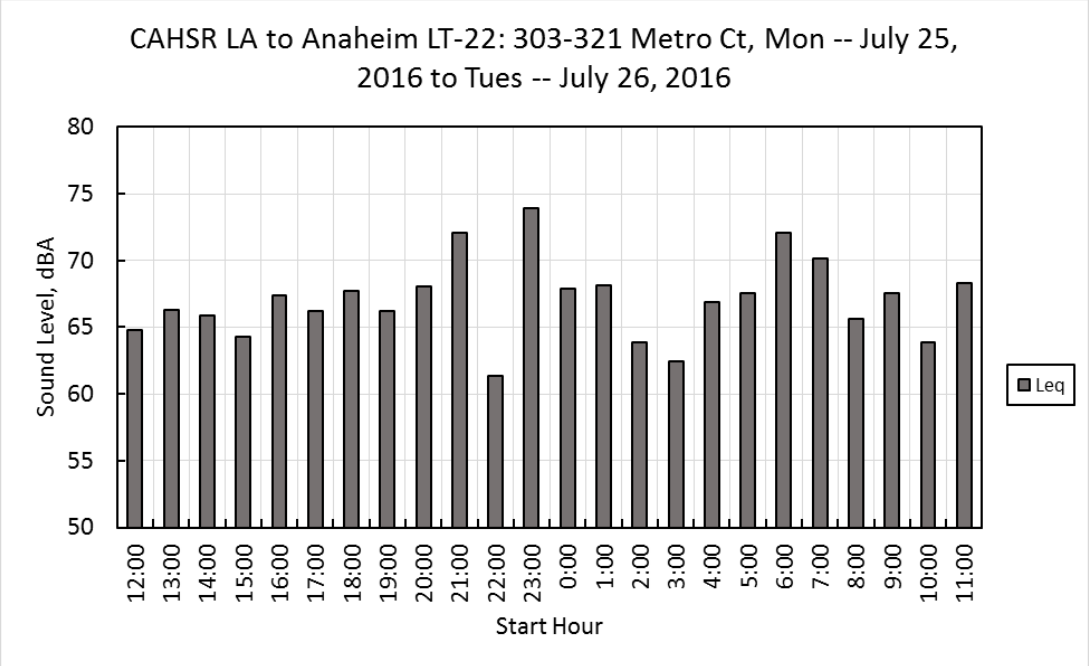
Long-Term Measurement Data – Site LT-19



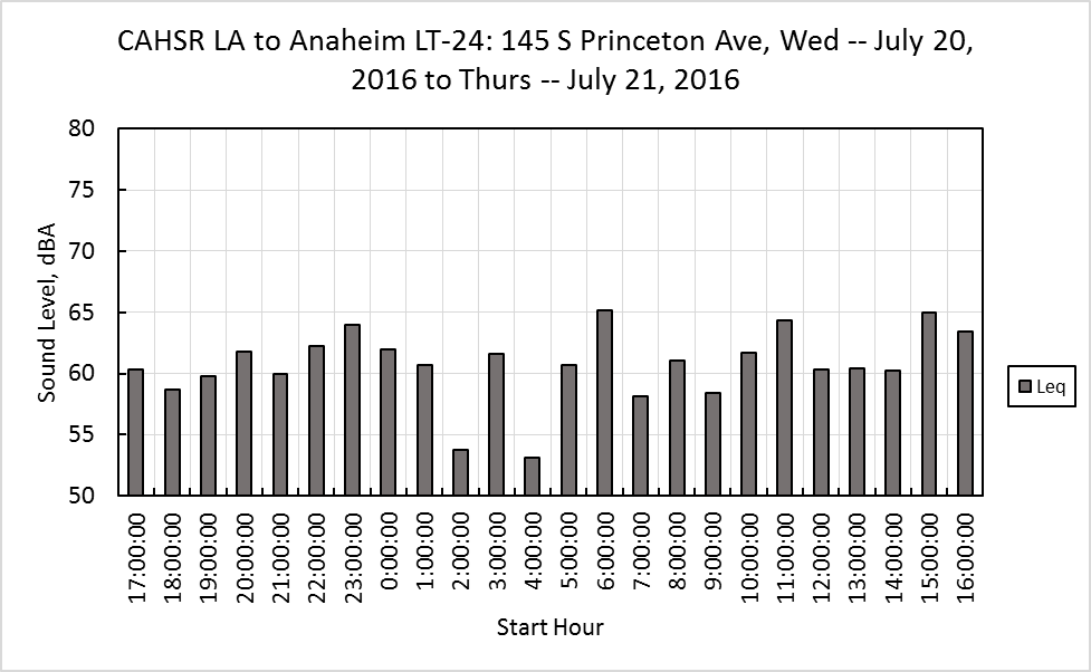
Long-Term Measurement Data – Site LT-20



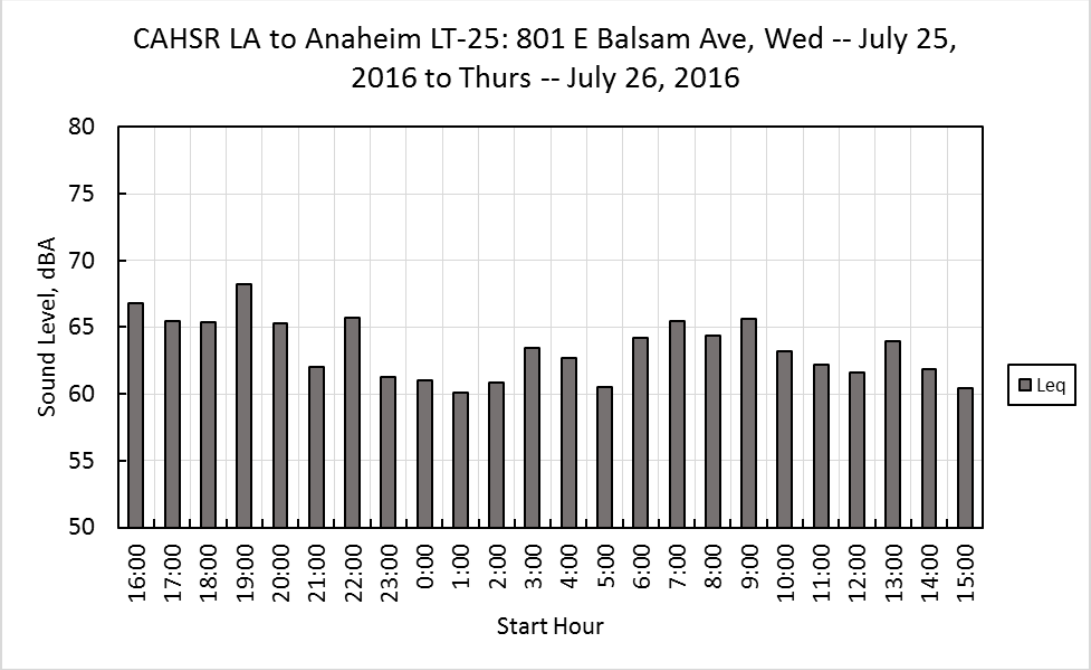
Long-Term Measurement Data – Site LT-21



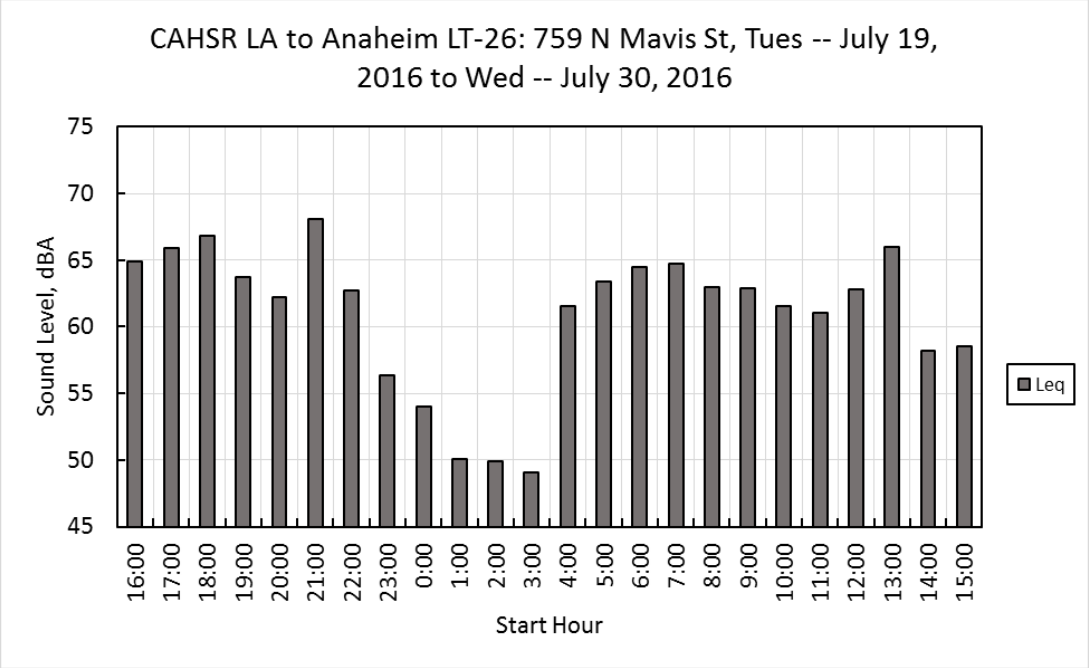
Long-Term Measurement Data – Site LT-22



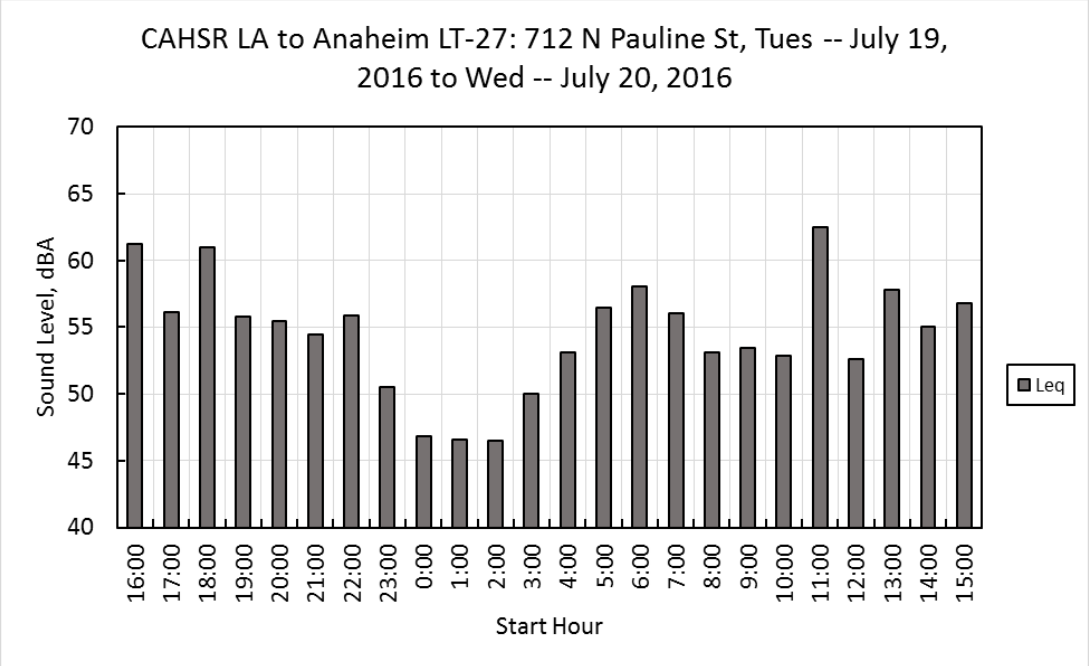
Long-Term Measurement Data – Site LT-24



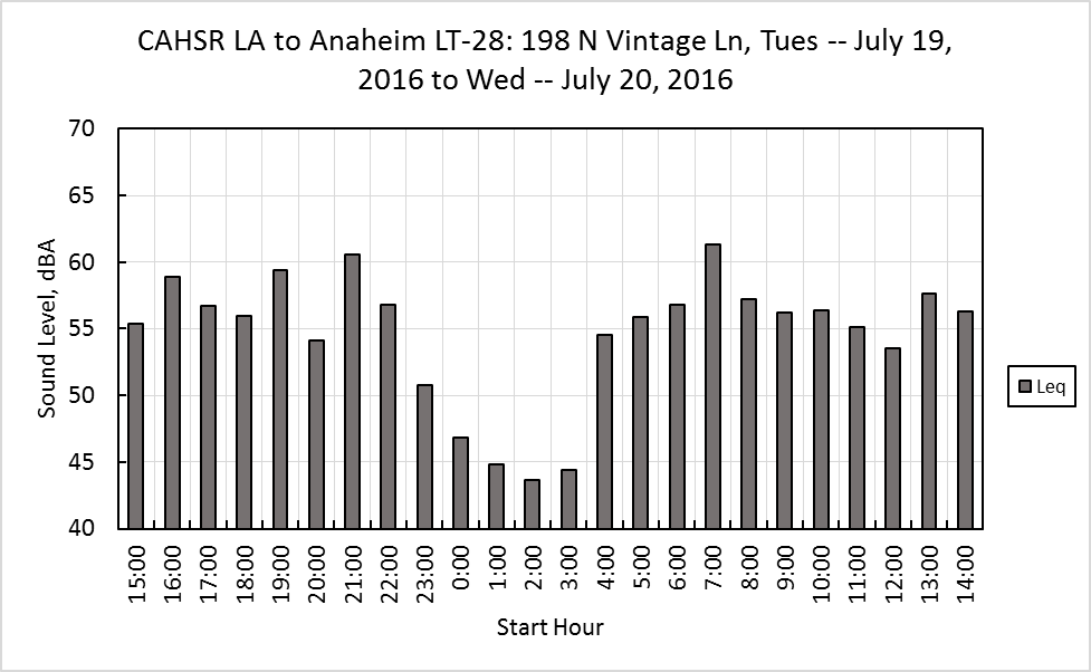
Long-Term Measurement Data – Site LT-25



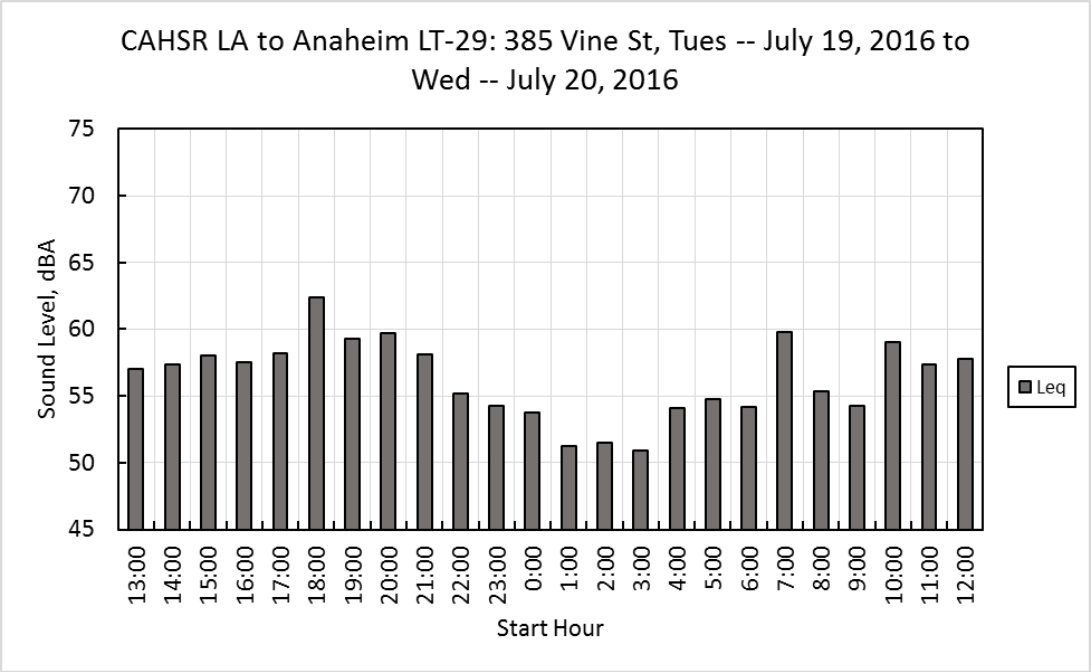
Long-Term Measurement Data – Site LT-26



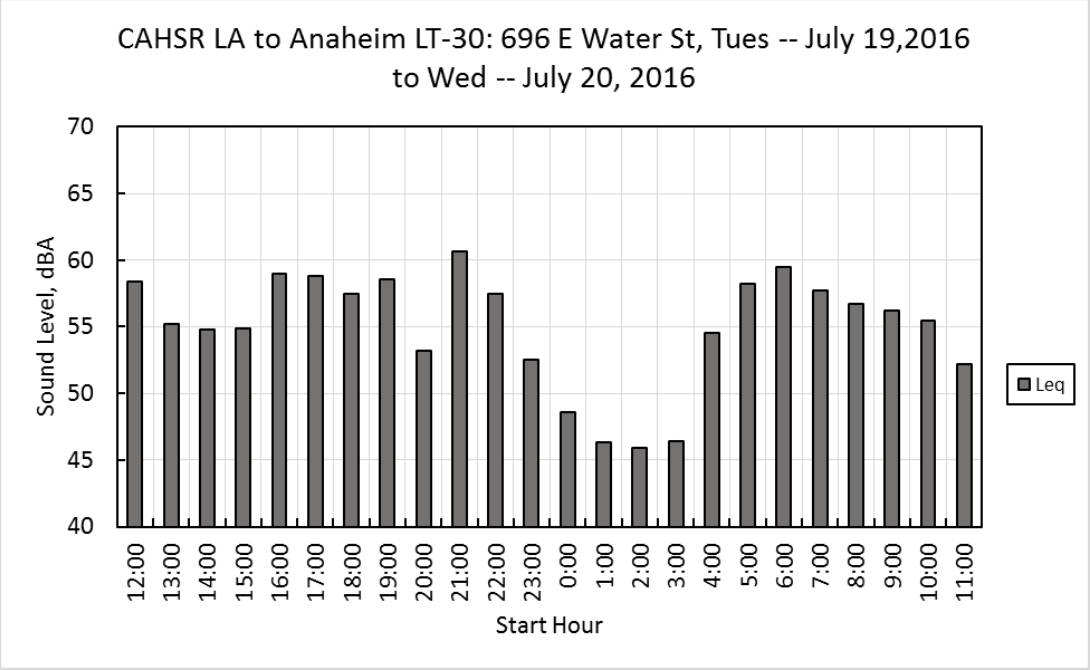
Long-Term Measurement Data – Site LT-27



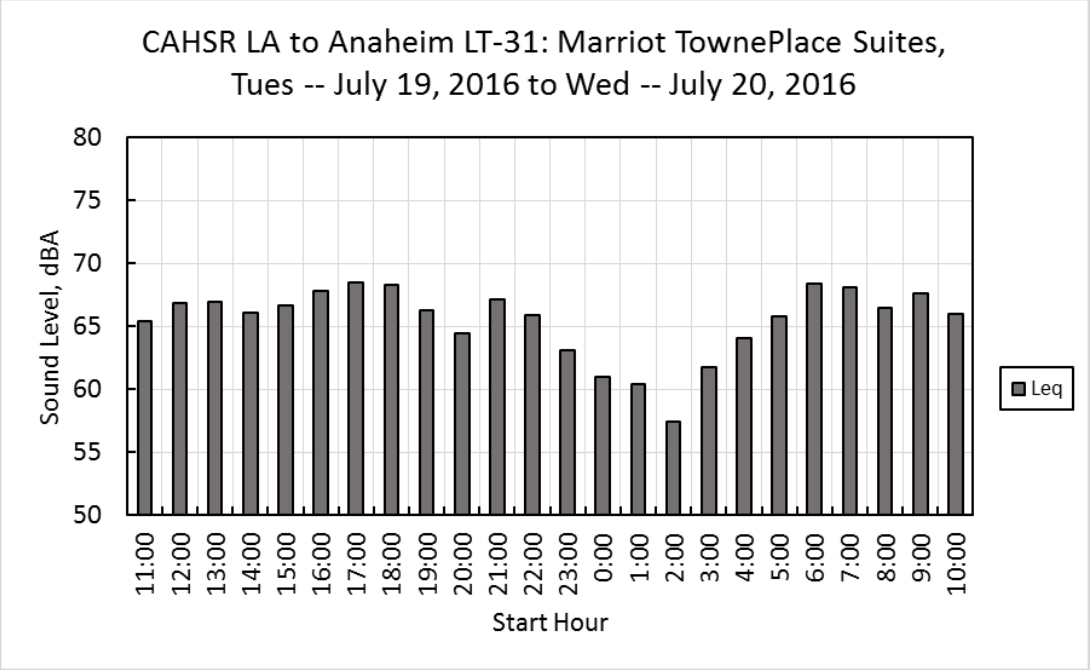
Long-Term Measurement Data – Site LT-28



Long-Term Measurement Data – Site LT-29



Long-Term Measurement Data – Site LT-30



Long-Term Measurement Data – Site LT-31

FIELD NOISE MEASUREMENT DATA

PROJECT: HSR LA-A PROJ. #

SITE IDENTIFICATION: ST1 OBSERVER(S): JGM
ADDRESS: Near 2444 E 8th St LA
START DATE / TIME: 3:10pm 8/4/2016 END DATE / TIME: 4:10pm 8/4

METEROLOGICAL CONDITIONS:
TEMP: 90 °F HUMIDITY: 60 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 5 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: TYPE: 1 2 SERIAL #: 4805
CALIBRATOR: SERIAL #: 2916
CALIBRATION CHECK, BEFORE: 114.9 AFTER 113.75 WINDSCREEN ✓
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

FILE / MEAS #	START TIME	END TIME	L_{eq}	max	1.67	8.33	10	25	50	90	min
97	3:10pm	4:10pm	61.4	77.1	68.1	64.2	63.7	61.0	59.2	57.4	54.4

COMMENTS:

NOISE SOURCE INFO:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER: Maybe 300' to rail (google earth) closest to traffic is on the 10. ~9' to distillery
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

PROJECT: HSR LA-A PROJ. #

SITE IDENTIFICATION: CT7 OBSERVER(S): JCM
ADDRESS: Near 2556 E Olympic Blvd, LA
START DATE / TIME: 4:22pm 8/4 END DATE / TIME: 5:22pm 8/4

METEROLOGICAL CONDITIONS:
TEMP: 80 °F HUMIDITY: %R.H. WIND: (CALM) LIGHT MODERATE VARIABLE
WINDSPEED: 2-3 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

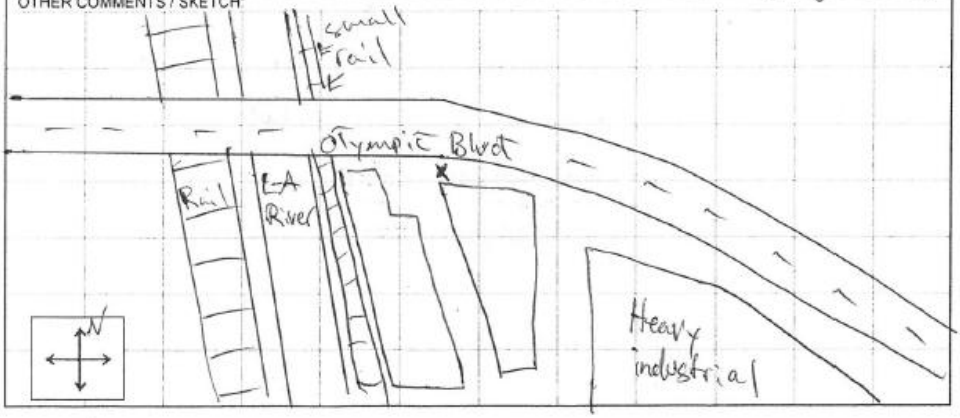
ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD 1xT TYPE: 1 (2) SERIAL #: 4605
CALIBRATOR: LD 200 SERIAL #:
CALIBRATION CHECK, BEFORE: 1405 AFTER WINDSCREEN V
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

FILE / MEAS #	START TIME	END TIME	L_{eq}	max	1.67	8.33	10	25	50	90	min
97	4:22pm	5:22pm	66.1	85.6	73.4	68.5	67.9	65.5	63.5	60.4	55.3

COMMENTS:

NOISE SOURCE INFO:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT (RAIL) INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: (HARD) SOFT MIXED FLAT OTHER: 20' to Bridge, About 200ft to rail (Google earth)
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

PROJECT: HSR / A-A PROJ. #

SITE IDENTIFICATION: ST3 OBSERVER(S): JGM
ADDRESS: 6630 Telegraph Rd
START DATE / TIME: 3:00pm 8/9/2016 END DATE / TIME: 4:00pm 8/9/16

METEROLOGICAL CONDITIONS:
TEMP: 85 °F HUMIDITY: 45 %R.H. towards WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 2-3 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD LxT TYPE: 1 2 SERIAL #: 4005
CALIBRATOR: LD200 SERIAL #: 2916
CALIBRATION CHECK, BEFORE: 114.2 AFTER 113.96 WINDSCREEN ✓
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

FILE / MEAS #	START TIME	END TIME	L_{eq}	max	1.67	8.33	10	25	50	90	min
96	3pm	4pm	73.3	86.2	80.5	77.1	76.7	74.4	71.1	61.8	55.6

COMMENTS: Freight Rail registers 101 dB @ 80 yards
* Engine

NOISE SOURCE INFO:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER: 80 yards to rail, 1ft to wall, 12' up off sidewalk.
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

PROJECT: HSR LA-A PROJ. #

SITE IDENTIFICATION: S14 OBSERVER(S): JGM
ADDRESS: Praise Chapel Orange County
START DATE / TIME: 4:49pm 7/28/2016 END DATE / TIME: 5:49pm 7/28/2016

METEROLOGICAL CONDITIONS:
TEMP: 89 °F HUMIDITY: 32 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 4-8 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

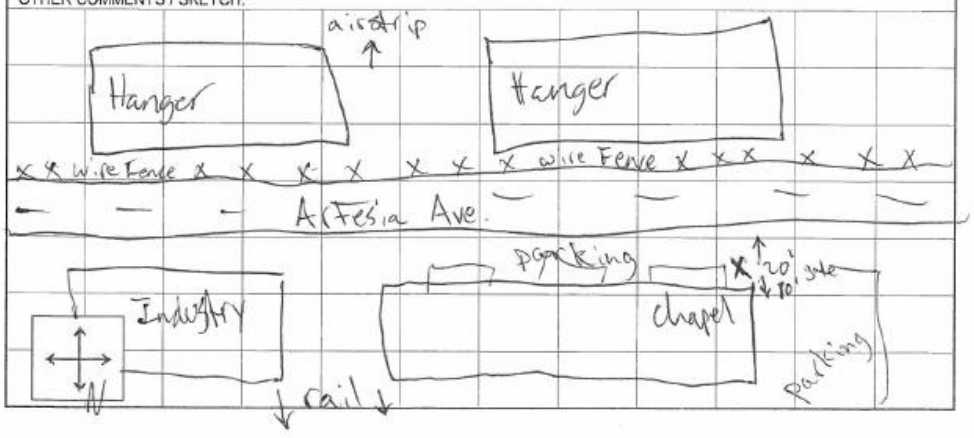
ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD LxT TYPE: 1 (2) SERIAL #: 4005
CALIBRATOR: LD700 SERIAL #: 2916
CALIBRATION CHECK, BEFORE: 114.06 AFTER 113.96 WINDSCREEN ✓
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM (ANSI) OTHER:

FILE / MEAS #	START TIME	END TIME	L_{eq}	max	1.67	8.33	10	25	50	90	min
					L						
58	4:49pm	5:49pm	69.5	87	76.6	73.8	73.5	71.1	67.1	54.3	48.2

COMMENTS:

NOISE SOURCE INFO:
PRIMARY NOISE SOURCE: (TRAFFIC) (AIRCRAFT) RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: (HARD) SOFT MIXED FLAT OTHER:
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

PROJECT: HSR LA-A PROJ. #

SITE IDENTIFICATION: ST5 OBSERVER(S): JGM
ADDRESS: Jehovas Witness / Kingdom Hall
START DATE / TIME: 3:43pm 7/28/2016 END DATE / TIME: 4:43pm 7/28/2016

METEROLOGICAL CONDITIONS:
TEMP: 92 °F HUMIDITY: 34 %R.H. WIND: (CALM) LIGHT MODERATE VARIABLE
WINDSPEED: 2-3 MPH DIR: N NE E SE S (SW) W NW STEADY GUSTY
SKY: (SUNNY) CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

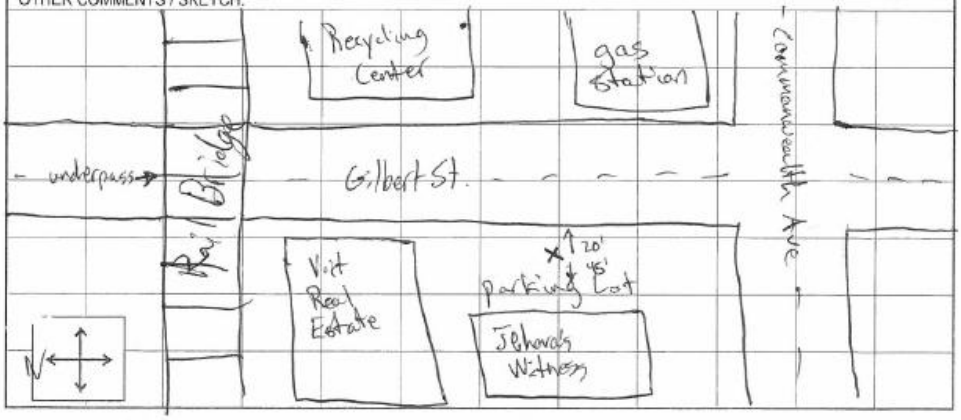
ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD LxT TYPE: 1 (2) SERIAL #: 4005
CALIBRATOR: LD200 SERIAL #: 2916
CALIBRATION CHECK, BEFORE: 114.3 AFTER 114.09 WINDSCREEN ✓
SETTINGS: A-WEIGHTED (SLOW) FAST FRONTAL RANDOM (ANSI) OTHER:

FILE / MEAS #	START TIME	END TIME	L_{eq}	max	1.67	8.33	10	25	50	90	min
							L				
ST	3:43pm	4:43pm	68.4	81.3	74.9	71.7	71.3	69.2	66.6	61.4	51.4

COMMENTS:

NOISE SOURCE INFO:
PRIMARY NOISE SOURCE: (TRAFFIC) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: (HARD) SOFT MIXED FLAT OTHER:
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

PROJECT: HSR LA-A PROJ. #

SITE IDENTIFICATION: S16 OBSERVER(S): JGM
ADDRESS: 7601 Carol Ave
START DATE / TIME: 4:30pm 8/9/16 END DATE / TIME: 5:30pm 8/9/16

METEOROLOGICAL CONDITIONS:
TEMP: 83 °F HUMIDITY: 48 %R.H. towards WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 2-3 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

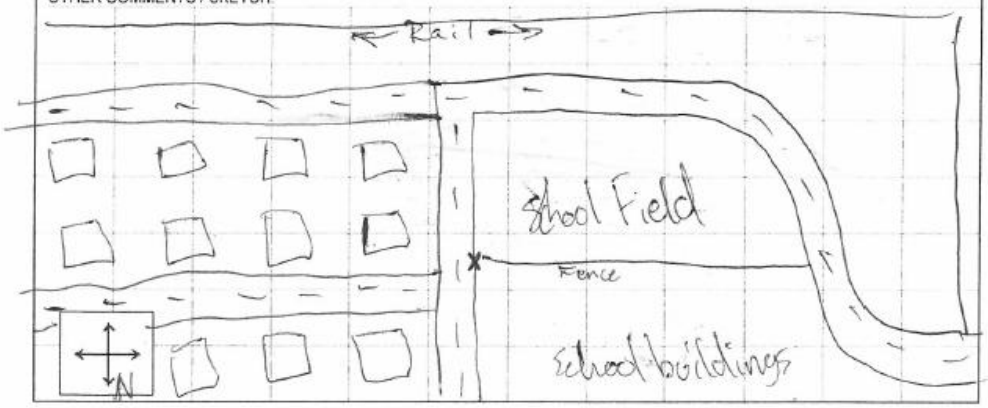
ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD LxT TYPE: 1 2 SERIAL #: 4005
CALIBRATOR: LD 200 SERIAL #: 2916
CALIBRATION CHECK, BEFORE: 113.95 AFTER 113.89 WINDSCREEN ✓
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

FILE / MEAS #	START TIME	END TIME	L_{eq}	max	L 1.67	L 8.33	L 10	L 25	L 50	L 90	min
97	4:30	5:30	59.8	80.6	68.9	62.4	61.3	57.0	53.9	49.6	45.6

COMMENTS:

NOISE SOURCE INFO:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:
Helicopters, distant sirens, a lot of birds, some aircraft (jet) flyovers.

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER: About 300' to rail (google earth)
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

PROJECT: HSR LA-A PROJ. #

SITE IDENTIFICATION: ST-7 Middle School OBSERVER(S): JGM
ADDRESS: 8600 S Alburtis Ave
START DATE / TIME: 5:00pm 8/14 END DATE / TIME: 6:00pm 8/8

METEROLOGICAL CONDITIONS:
TEMP: 84 °F HUMIDITY: 51 %R.H. towards WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 5-10 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

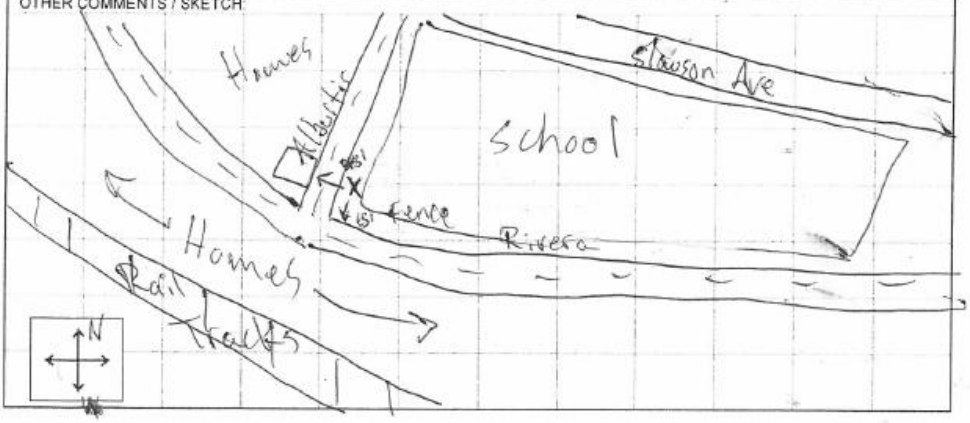
ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD LxT TYPE: 1 2 SERIAL #: 4005
CALIBRATOR: LD200 SERIAL #: 23916
CALIBRATION CHECK, BEFORE: 114.02 AFTER 114.1 WINDSCREEN ✓
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

FILE / MEAS #	START TIME	END TIME	L_{eq}	max	L 1.67	8.33	10	25	50	90	min
95	5:00pm	5:00pm	61.2	81.4	71.2	64.8	64.2	58.4	52.9	48.6	46.4

COMMENTS: Several freight trains. Horn noise very prominent.

NOISE SOURCE INFO:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER:
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

PROJECT: HSR LA-A PROJ. #

SITE IDENTIFICATION: STB Park OBSERVER(S): JGM
ADDRESS: 3031 Shoemaker Ave Norwalk
START DATE / TIME: 3:40 pm 8/8/16 END DATE / TIME: 3:41pm 8/8/16

METEOROLOGICAL CONDITIONS:
TEMP: 87 °F HUMIDITY: 55 %R.H. towards WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 4-8 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

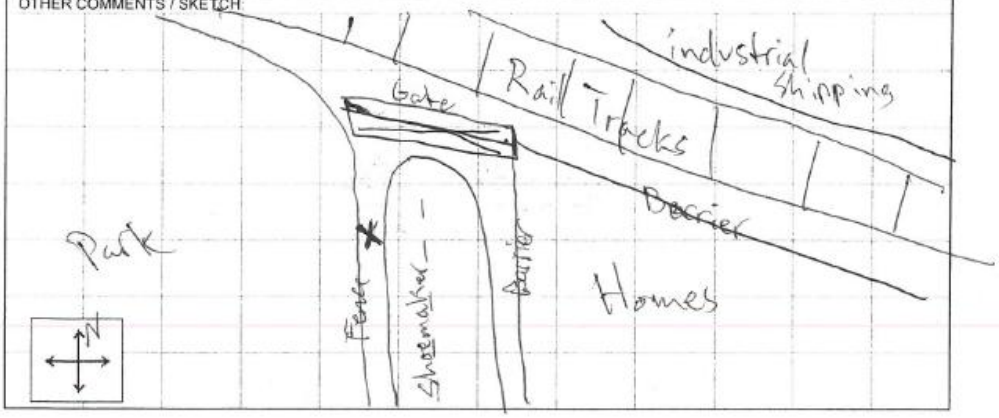
ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD LxT TYPE: 1 2 SERIAL #: 4005
CALIBRATOR: LD200 SERIAL #: 2916
CALIBRATION CHECK, BEFORE: 114.23 AFTER 113.91 WINDSCREEN V
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

FILE / MEAS #	START TIME	END TIME	L_{eq}	max	1.67	8.33	10	L 25	50	90	min
94	3:40pm	4:41pm	57.9	83.2	67.3	54.3	53.9	51.2	49.5	47.1	44.7

COMMENTS:

NOISE SOURCE INFO:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT some RAIL INDUSTRIAL light AMBIENT OTHER:
ROADWAY TYPE:
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER: About 100' to rail (google earth)
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

PROJECT: HSR LA-A PROJ. #

SITE IDENTIFICATION: 979 Redo OBSERVER(S): JGM
ADDRESS: Near 100 s Richman Ave
START DATE / TIME: 4:15pm 8/3/2016 END DATE / TIME: 5:15pm 8/3/16

METEROLOGICAL CONDITIONS:
TEMP: 84 °F HUMIDITY: 45 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 4-5 MPH DIR: N NE E SE (S) SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

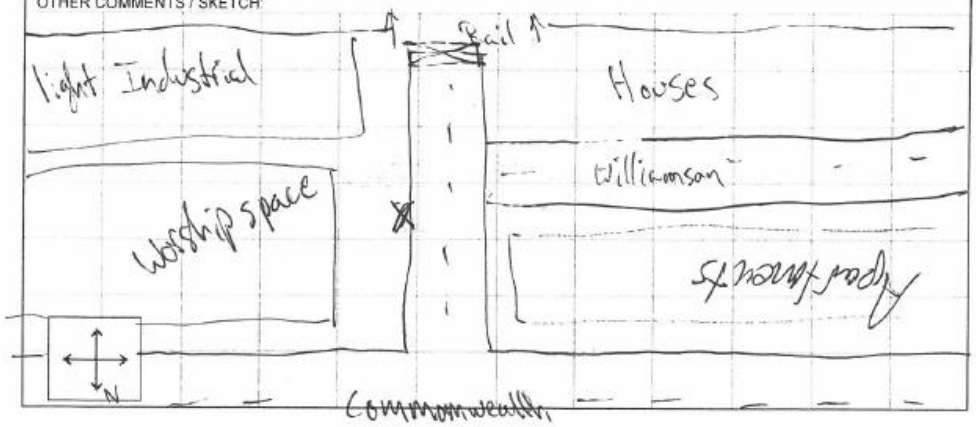
ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD LxT TYPE: 1 (2) SERIAL #: 4005
CALIBRATOR: LD700 SERIAL #: 2916
CALIBRATION CHECK, BEFORE: 114.35 AFTER 114.09 WINDSCREEN ✓
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

FILE / MEAS #	START TIME	END TIME	L_{eq}	max	1.67	8.33	10	L 25	50	90	min
91	4:15pm	5:15pm	57.3	80.5	65.8	59.6	59.0	55.8	53.0	49.1	45.3

COMMENTS:
light traffic, neighborhood road. Only a few trains

NOISE SOURCE INFO:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT (RAIL) INDUSTRIAL (AMBIENT) OTHER:
ROADWAY TYPE:
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: (HARD) SOFT MIXED FLAT OTHER: Maybe 300ft to rail (google earth)
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

PROJECT: HSR LA-A PROJ. #

SITE IDENTIFICATION: ST10 OBSERVER(S): JGM
ADDRESS: 1300 S Lewis St, Anaheim
START DATE / TIME: 7:48am 8/10/16 END DATE / TIME: 8:48am 8/10/16

METEOROLOGICAL CONDITIONS:
TEMP: 73 °F HUMIDITY: 45 %R.H WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 2-3 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

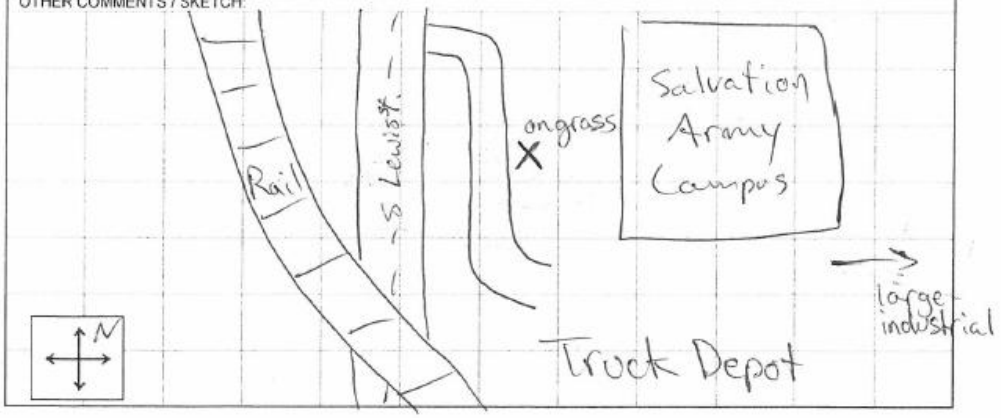
ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD LxT TYPE: 1 (2) SERIAL #: 4005
CALIBRATOR: LD200 SERIAL #: 2916
CALIBRATION CHECK, BEFORE: 113.8 AFTER 113.93 WINDSCREEN √
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

FILE / MEAS #	START TIME	END TIME	L_{eq}	max	1.67	8.33	10	L 25	50	90	min
98	7:48	8:48	66.8	85.1	73.4	70.3	69.9	67.8	64.6	56.0	44.1

COMMENTS:

NOISE SOURCE INFO:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE: some rail not as loud as truck traffic usually
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER: Maybe 50' to Lewis St.
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

PROJECT: HSR LA-A PROJ. #

SITE IDENTIFICATION: ST11 OBSERVER(S): JGM
ADDRESS: 9016 Rivera Rd, Pico Rivera
START DATE / TIME: 1:40 pm 8/1/2016 END DATE / TIME: 2:41 pm 8/1/2016

METEROLOGICAL CONDITIONS:
TEMP: 88 °F HUMIDITY: 41 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: ~5 MPH DIR: N NE E SE (S) SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

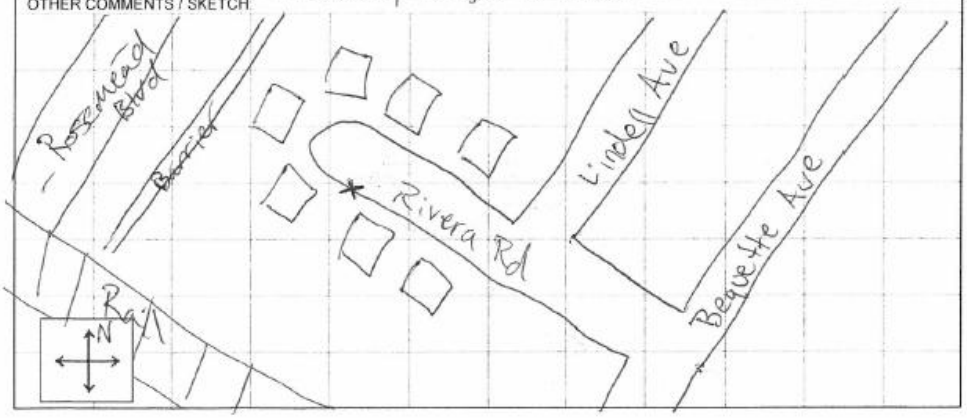
ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD LxT TYPE: 1 (2) SERIAL #: 4005
CALIBRATOR: LD200 SERIAL #: 2916
CALIBRATION CHECK, BEFORE: 113.65 AFTER 113.95 WINDSCREEN ✓
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

FILE / MEAS #	START TIME	END TIME	L_{eq}	max	1.67	8.33	10	L 25	50	90	min
S9	1:40pm	2:41pm	55.5	74.9	63.9	59.5	58.6	53.7	49.4	45.8	43.3

COMMENTS:

NOISE SOURCE INFO:
PRIMARY NOISE SOURCE: TRAFFIC (AIRCRAFT) RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:
several close jet aircraft, 2-3 trains. Not as loud as anticipated.

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER: grass parkway / sidewalk
PHOTOS: 1' to curb, 63 yds to barrier
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

PROJECT: HSR LA-A PROJ. #

SITE IDENTIFICATION: ST 17 OBSERVER(S): JGM
ADDRESS: 10701 Wheelock Cir
START DATE / TIME: 7:57pm 8/1/2016 END DATE / TIME: 4:01pm 8/1

METEROLOGICAL CONDITIONS:
TEMP: 89 °F HUMIDITY: 38 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 3-4 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD LxT TYPE: 1 (2) SERIAL #: 4005
CALIBRATOR: LD 200 SERIAL #: 2916
CALIBRATION CHECK, BEFORE: 114.01 AFTER 113.83 WINDSCREEN ✓
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

FILE / MEAS #	START TIME	END TIME	L_{eq}	max	1.67	8.33	10	L 25	50	90	min
90	7:57pm	4:01pm	64.1	87.1	68.7	65.2	64.8	63.3	61.8	59.5	54.6

COMMENTS:

NOISE SOURCE INFO:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:
lots of neighborhood activity. Distant rail traffic is dominant. w/ horn.

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER:
PHOTOS: 1' to curb, 50yds to Pioneer Blvd.
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

PROJECT: HSR LA-A PROJ. #

SITE IDENTIFICATION: ST13 OBSERVER(S): JLM
ADDRESS: East of 1830 Commonwealth Ave
START DATE / TIME: 4:31 pm 7/25/2016 END DATE / TIME: 5:32 pm 7/25/2016

METEOROLOGICAL CONDITIONS:
TEMP: 90 °F HUMIDITY: 38 %R.H. Toward WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 4.5-11 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

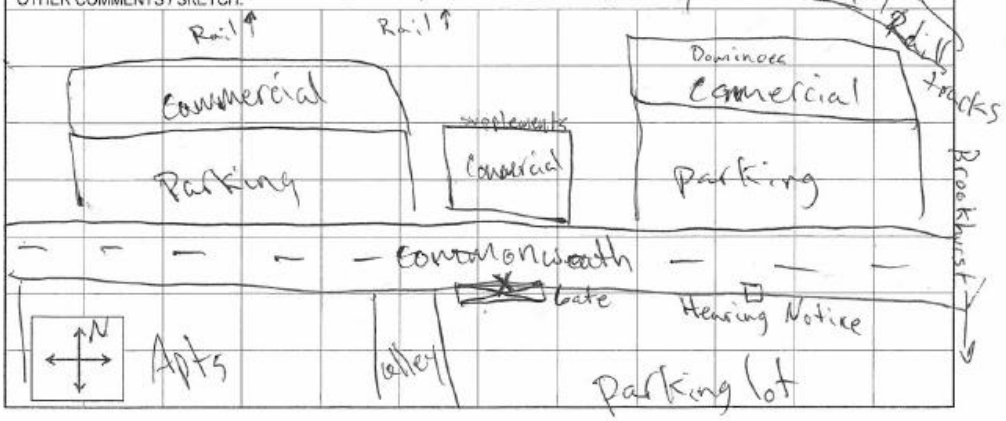
ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD LxT TYPE: 1 2 SERIAL #: 4005
CALIBRATOR: LD200 SERIAL #: 2916
CALIBRATION CHECK, BEFORE: 114.28 AFTER 113.8 WINDSCREEN ✓
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

FILE / MEAS #	START TIME	END TIME	L_{eq}	max	L 1.67	8.33	10	25	50	90	min
85	4:31pm	5:32pm	69.8	87.9	76.4	73.0	72.6	70.6	67.8	60.7	55.0

COMMENTS: Hearing notice for apartment complex construction on parking lot.

NOISE SOURCE INFO:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:
Some rail noise, mostly traffic, Occasional helicopter
lots of crows around apartments

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER:
PHOTOS: 8' to curb, 30ft to apt alley
OTHER COMMENTS / SKETCH:



APPENDIX E: NOISE IMPACTS

Representative operational noise assessment results at each of the long-term noise measurement sites are presented in Table E-1 and operational noise impact locations are depicted on Figures E-1 through E-16.

Table E-1 Representative Noise Assessment Results

Noise Meas. Site[1]	Rec. Num	Land Use Cat.	Dist. to Near Track (feet)	Civ. Sta. Num.	Track Type	Train Speed (mph)	Speed Regime[3]	Sub-source SEL (dBA)[4]				Shielding Adjustment (dB)	Project Noise Level (dBA)	Existing Noise Level (dBA)	Noise Impact Criteria (dBA)		Impact Type
								Propulsion		Wheel-Rail							
								NB	SB	NB	SB				Mod.	Sev.	
LT1	6681	2	227	S243+00	At-grade	50	HS	72	74	72	55	0	49	67	62	68	--
LT2	N/A[2]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LT3	6211	2	121	SBN 504+00	At-grade	90	HS	78	78	84	84	0	58	74	65	72	--
LT4	6062	2	26	SBN 555+00	At-grade	79	HS	89	89	94	94	0	69	67	62	67	Severe
LT5	5860	2	113	SBN 567+00	At-grade	79	HS	79	79	84	84	0	58	75	65	73	--
LT6	5422	2	278	SBN 597+00	At-grade	70	HS	72	72	76	76	0	51	67	62	67	--
LT7	5268	2	129	SBN 622+00	At-grade	70	HS	78	78	82	82	0	56	82	65	75	--
LT8	4921	2	71	SBN 660+00	At-grade	70	HS	82	82	86	86	0	61	77	65	75	--
LT9	4838	2	515	SBN 840+00	Elevated structure	45	HS	70	70	69	70	0	50	63	59	65	--
LT10	4683	2	101	SBN 874+00	Elevated structure	45	HS	80	81	80	80	0	60	68	62	68	--
LT11	4394	2	104	SBN 982+00	At-grade	79	HS	79	79	84	84	0	59	68	63	68	--
LT12	4353	2	104	SBN 987+00	At-grade	79	HS	79	79	84	84	0	59	76	65	74	--
LT13	3987	2	99	SBN 1030+00	At-grade	79	HS	80	80	85	85	0	59	70	64	69	--
LT14	3801	2	130	SBN 1060+00	At-grade	79	HS	78	78	83	83	0	57	68	63	68	--
LT15	3190	2	109	SBN 1106+00	At-grade	75	HS	78	79	83	83	0	58	64	60	65	--
LT16	3384	2	29	SBN 1095+00	At-grade	75	HS	88	88	93	93	0	67	72	65	71	Moderate
LT17	2574	2	331	SBN 1187+00	At-grade	79	HS	71	71	76	76	5	45	71	65	70	--
LT18	2391	2	131	SBN 1232+00	At-grade	79	HS	78	77	83	82	0	57	67	62	68	--
LT19	2315	2	38	SBN 1239+00	At-grade	79	HS	84	87	89	72	0	62	68	63	68	--
LT20	7108	2	99	SBN 1265+00	At-grade	79	HS	80	79	85	84	0	58	74	65	72	--
LT21	7066	2	62	SBN 1260+00	At-grade	79	HS	82	83	86	88	0	62	60	58	63	Moderate
LT22	1970	2	48	SBN 1334+00	At-grade	55	HS	82	85	84	67	0	59	75	65	73	--
LT23	N/A[2]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LT24	2377	2	380	SBN 1331+00	At-grade	55	HS	70	70	72	71	5	42	68	63	68	--
LT25	1134	2	60	SOC 1388+00	At-grade	79	HS	83	82	88	86	0	62	69	64	69	--
LT26	N/A[1]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LT27	758	2	21	SOC 1422+00	At-grade	79	HS	91	87	96	92	0	69	61	58	64	Severe
LT28	522	2	31	SOC 1436+00	At-grade	90	HS	88	85	94	91	0	67	61	58	64	Severe
LT29	108	2	42	SOC 1461+00	At-grade	90	HS	86	84	92	90	0	65	61	58	64	Severe
LT30	7245	2	30	SOC 1483+00	At-grade	90	HS	85	88	91	74	0	64	62	59	64	Moderate

Noise Meas. Site[1]	Rec. Num	Land Use Cat.	Dist. to Near Track (feet)	Civ. Sta. Num.	Track Type	Train Speed (mph)	Speed Regime[3]	Sub-source SEL (dBA)[4]				Shielding Adjustment (dB)	Project Noise Level (dBA)	Existing Noise Level (dBA)	Noise Impact Criteria (dBA)		Impact Type
								Propulsion		Wheel-Rail							
								NB	SB	NB	SB				Mod.	Sev.	
LT31	5	2	180	SOC 1577+00	At-grade	70	HS	75	75	79	79	0	54	71	65	70	--

[1] The locations of the noise measurement sites are depicted on Figure 5-4 of the *Los Angeles to Anaheim Project Section Noise and Vibration Technical Report*.
[2] There are no sensitive noise receptors associated with this noise measurement site.
[3] HS = high-speed; VHS = very high-speed
[4] Only Propulsion and Wheel-Rail sub-sources are included in this table. Aerodynamic sub-sources are only considered for train speeds above 150 mph, and there are no train speeds above 150 mph in this section of the project.
dB = decibel; dBA = A-weighted decibel; mph = miles per hour; N/A = not applicable; NB = northbound; SB = southbound; SEL = sound exposure level

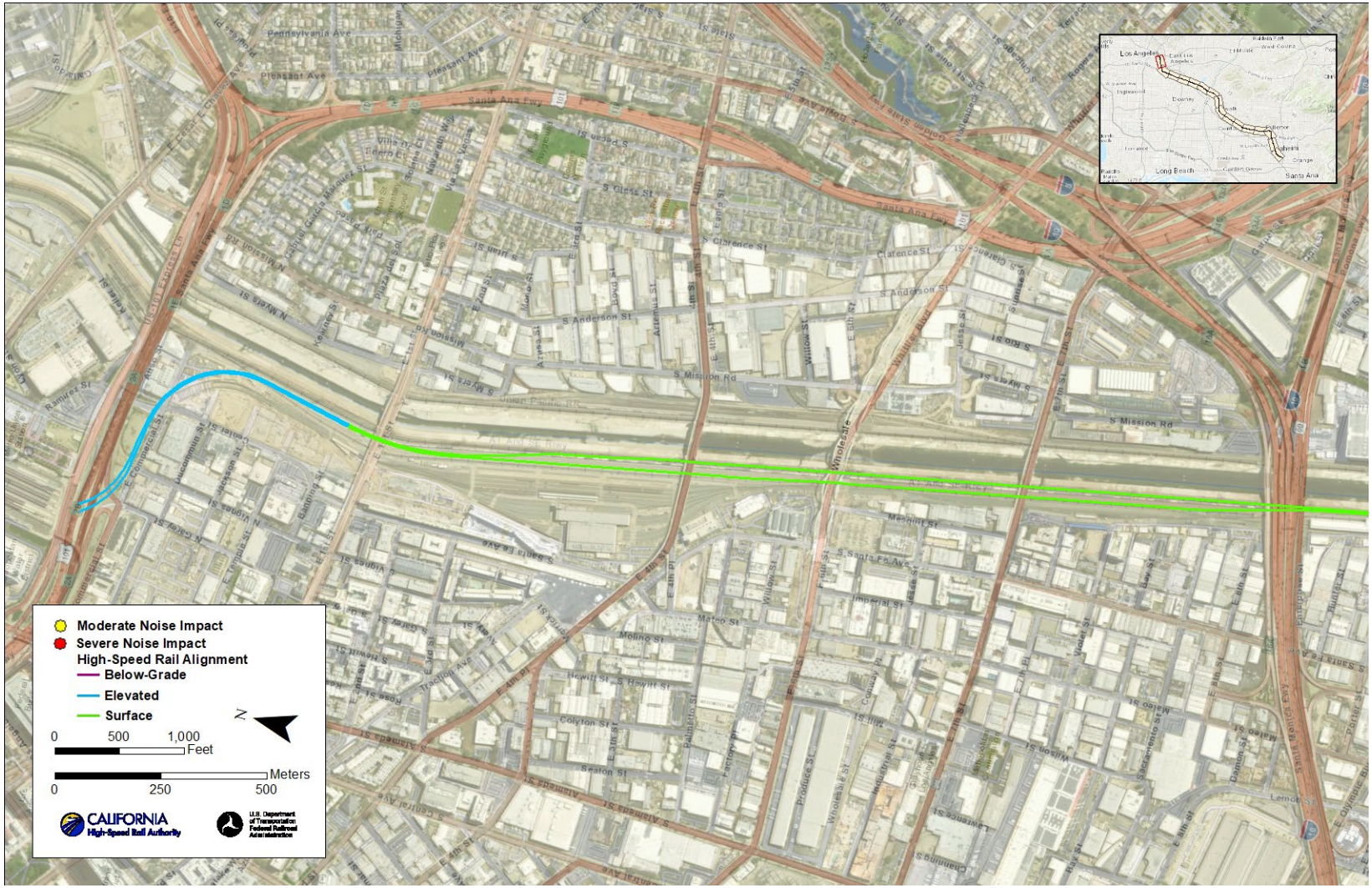


Figure E-1 Noise Impacts

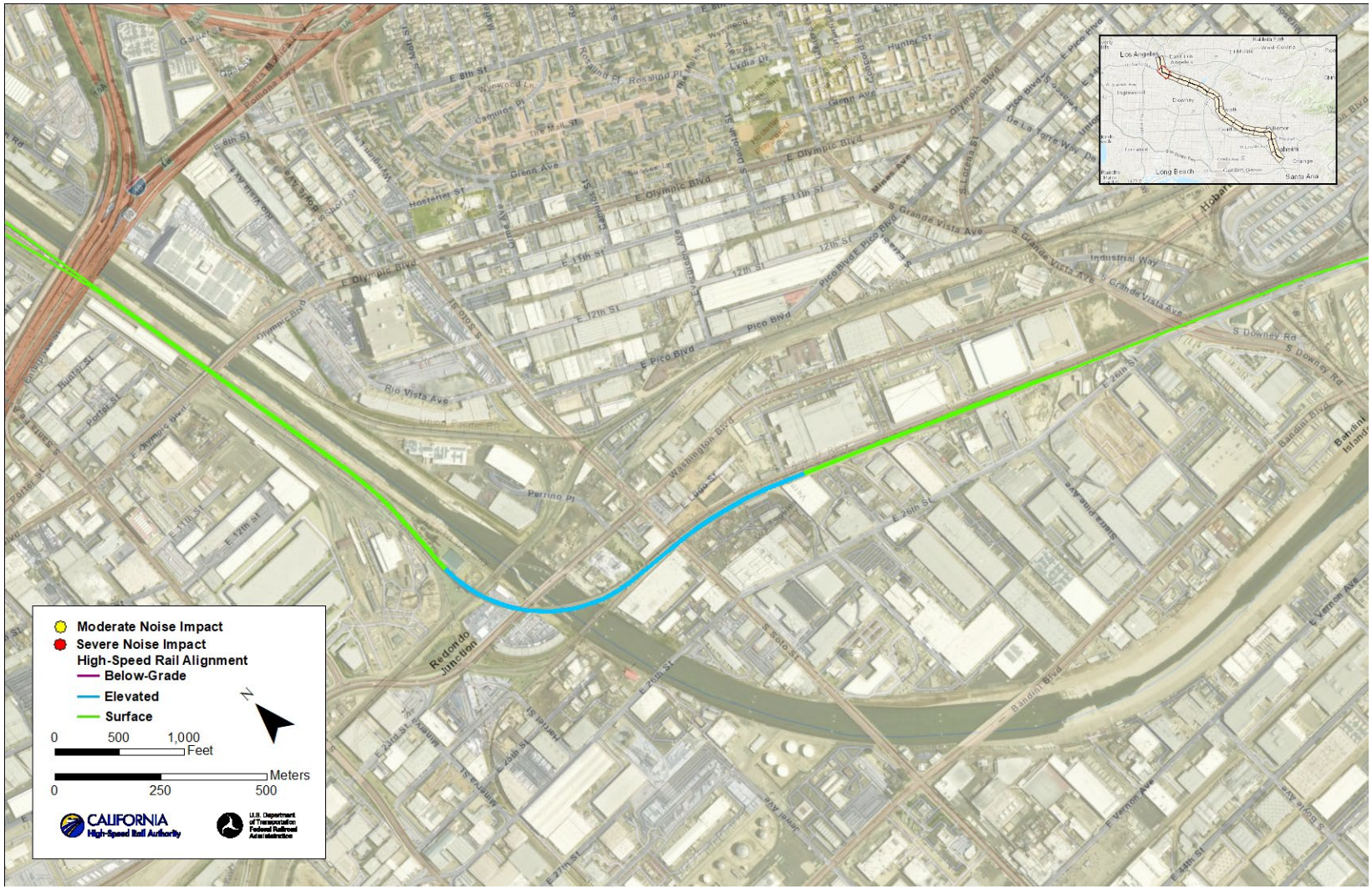


Figure E-2 Noise Impacts

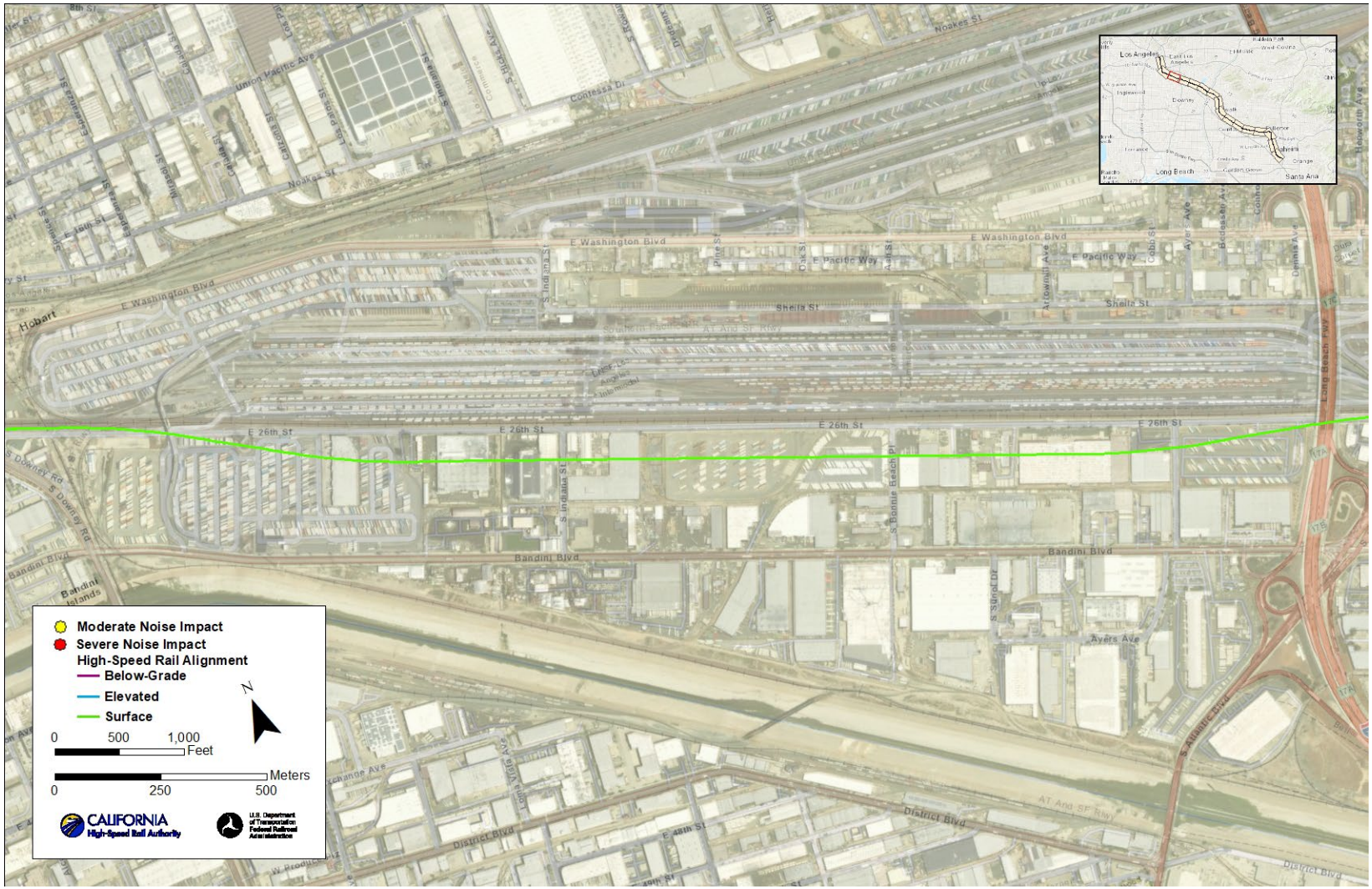


Figure E-3 Noise Impacts

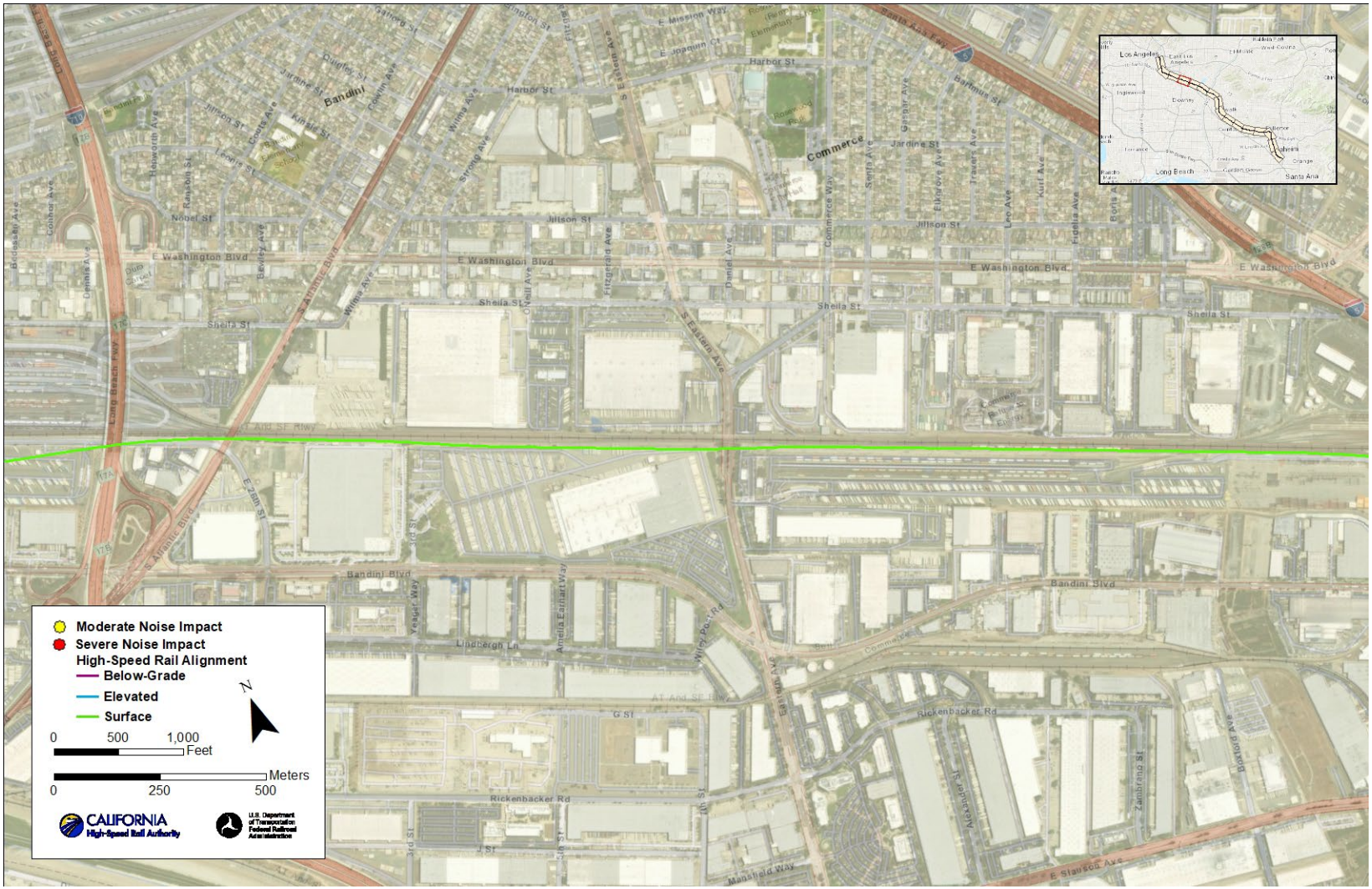


Figure E-4 Noise Impacts



Figure E-5 Noise Impacts



Figure E-6 Noise Impacts



Figure E-7 Noise Impacts

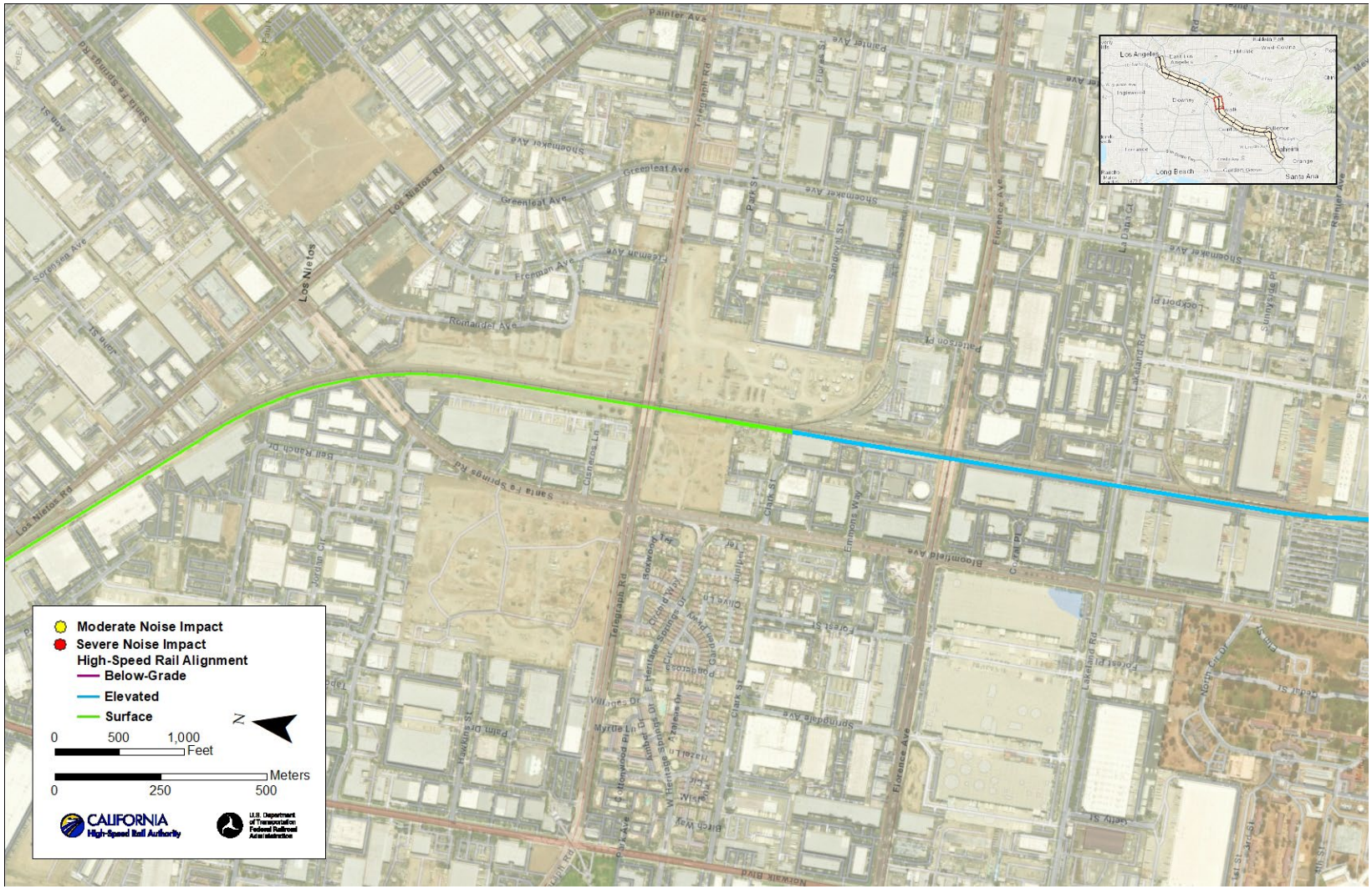


Figure E-8 Noise Impacts



Figure E-9 Noise Impacts



Figure E-10 Noise Impacts



Figure E-11 Noise Impacts

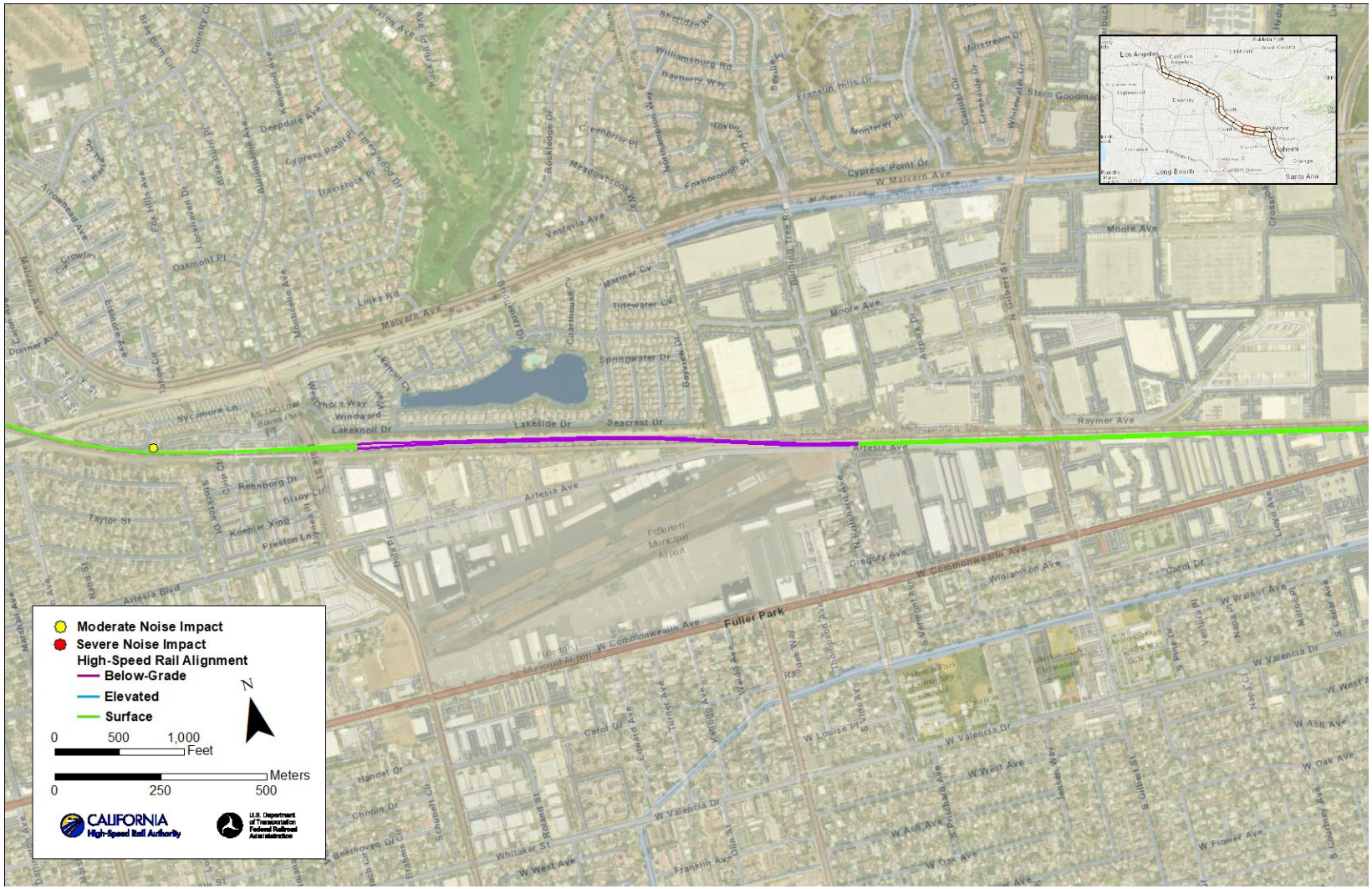


Figure E-12 Noise Impacts

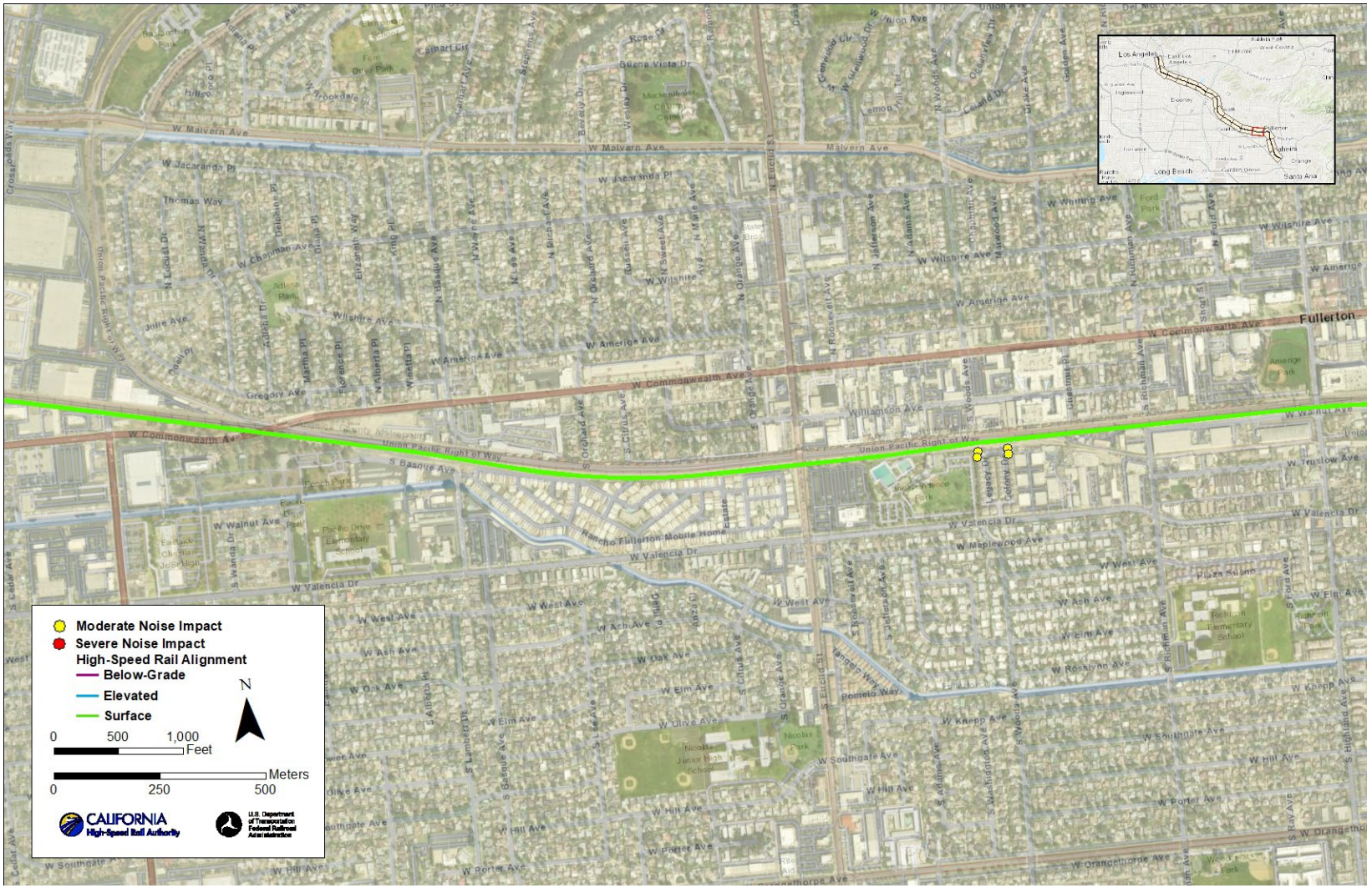


Figure E-13 Noise Impacts

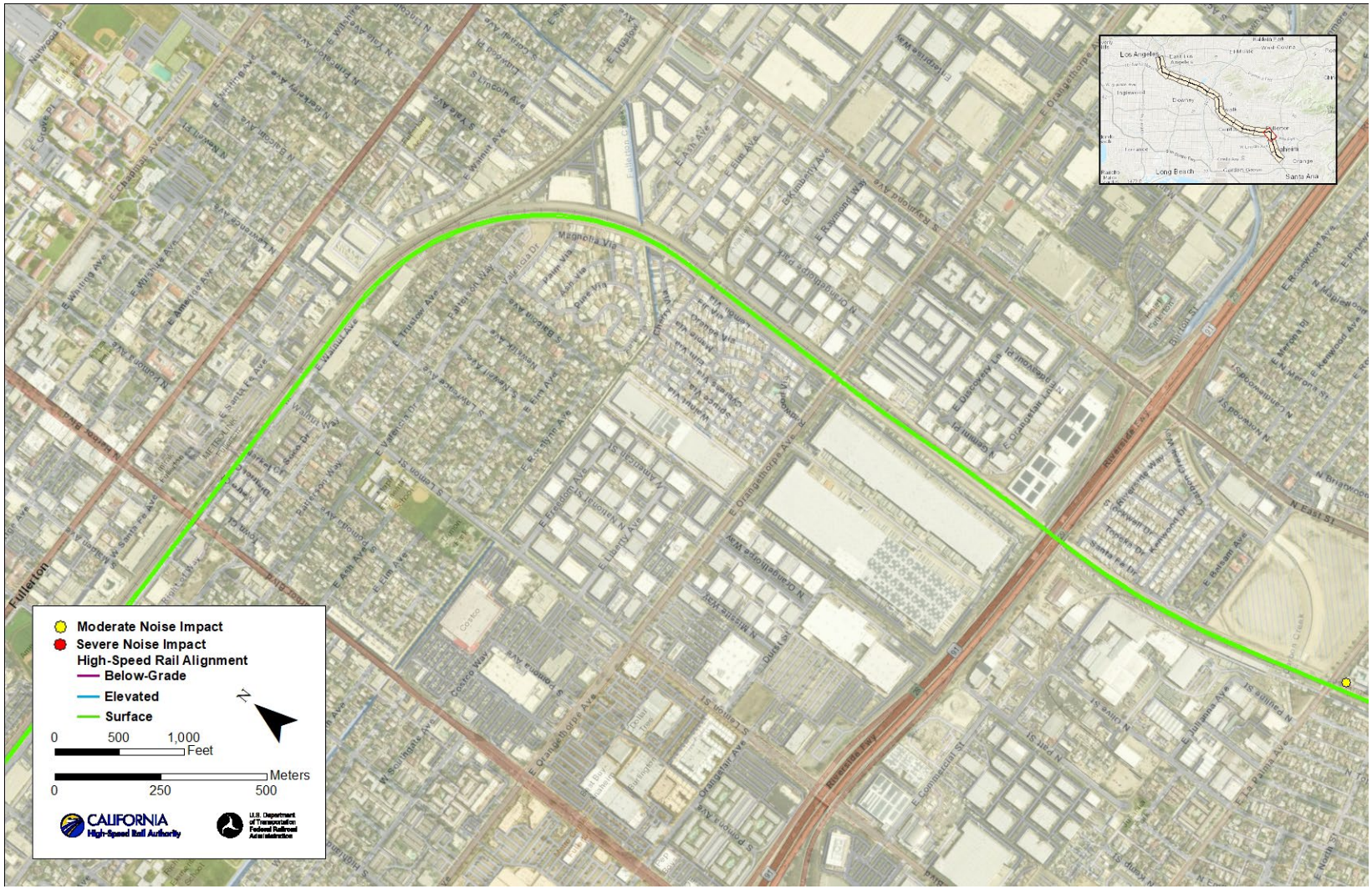


Figure E-14 Noise Impacts

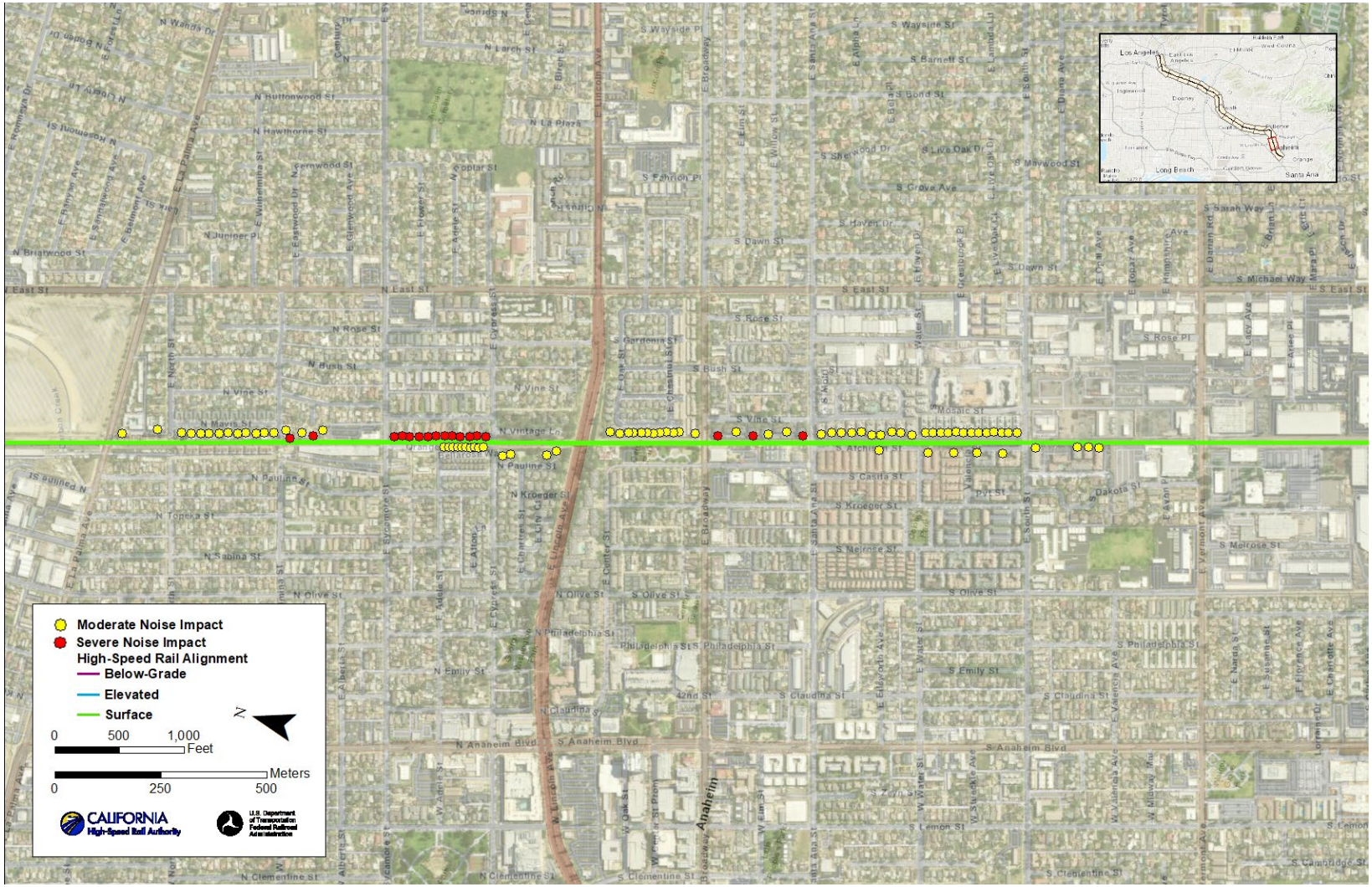


Figure E-15 Noise Impacts

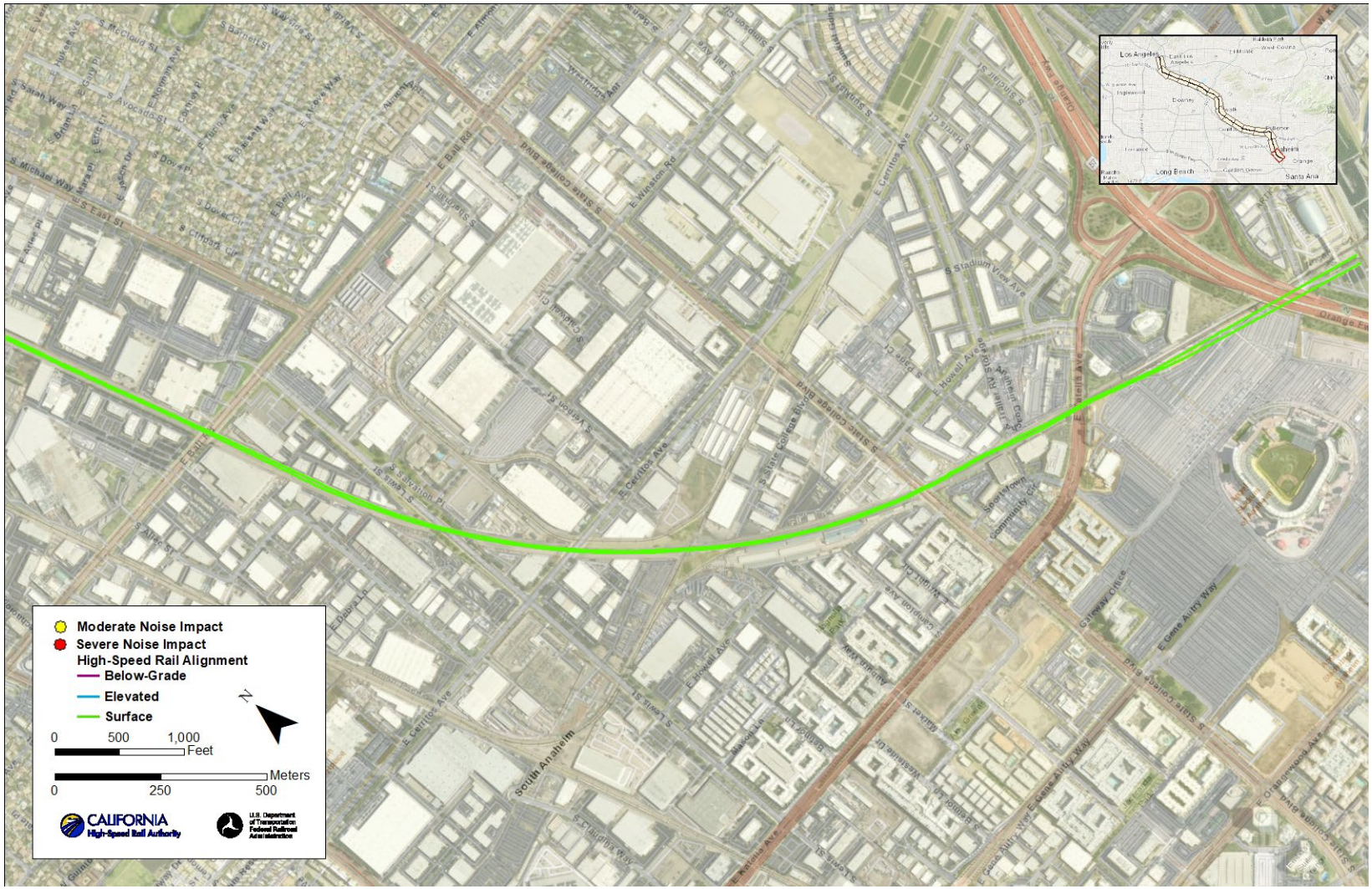


Figure E-16 Noise Impacts

APPENDIX F: VIBRATION IMPACTS

The anticipated vibration impact locations are depicted on Figures F-1 through F-16.

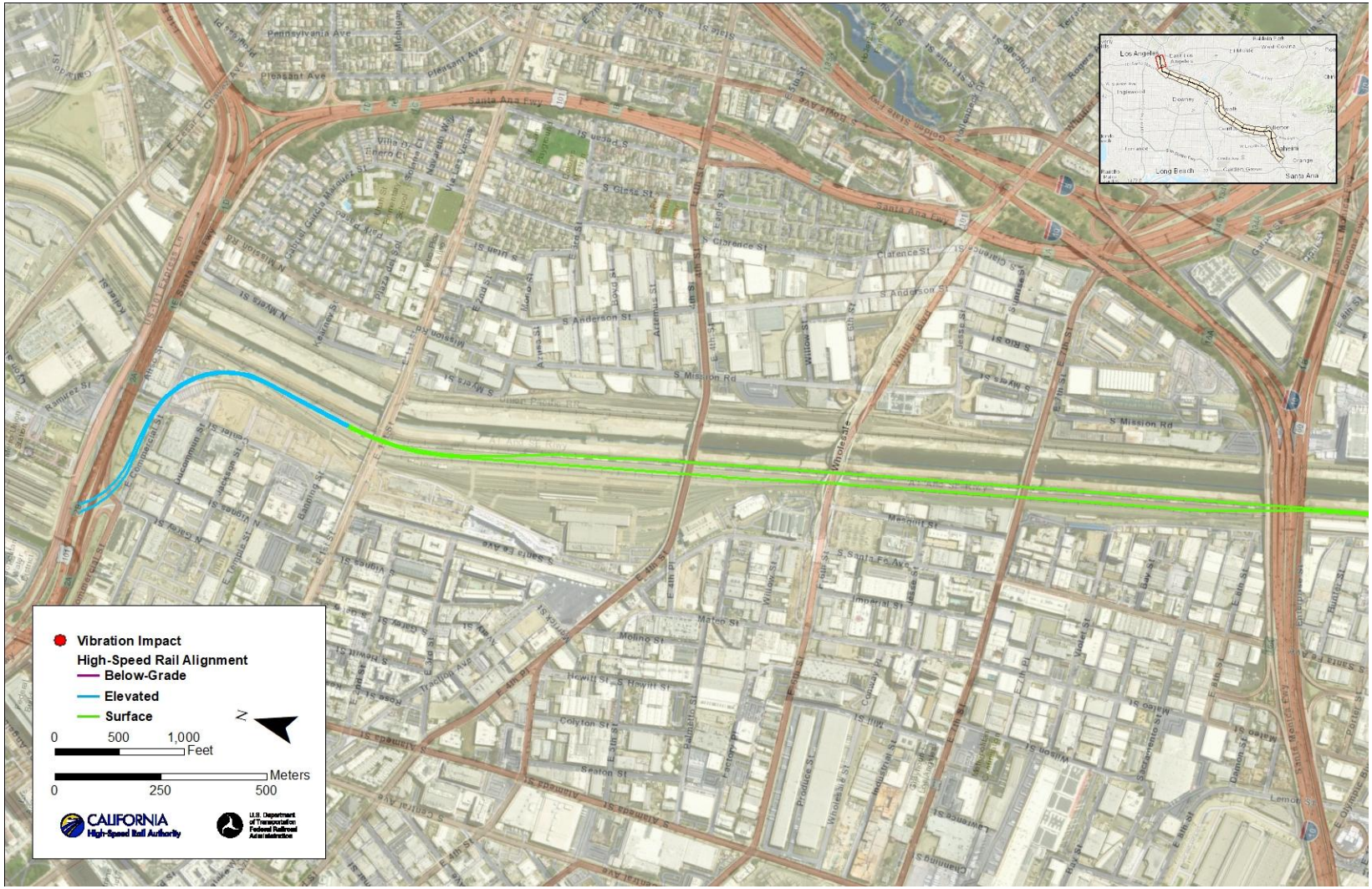


Figure F-1 Vibration Impacts

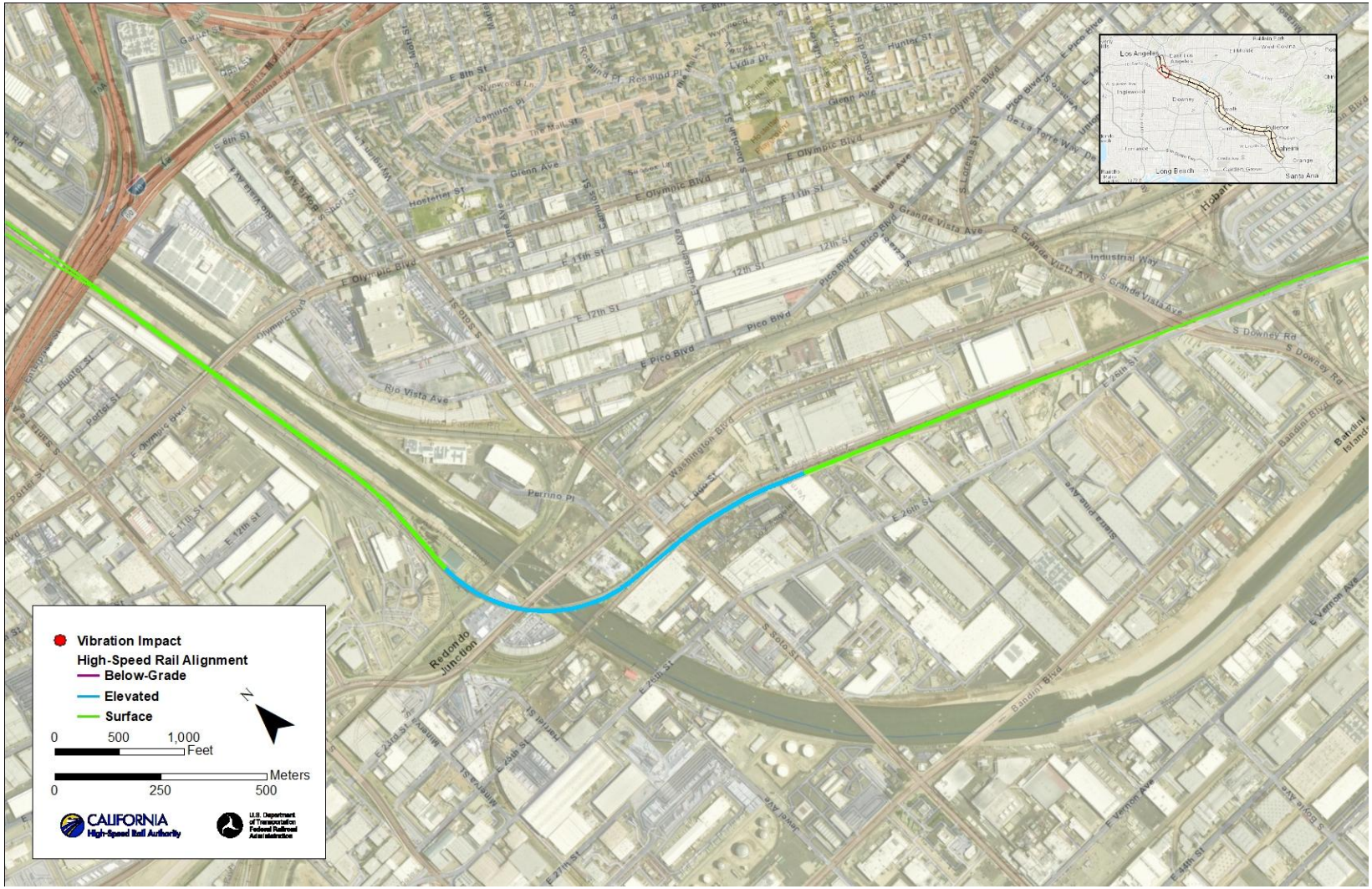


Figure F-2 Vibration Impacts

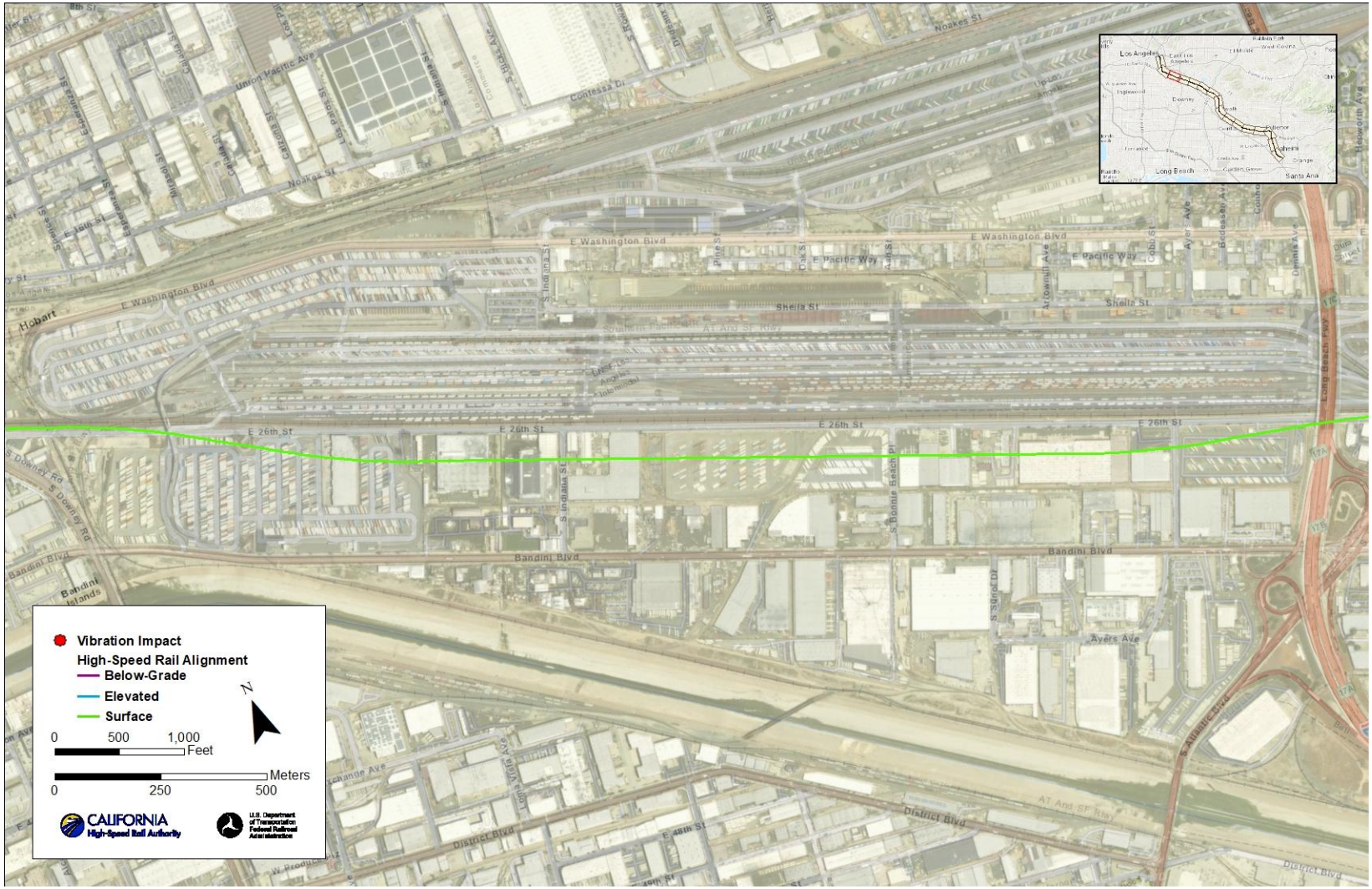


Figure F-3 Vibration Impacts

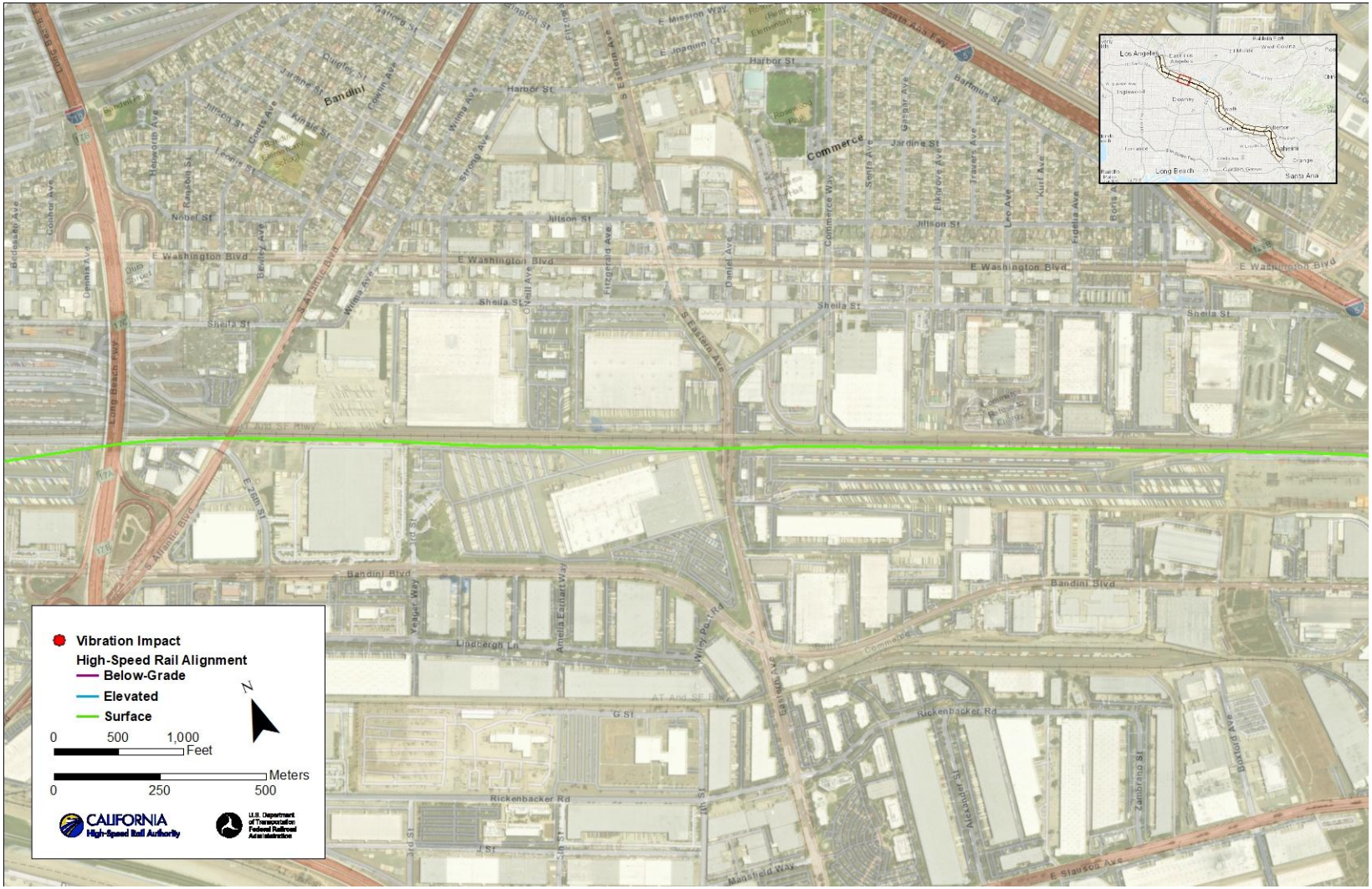


Figure F-4 Vibration Impacts



Figure F-5 Vibration Impacts



Figure F-6 Vibration Impacts



Figure F-7 Vibration Impacts

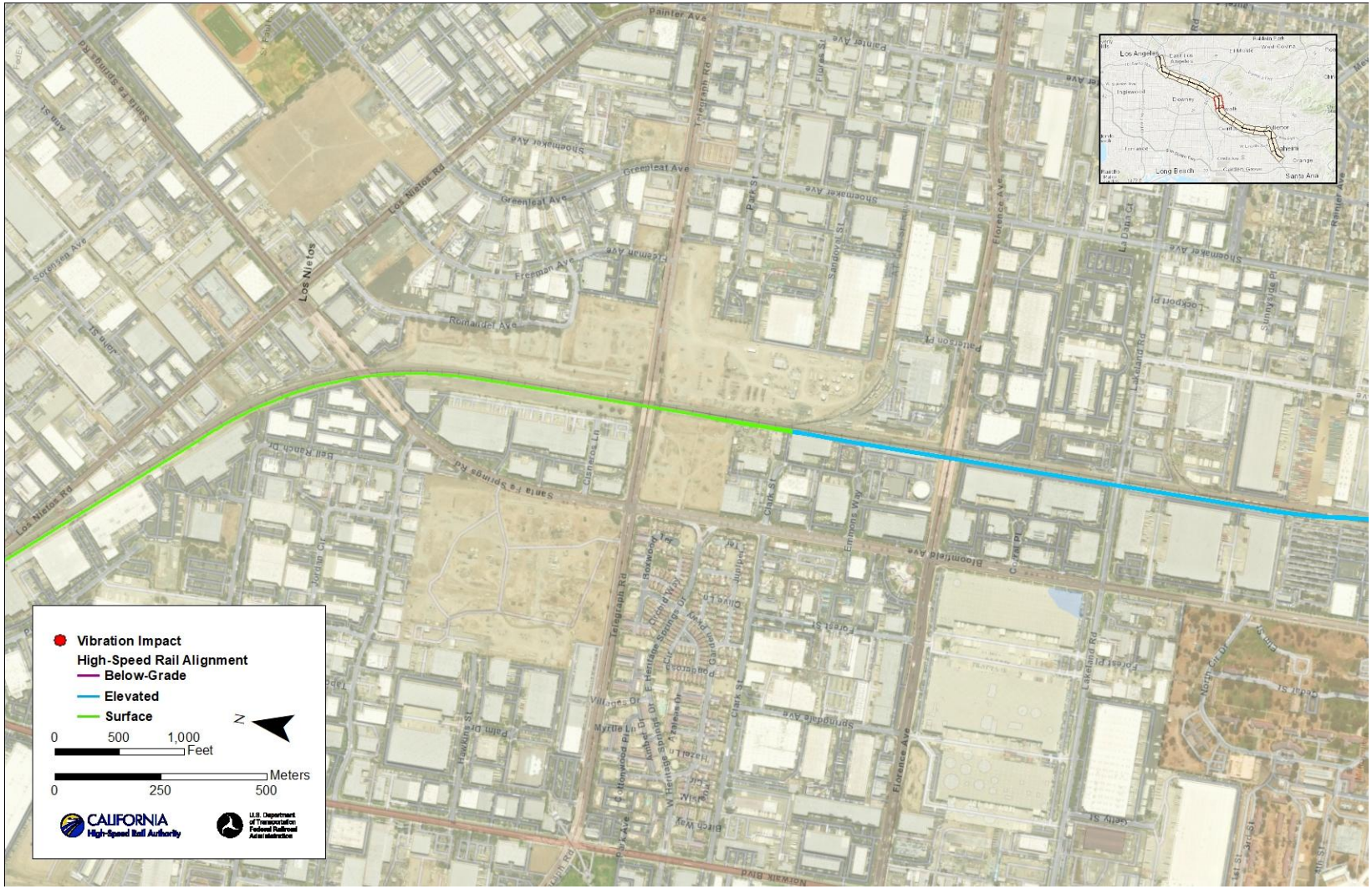


Figure F-8 Vibration Impacts

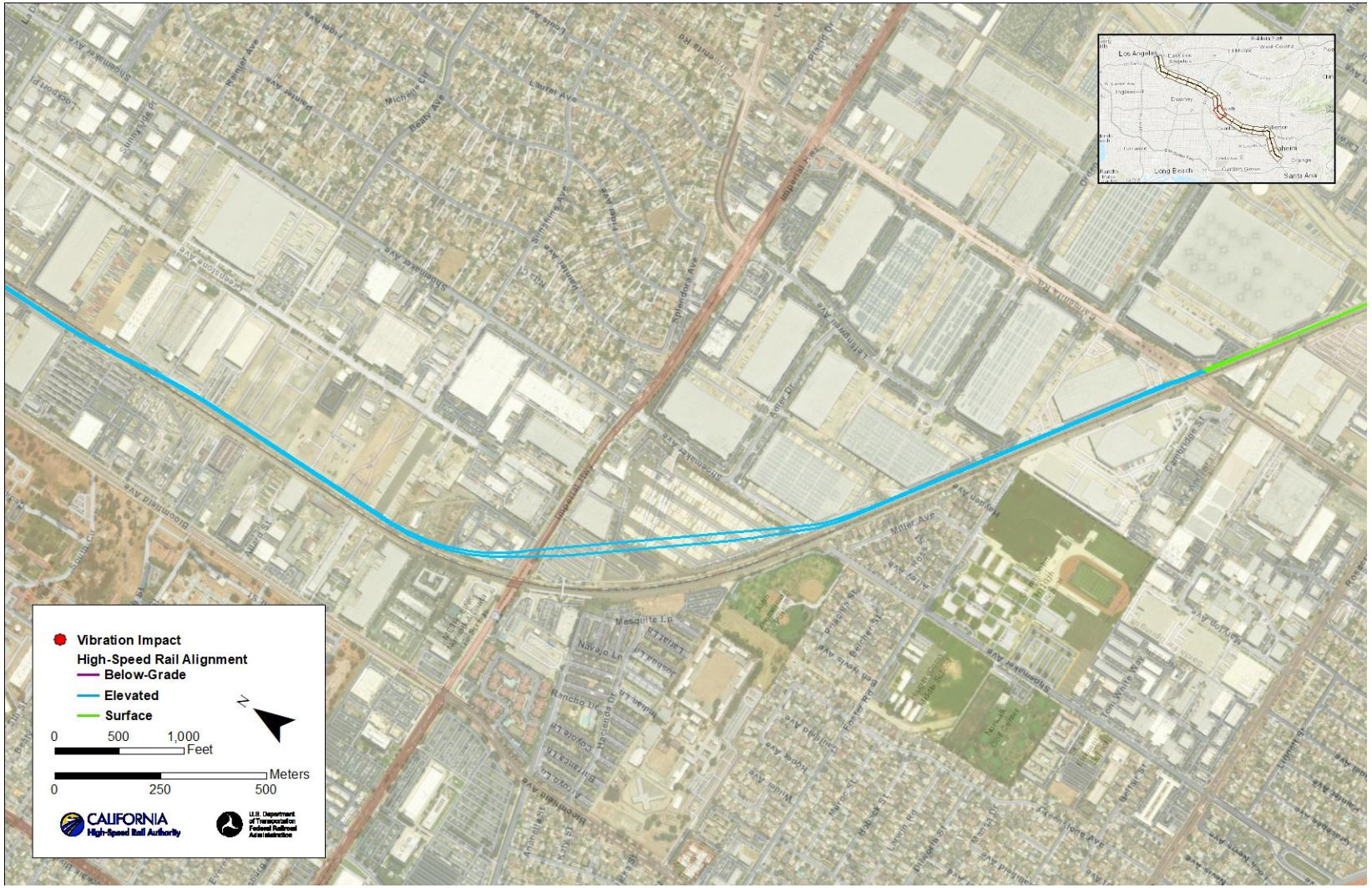


Figure F-9 Vibration Impacts



Figure F-10 Vibration Impacts



Figure F-11 Vibration Impacts

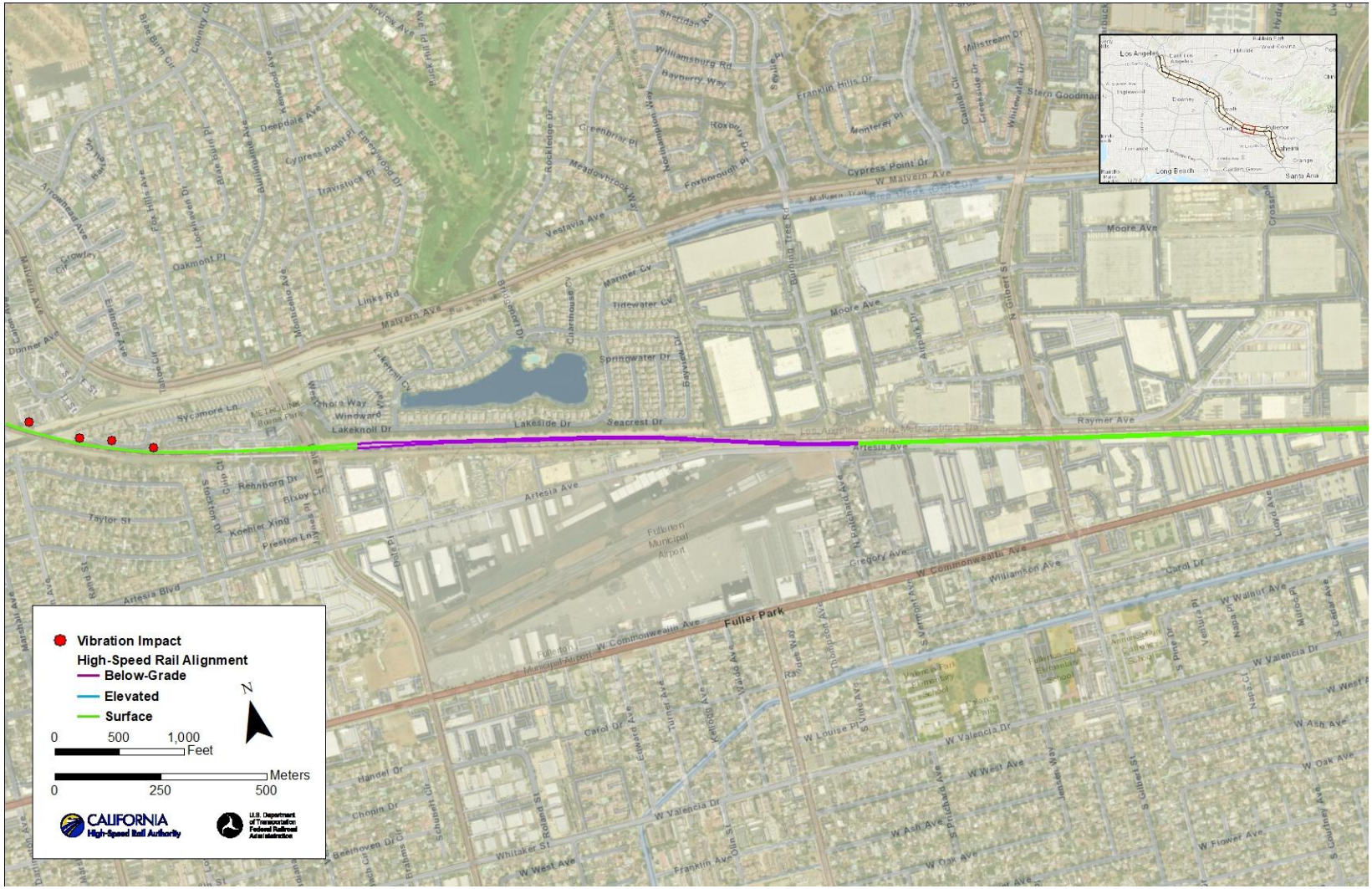


Figure F-12 Vibration Impacts

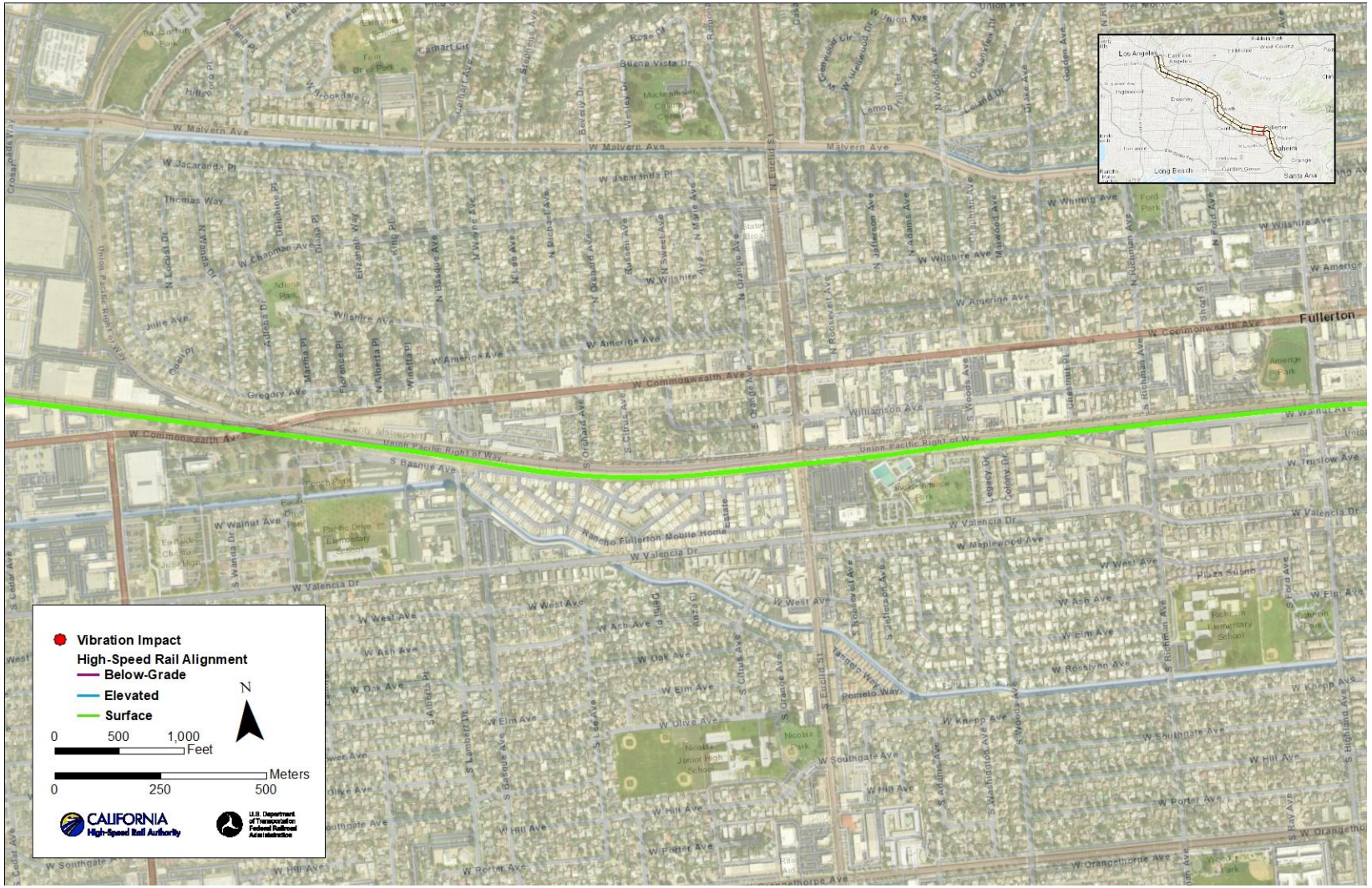


Figure F-13 Vibration Impacts



Figure F-14 Vibration Impacts

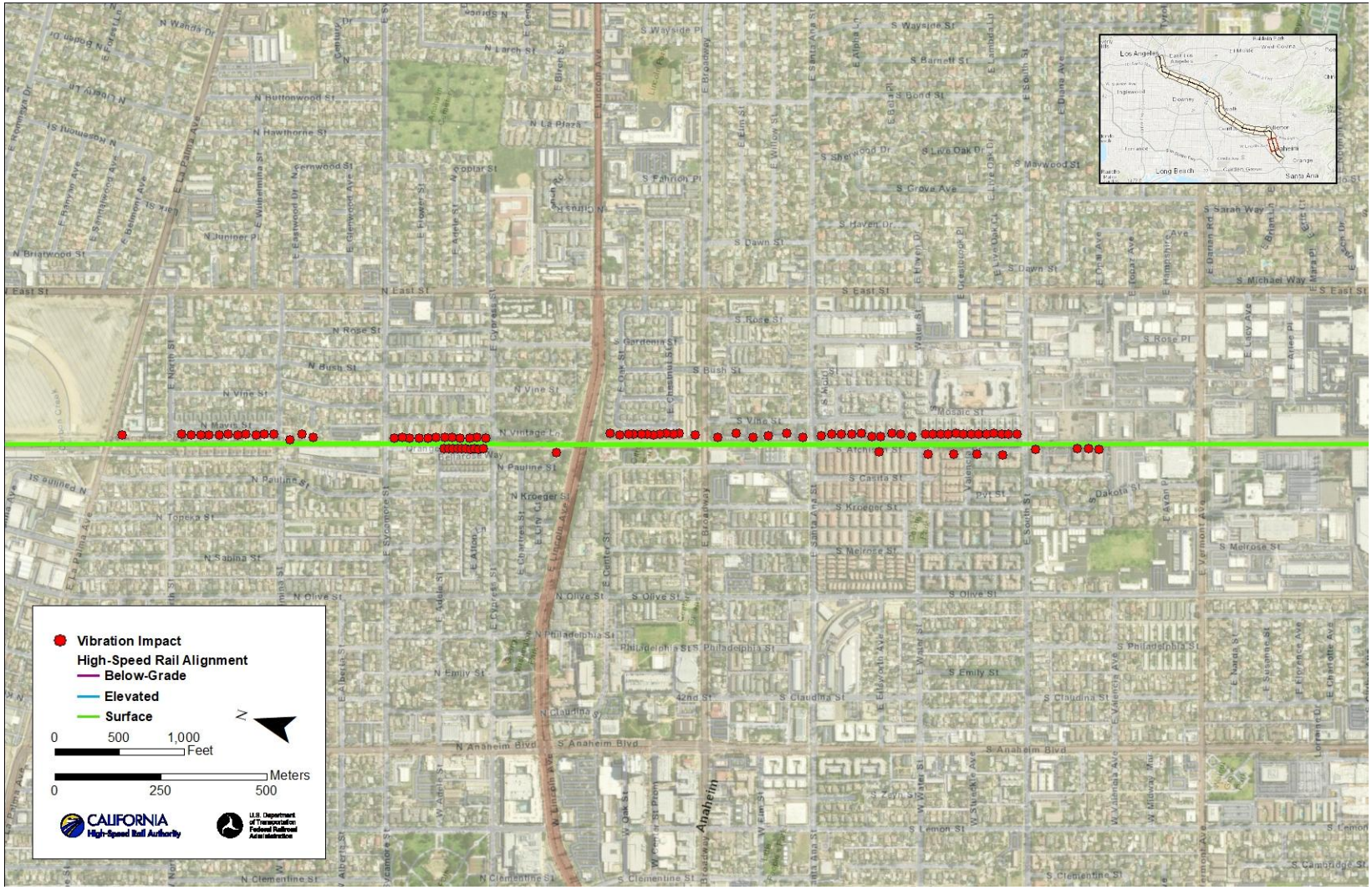


Figure F-15 Vibration Impacts

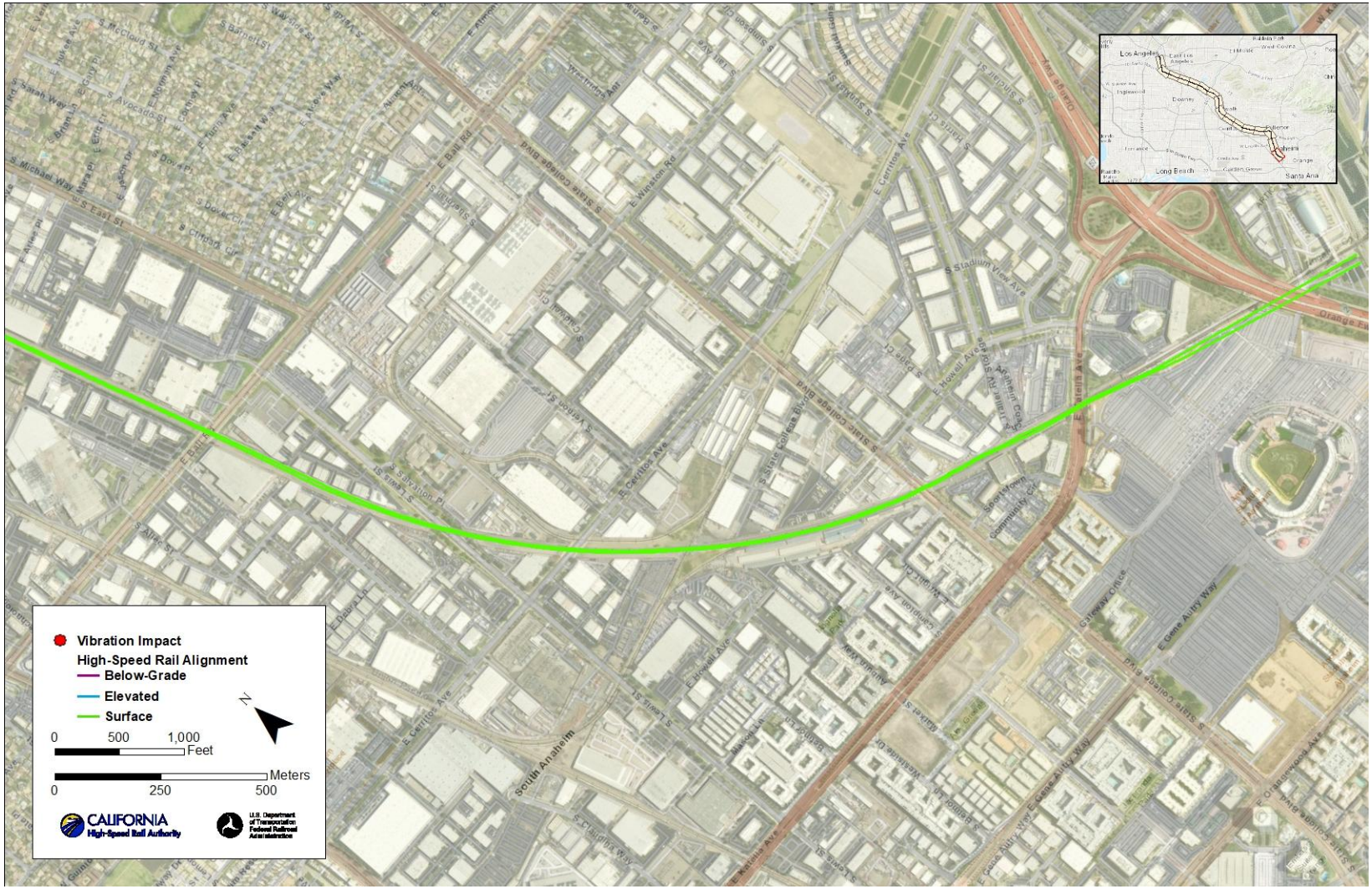


Figure F-16 Vibration Impacts

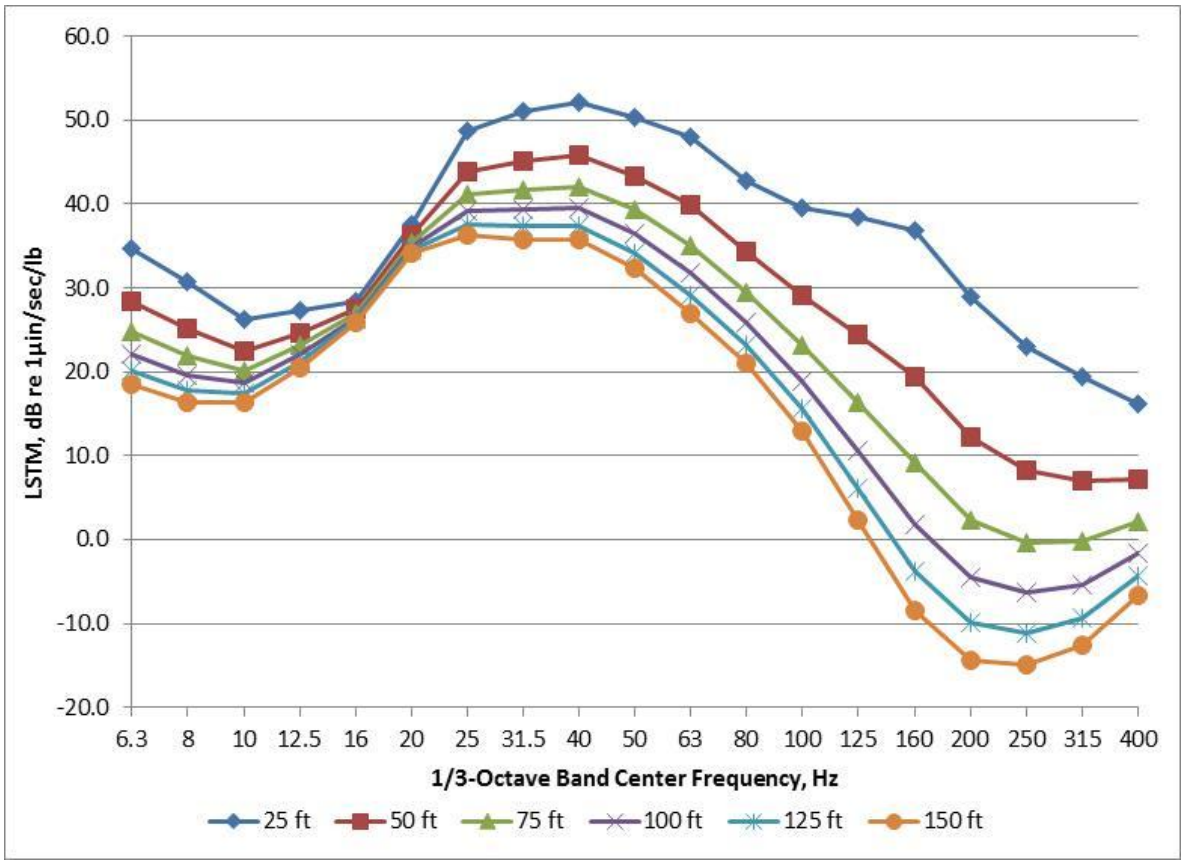
APPENDIX G: FIELD TRANSFER MOBILITY MEASUREMENT AND DOCUMENTATION DETAILS

Vibration Propagation Measurement Site VP-A: Leroy Street and Bolero Lane – Los Angeles Union Station to Redondo Junction

1/3-Octave Band Transfer Mobility Coefficients – Site VP-A

Coefficients	6.3 Hz	8 Hz	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
A	63.7	56.8	44.0	39.5	33.1	43.9	71.3	78.6	81.3	82.5	86.0	81.8	87.3	103.2	118.4	106.7
B	-20.7	-18.6	-12.7	-8.7	-3.3	-4.5	-16.1	-19.7	-20.9	-23.0	-27.1	-27.9	-34.2	-46.3	-58.3	-55.6
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

$TM = A + B * \log(dist) + C * \log(dist)^2$
Hz = Hertz

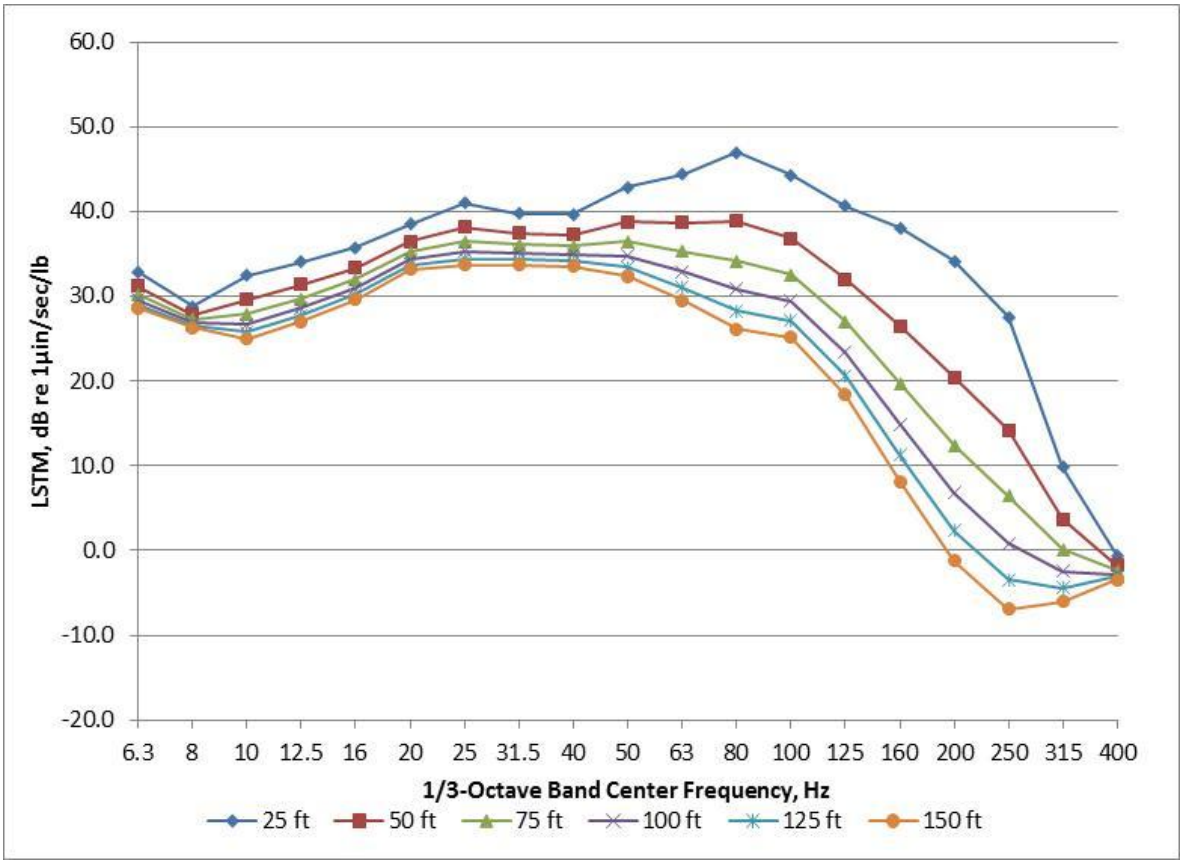


Vibration Propagation Measurement Site VP-1: Mateo Street and Violet Street – Los Angeles Union Station to Redondo Junction

1/3-Octave Band Transfer Mobility Coefficients – Site VP-1

Coefficients	6.3 Hz	8 Hz	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
A	40.5	33.3	45.9	46.9	46.8	48.3	54.1	50.7	50.7	61.8	71.2	84.3	78.6	80.6	91.8	97.6
B	-5.5	-3.2	-9.6	-9.2	-7.9	-7.0	-9.4	-7.8	-7.9	-13.5	-19.1	-26.7	-24.6	-28.6	-38.4	-45.4
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

$TM = A + B * \log(dist) + C * \log(dist)^2$
Hz = Hertz

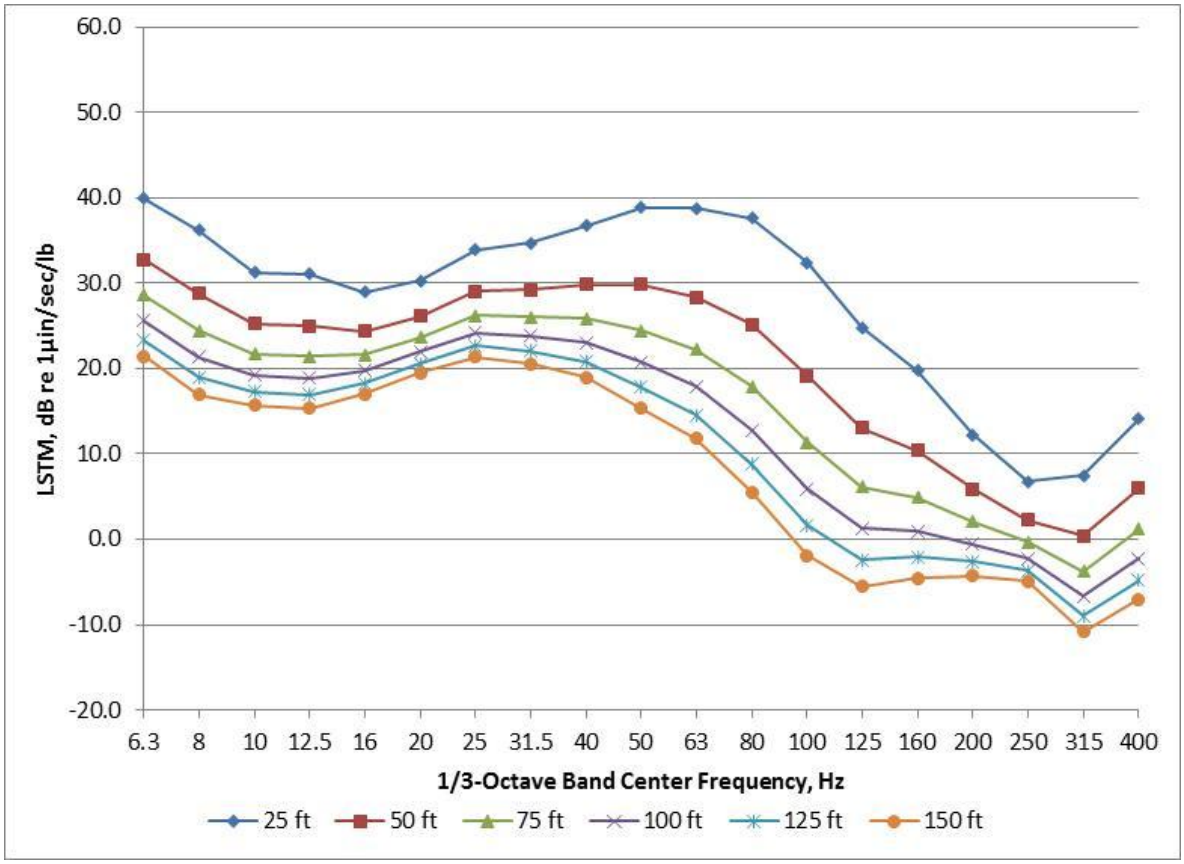


Vibration Propagation Measurement Site VP-2: Sycamore Street and Montebello Boulevard – Redondo Junction to Fullerton Junction

1/3-Octave Band Transfer Mobility Coefficients – Site VP-2

Coefficients	6.3 Hz	8 Hz	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
A	73.2	70.8	59.2	59.4	50.5	49.8	56.5	60.1	68.6	81.1	87.2	95.2	93.9	79.3	63.5	42.1
B	-23.8	-24.7	-20.0	-20.3	-15.4	-13.9	-16.1	-18.1	-22.8	-30.2	-34.7	-41.2	-44.0	-39.0	-31.3	-21.3
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

$TM = A + B * \log(dist) + C * \log(dist)^2$
Hz = Hertz

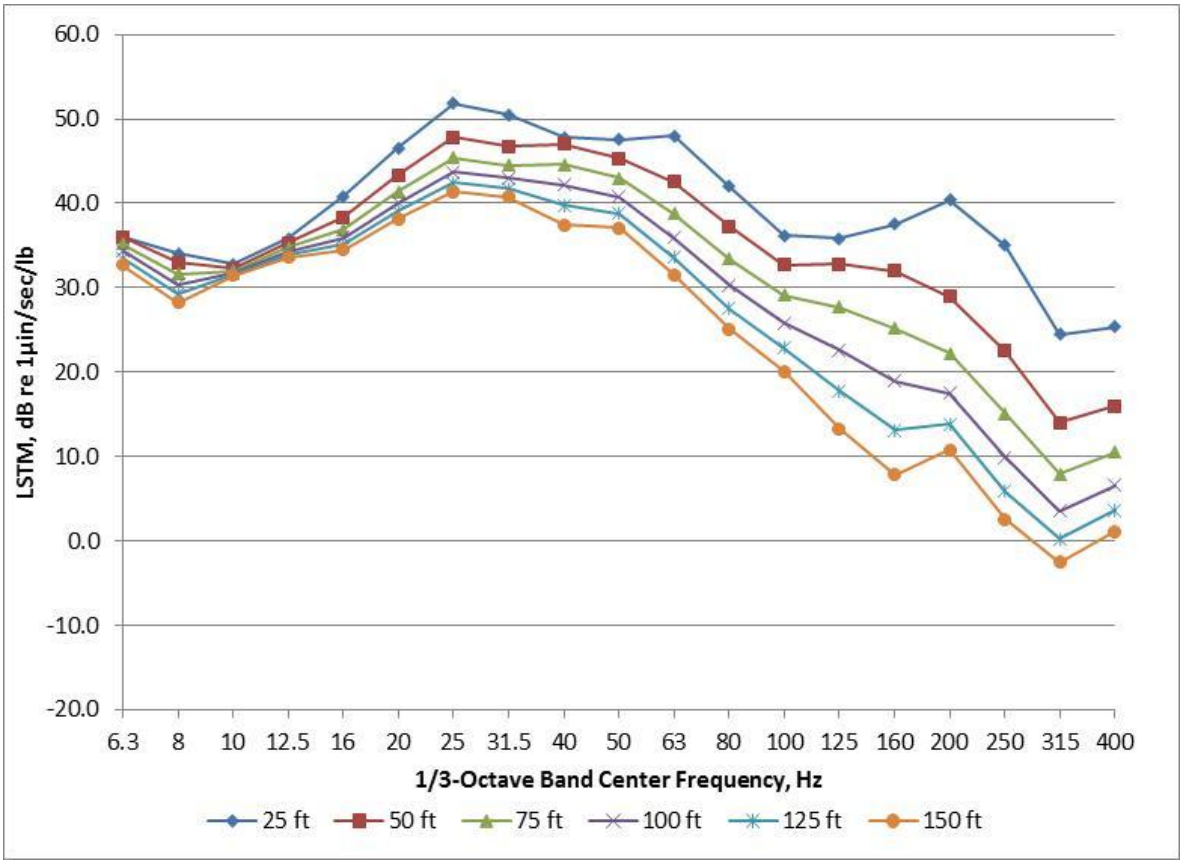


Vibration Propagation Measurement Site VP-3: Rivera Road and Lindell Avenue – Redondo Junction to Fullerton Junction

1/3-Octave Band Transfer Mobility Coefficients – Site VP-3

Coefficients	6.3 Hz	8 Hz	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
A	15.2	19.9	35.3	32.4	52.1	61.6	70.8	68.0	0.0	27.1	59.2	34.4	6.7	-43.5	-34.9	93.6
B	27.1	21.4	-1.7	5.9	-8.1	-10.8	-13.5	-12.5	64.9	32.7	0.4	22.9	48.0	111.8	109.6	-38.0
C	-8.8	-8.1	0.0	-2.4	0.0	0.0	0.0	0.0	-21.9	-12.9	-6.0	-12.5	-19.2	-39.4	-41.3	0.0

$TM = A + B * \log(dist) + C * \log(dist)^2$
Hz = Hertz

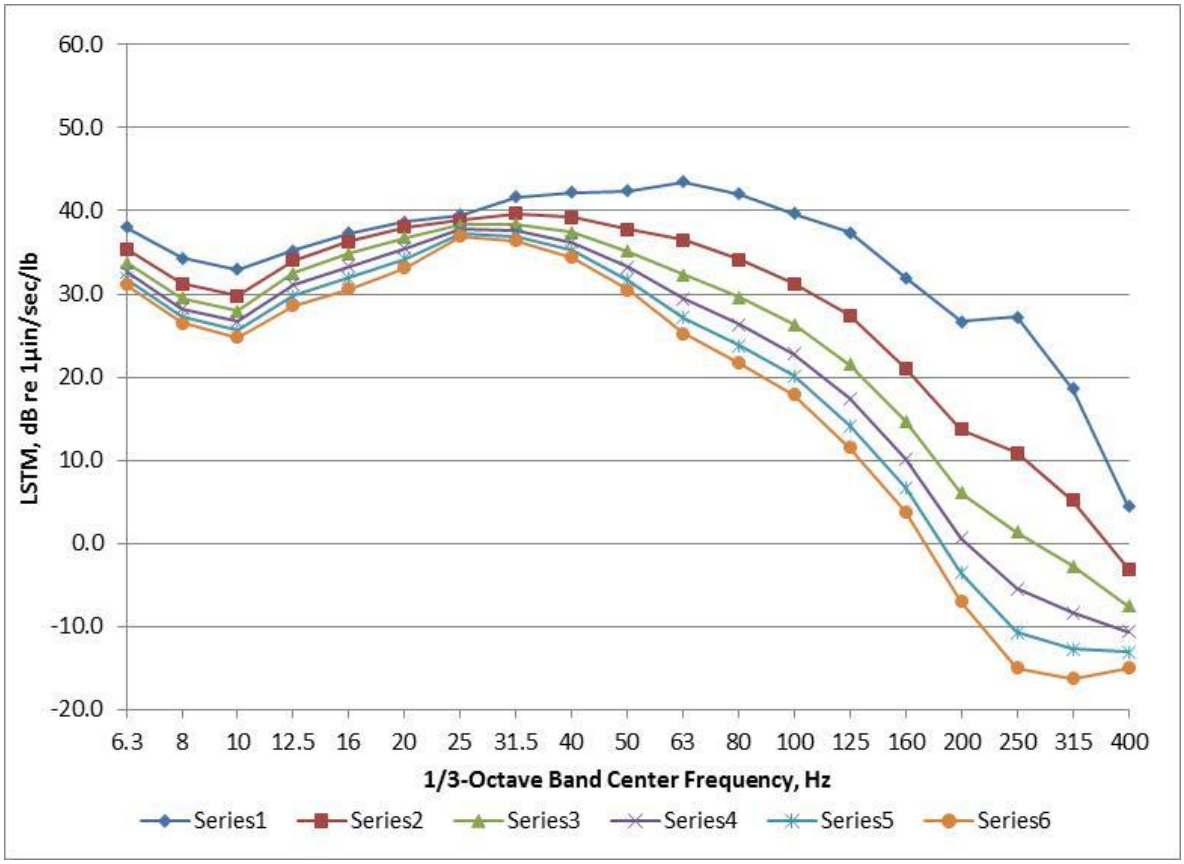


Vibration Propagation Measurement Site VP-4: Rivera Road and Millergrove Drive – Redondo Junction to Fullerton Junction

1/3-Octave Band Transfer Mobility Coefficients – Site VP-4

Coefficients	6.3 Hz	8 Hz	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
A	50.5	48.3	47.7	18.9	14.5	16.8	36.4	51.3	56.1	63.6	76.3	78.5	78.8	83.8	82.4	87.3
B	-8.9	-10.0	-10.5	24.7	32.3	30.3	5.7	-6.8	-9.9	-15.2	-23.4	-26.1	-28.0	-33.2	-36.1	-43.3
C	0.0	0.0	0.0	-9.3	-11.4	-10.5	-2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

$TM = A + B * \log(dist) + C * \log(dist)^2$
Hz = Hertz

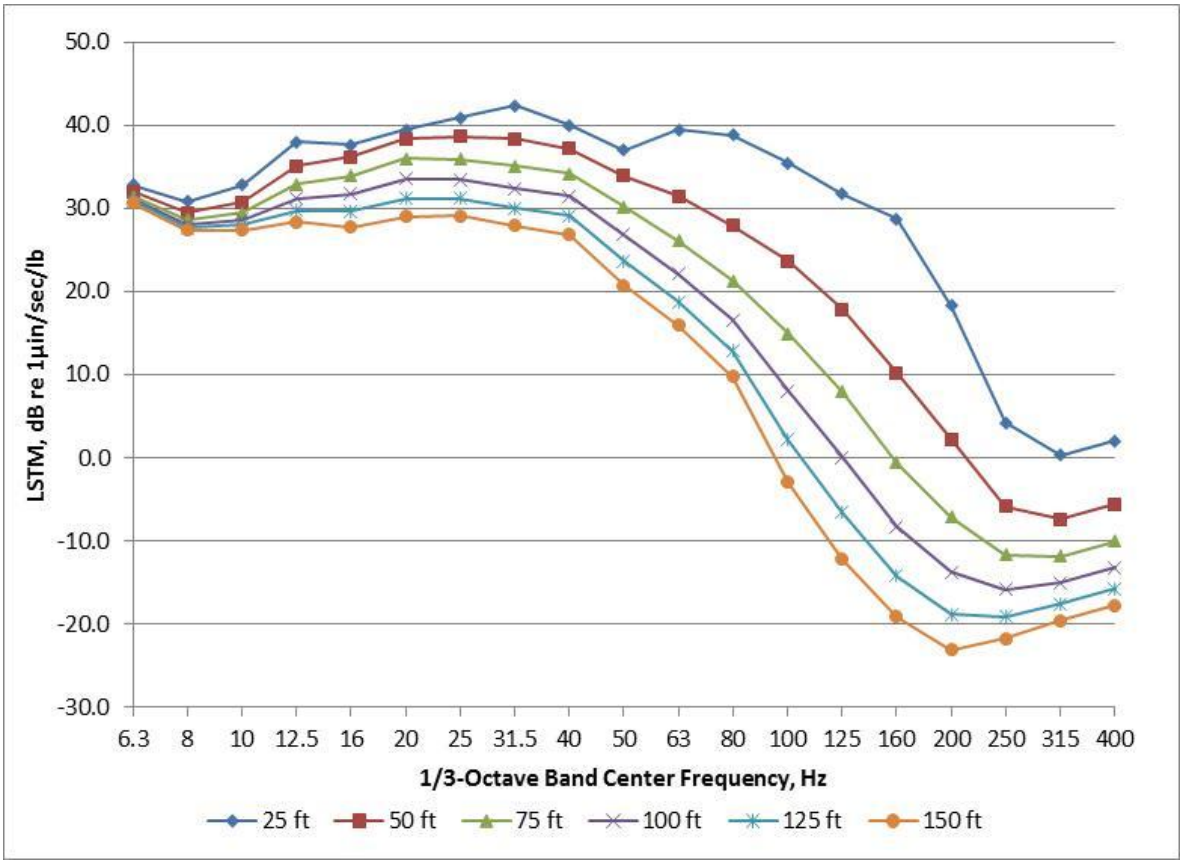


Vibration Propagation Measurement Site VP-5: Arrey Avenue and Ross Street – Redondo Junction to Fullerton Junction

1/3-Octave Band Transfer Mobility Coefficients – Site VP-5

Coefficients	6.3 Hz	8 Hz	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
A	36.6	37.0	42.5	37.5	4.2	-4.4	14.3	35.4	15.1	-1.1	58.2	83.2	40.1	43.7	114.6	92.5
B	-2.7	-4.4	-6.9	8.4	47.5	60.2	41.0	20.2	40.0	58.3	-2.6	-28.3	26.3	22.2	-61.4	-53.1
C	0.0	0.0	0.0	-5.8	-16.8	-20.6	-15.7	-10.9	-15.9	-22.2	-7.7	-2.5	-21.2	-22.0	0.0	0.0

$TM = A + B * \log(dist) + C * \log(dist)^2$
Hz = Hertz

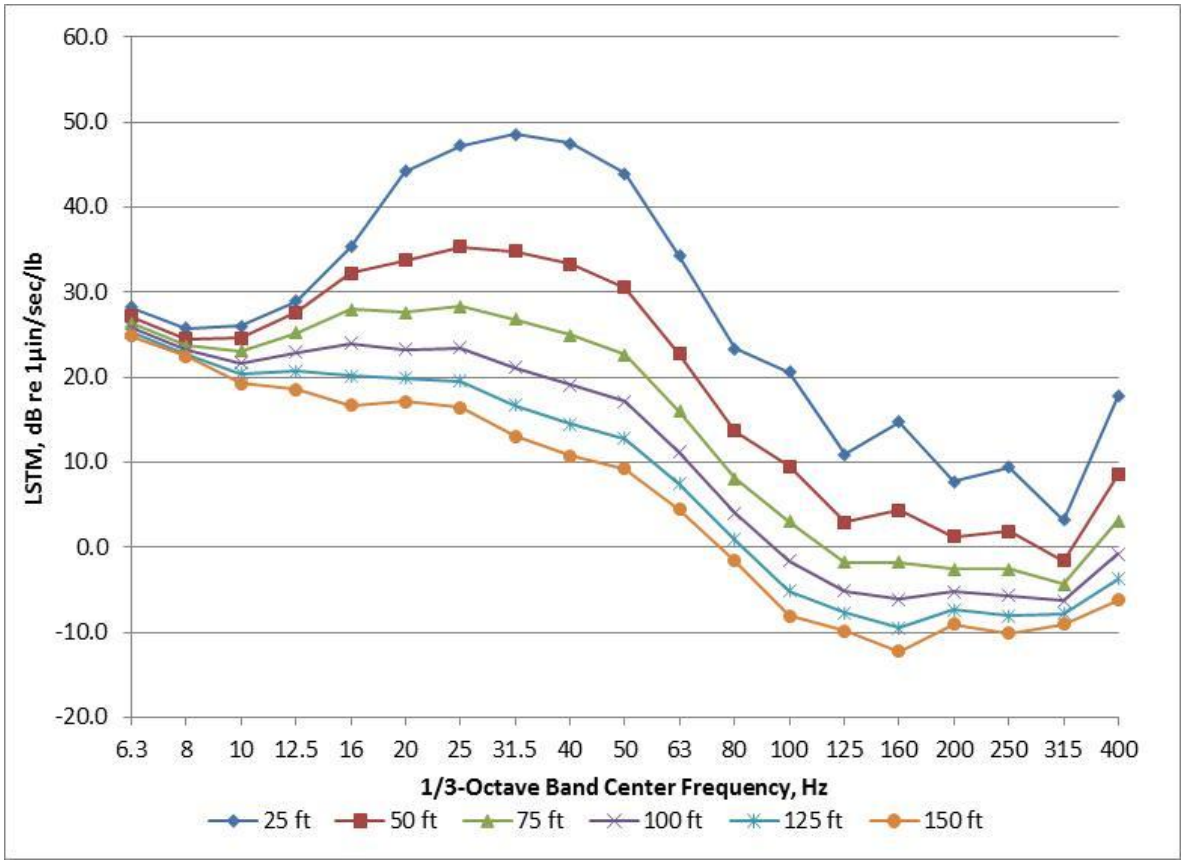


Vibration Propagation Measurement Site VP-6: San Ardo Drive and Vanada Road – Redondo Junction to Fullerton Junction

1/3-Octave Band Transfer Mobility Coefficients – Site VP-6

Coefficients	6.3 Hz	8 Hz	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
A	29.6	31.8	12.9	-8.4	-17.6	92.7	102.6	112.2	113.4	106.2	87.9	68.3	72.1	48.3	63.3	37.8
B	1.2	-4.3	20.9	52.4	77.5	-34.7	-39.6	-45.5	-47.2	-44.5	-38.4	-32.1	-36.8	-26.7	-34.7	-21.5
C	-1.5	0.0	-8.3	-18.4	-28.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

$TM = A + B * \log(dist) + C * \log(dist)^2$
Hz = Hertz

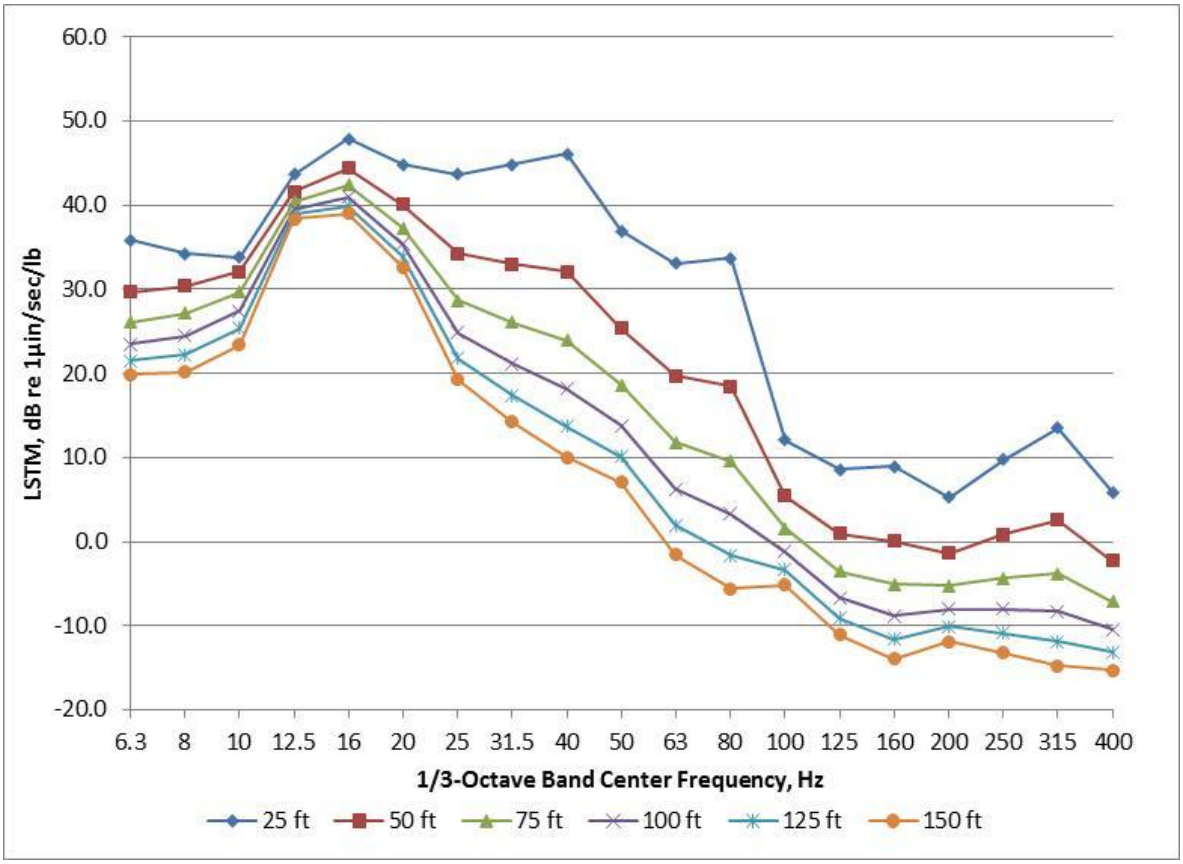


Vibration Propagation Measurement Site VP-7: Fullerton Avenue and Pacific Avenue – Redondo Junction to Fullerton Junction

1/3-Octave Band Transfer Mobility Coefficients – Site VP-7

Coefficients	6.3 Hz	8 Hz	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
A	64.5	27.4	4.0	53.3	63.8	66.8	87.5	99.7	110.9	90.6	95.4	104.3	43.0	43.9	50.1	36.1
B	-20.5	19.7	43.6	-6.8	-11.4	-15.7	-31.4	-39.3	-46.4	-38.4	-44.6	-50.5	-22.1	-25.3	-29.5	-22.0
C	0.0	-10.6	-15.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

$TM = A + B * \log(dist) + C * \log(dist)^2$
Hz = Hertz

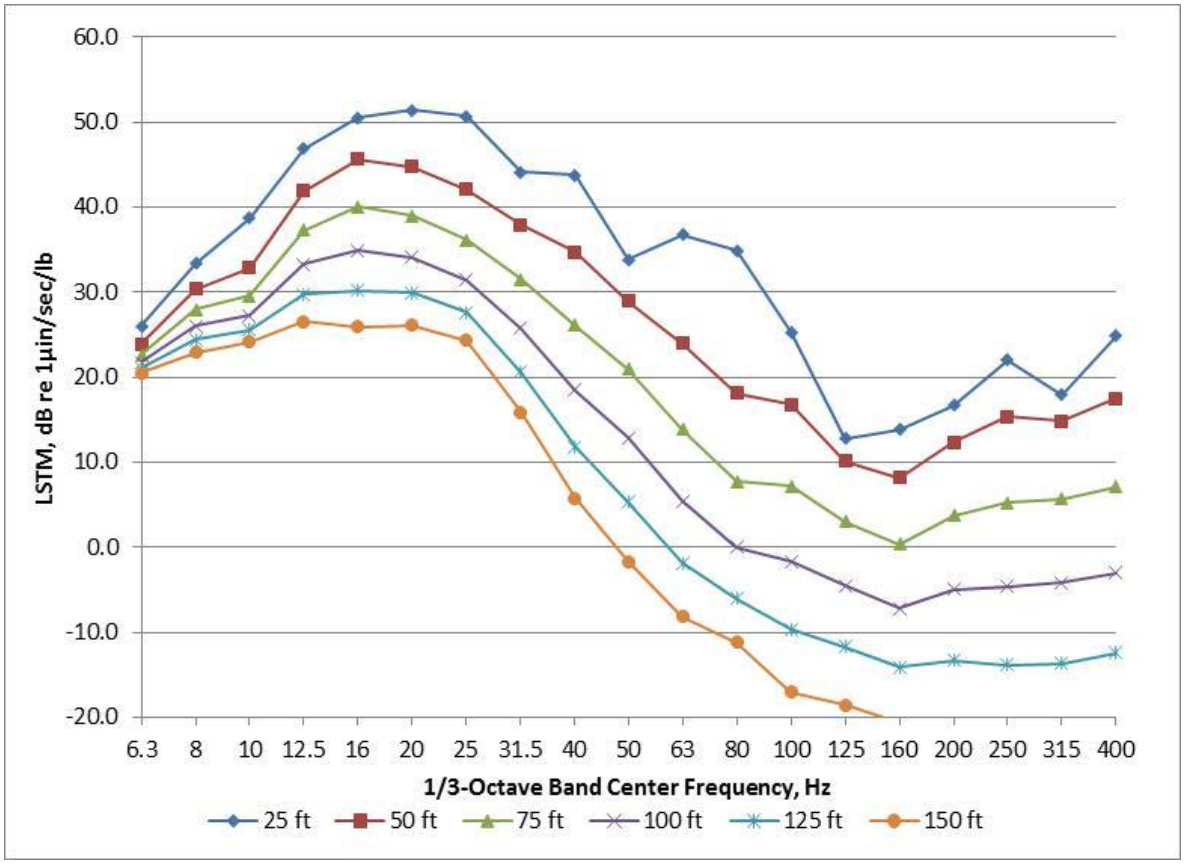


Vibration Propagation Measurement Site VP-8: Franklin Street and Stanton Avenue – Redondo Junction to Fullerton Junction

1/3-Octave Band Transfer Mobility Coefficients – Site VP-8

Coefficients	6.3 Hz	8 Hz	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
A	35.8	30.3	68.9	22.2	-3.2	30.8	64.2	-3.9	-7.1	-89.8	19.3	95.3	-65.7	-131.1	-84.6	-131.5
B	-7.0	12.3	-23.5	45.7	83.5	45.1	5.8	79.7	91.2	174.6	57.6	-33.0	141.9	194.9	144.2	205.4
C	0.0	-7.2	1.4	-20.1	-32.2	-21.7	-11.1	-32.5	-39.2	-61.6	-32.3	-7.3	-54.9	-65.8	-52.7	-71.1

$TM = A + B * \log(dist) + C * \log(dist)^2$
Hz = Hertz

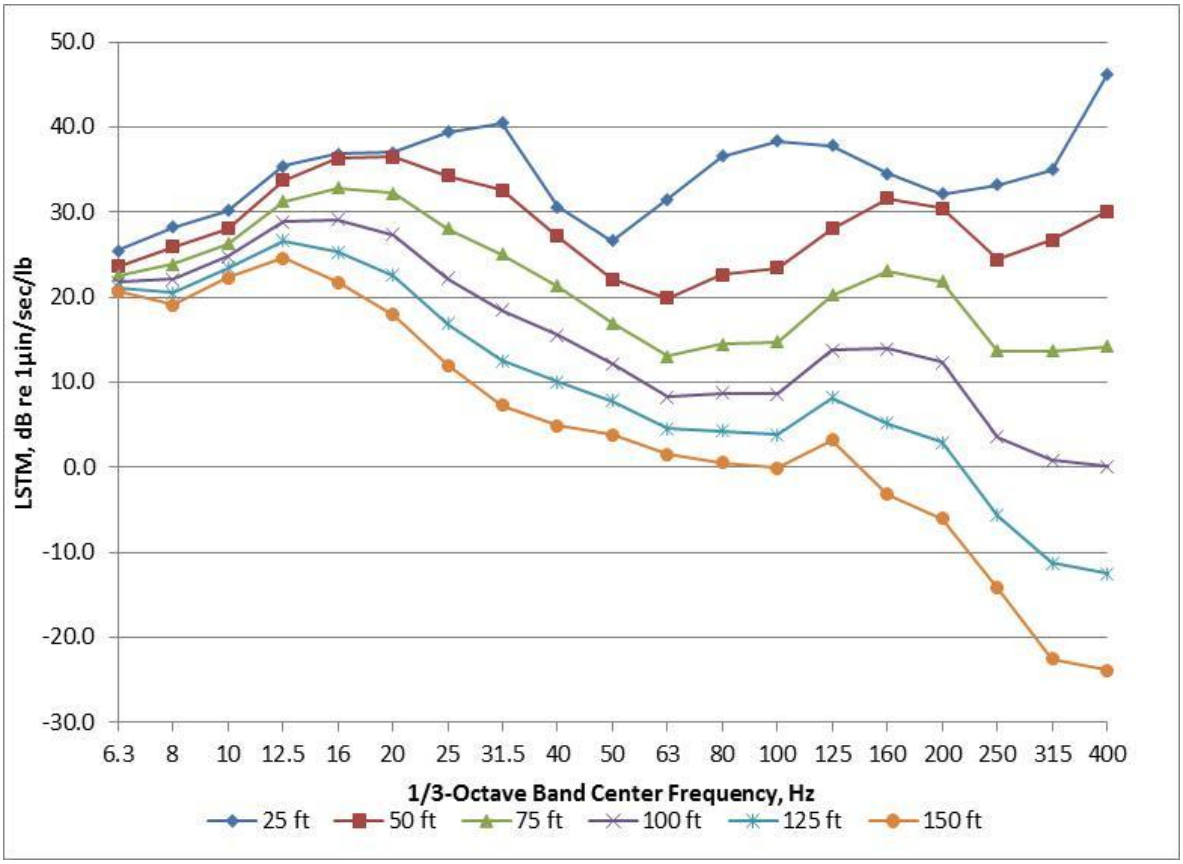


Vibration Propagation Measurement Site VP-9: South Orange Avenue and West Williamson Avenue – Redondo Junction to Fullerton Junction

1/3-Octave Band Transfer Mobility Coefficients – Site VP-9

Coefficients	6.3 Hz	8 Hz	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
A	35.8	30.3	68.9	22.2	-3.2	30.8	64.2	-3.9	-7.1	-89.8	19.3	95.3	-65.7	-131.1	-84.6	-131.5
B	-7.0	12.3	-23.5	45.7	83.5	45.1	5.8	79.7	91.2	174.6	57.6	-33.0	141.9	194.9	144.2	205.4
C	0.0	-7.2	1.4	-20.1	-32.2	-21.7	-11.1	-32.5	-39.2	-61.6	-32.3	-7.3	-54.9	-65.8	-52.7	-71.1

$TM = A + B * \log(dist) + C * \log(dist)^2$
Hz = Hertz

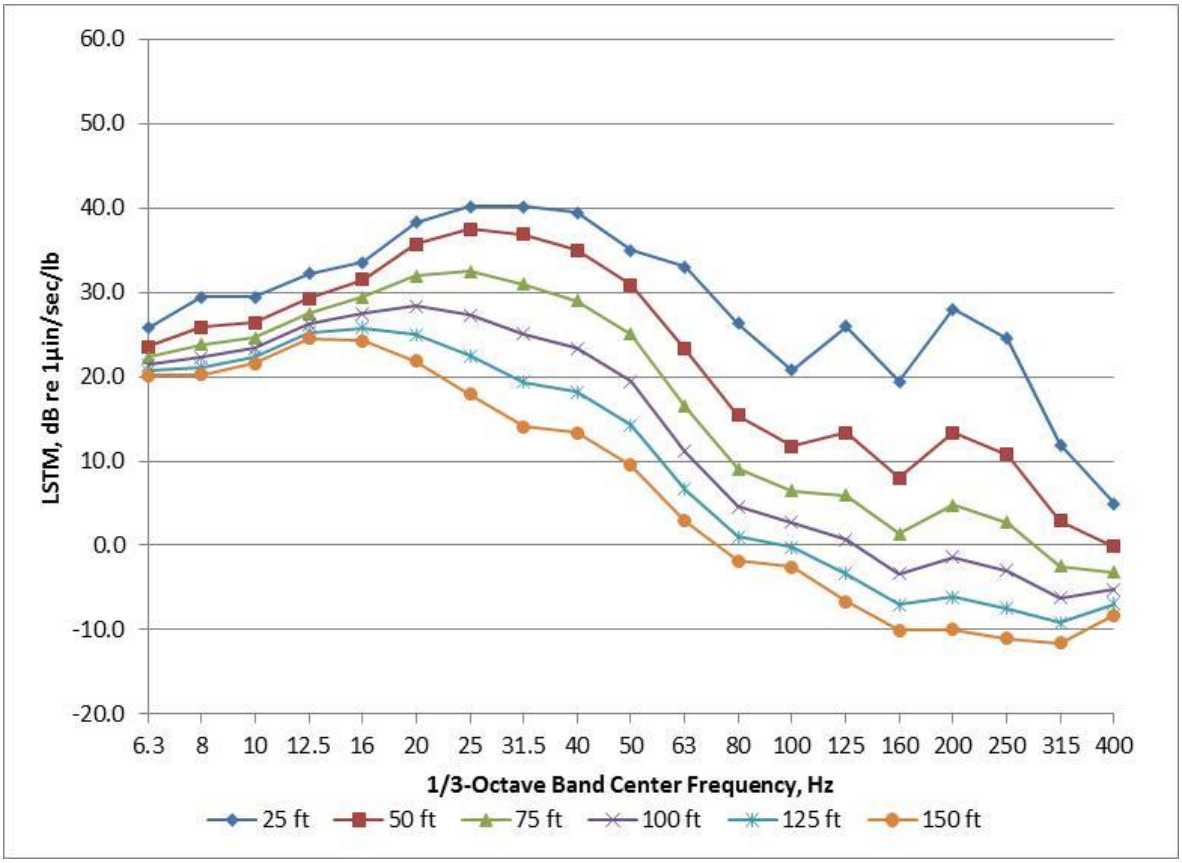


Vibration Propagation Measurement Site VP-10: Truslow Avenue and Lawrence Avenue – Redondo Junction to Fullerton Junction

1/3-Octave Band Transfer Mobility Coefficients – Site VP-10

Coefficients	6.3 Hz	8 Hz	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
A	36.0	46.1	43.5	46.2	17.4	-10.8	-46.1	-56.7	-32.0	-39.5	46.0	76.9	62.7	84.6	72.3	96.4
B	-7.3	-11.9	-10.1	-10.0	26.7	71.3	119.9	135.4	105.6	108.6	9.7	-36.2	-30.0	-41.9	-37.8	-48.9
C	0.0	0.0	0.0	0.0	-10.8	-25.9	-41.6	-47.3	-38.9	-39.6	-13.6	0.0	0.0	0.0	0.0	0.0

$TM = A + B * \log(dist) + C * \log(dist)^2$
Hz = Hertz

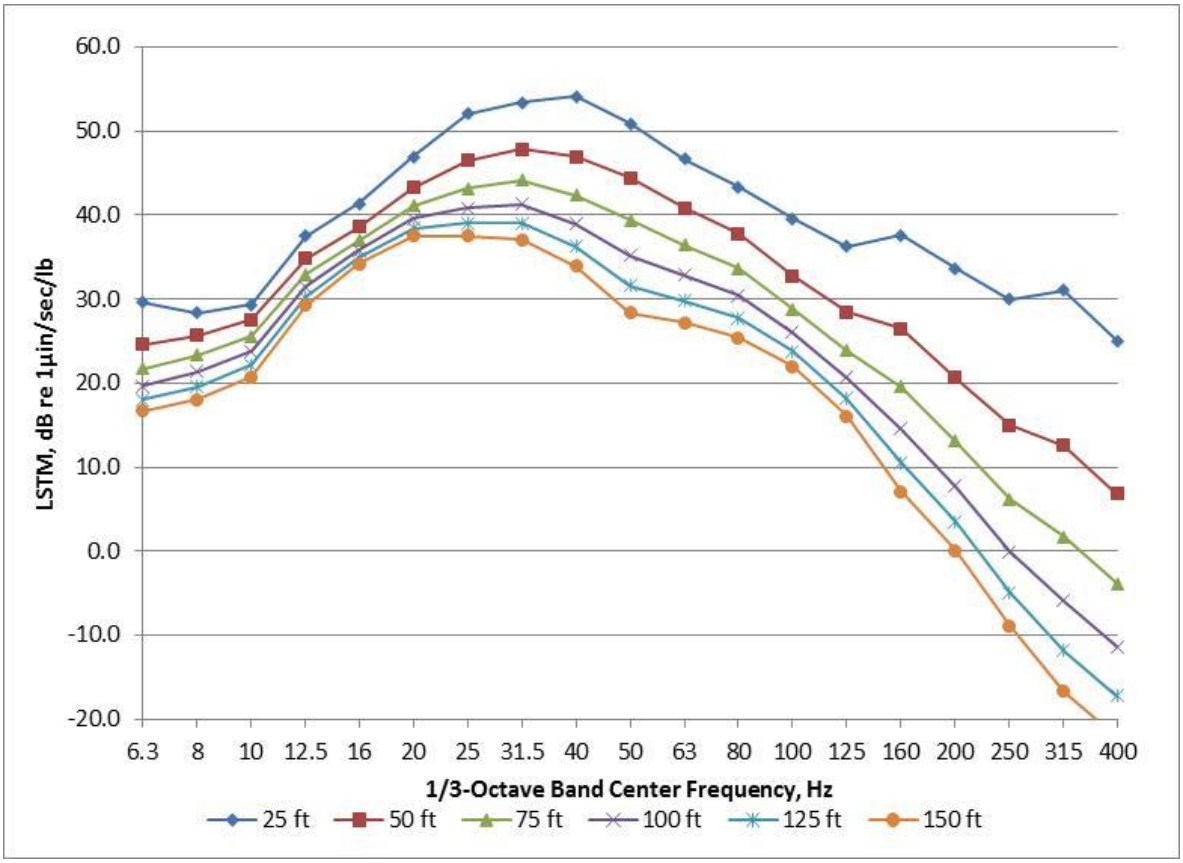


Vibration Propagation Measurement Site VP-11: East Wilhelmina Street and North Pauline Street – Fullerton Junction to Anaheim Regional Transportation Intermodal Center

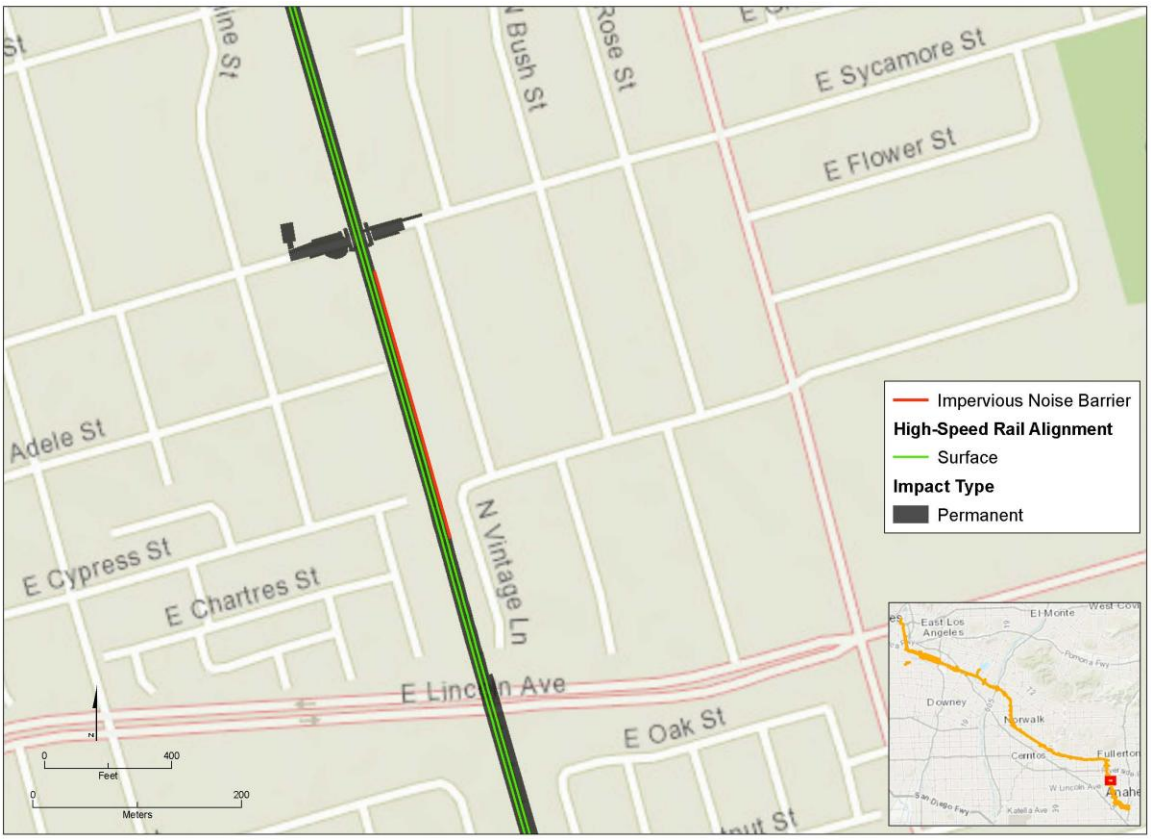
1/3-Octave Band Transfer Mobility Coefficients – Site VP-11

Coefficients	6.3 Hz	8 Hz	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
A	52.9	19.9	12.1	42.2	54.2	63.9	78.2	66.6	76.8	43.3	46.5	46.8	71.1	72.4	77.4	93.9
B	-16.7	18.5	27.3	1.3	-9.2	-12.1	-18.7	-1.9	-10.0	27.5	16.3	10.8	-22.6	-25.9	-21.7	-43.1
C	0.0	-8.9	-10.7	-3.3	0.0	0.0	0.0	-5.4	-4.4	-15.8	-11.6	-9.5	0.0	0.0	-4.9	0.0

$TM = A + B * \log(dist) + C * \log(dist)^2$
Hz = Hertz



APPENDIX H: POTENTIAL NOISE BARRIER SITES



Source: Authority 2025

Figure H-1 Location of Proposed Sound Barrier

References

California High-Speed Rail Authority (Authority). 2025. Los Angeles to Anaheim Project Section Preliminary Engineering for Project Definition.

APPENDIX I: HIGH-SPEED RAIL CORRIDOR CONSTRUCTION EQUIPMENT LIST BY CONSTRUCTION PHASE

Construction scenarios, including lists of equipment along with the assumed equipment numbers, noise emission levels (from FRA 2012 and FHWA 2006), usage factors, and daily hours of operation, are provided in Tables I-1 through I-9 below for each construction activity.

Table I-1 Scenario for At-Grade Rail Construction (First Street, City of Los Angeles, to ARTIC)

Equipment Type	Noise Level at 50 feet (dBA)	Number of Pieces	Usage Factor (%)	Hours per Day	L_{eq} at 50 feet (dBA)
Phase: Utility Relocation					
Trencher	85	2	5	7	74
Concrete transit mixer	80	5	4	4	70
Haul truck	84	2	15	4	76
Front end loader	80	3	15	7	76
Other construction equipment	85	3	40	7	85
Phase: New Track Ballast Installation					
Track, tie & ballast laying machine	85	1	5	6	71
Ballast tamper	83	1	10	6	72
Crawler tractor	84	1	10	6	73
BNSF rail train	85	2	0.5	6	64
Other construction equipment	85	4	15	6	82

ARTIC = Anaheim Regional Transportation Intermodal Center; dBA = A-weighted decibel; L_{eq} = equivalent sound level

Table I-2 Scenario for Aerial and Tunnel Structure Direct Fixation Rail Installation

Equipment Type	Noise Level at 50 feet (dBA)	Number of Pieces	Usage Factor (%)	Hours per Day	L_{eq} at 50 feet (dBA)
Phase: Plinth Construction					
Concrete pumper	82	2	60	7	82
Concrete haul truck	84	6	60	7	89
Flatbed truck	84	2	60	6	84
Crane	85	2	60	4	83
Other construction equipment	85	10	60	7	92

dBA = A-weighted decibel; L_{eq} = equivalent sound level

Table I-3 Scenario for Trench Construction (Fullerton)

Equipment Type	Noise Level at 50 feet (dBA)	Number of Pieces	Usage Factor (%)	Hours per Day	L_{eq} at 50 feet (dBA)
Phase: Utility Relocation					
Trencher	80	1	25	7	73
Concrete transit mixer	85	2	35	4	80
Front end loader	80	1	50	6	77
Other construction equipment	85	3	25	6	86
Phase: Tunnel Construction					
Drill rig	85	2	25	7	81
Crane	85	2	68	7	86
Concrete pumper	82	3	35	7	82
Concrete transit mixer	85	3	25	7	83
Other material handling equipment	85	3	50	7	86
Crawler dozer	85	2	50	7	84
Off-road truck	84	6	40	7	87
Front end loader	80	6	50	7	84
Dozer	85	2	35	7	83
Grader	85	2	55	7	85
Roller	85	1	45	7	81
Forklift	75	1	65	5	71
Excavator	85	2	70	7	86
Other construction equipment	85	5	45	6	87

dBA = A-weighted decibel; L_{eq} = equivalent sound level

Table I-4 Scenario for Elevated Structure Construction (Commerce)

Equipment Type	Noise Level at 50 feet (dBA)	Number of Pieces	Usage Factor (%)	Hours per Day	L_{eq} at 50 feet (dBA)
Phase: Utility Relocation					
Concrete transit mixer	85	1	2	7	67
Haul truck	84	2	10	7	76
Front end loader	80	1	65	7	78
Trencher	80	1	20	7	72
Other material handling equipment	85	4	40	7	86

Equipment Type	Noise Level at 50 feet (dBA)	Number of Pieces	Usage Factor (%)	Hours per Day	L_{eq} at 50 feet (dBA)
Phase: Foundation and Column Construction					
Front end loader	80	4	56	7	83
Crane	85	9	40	7	90
Drill rig	85	4	70	6	88
Concrete pumper	82	6	80	7	88
Concrete transit mixer	80	10	15	7	81
Roller	85	3	10	7	79
Forklift	75	2	65	7	76
Dozer	85	2	65	6	85
Excavator	85	1	30	7	79
Other construction equipment	85	3	45	7	86
Phase: Placement of Precast Concrete Box Girders					
Crane	85	3	75	7	88
Other construction equipment	85	2	75	7	86
Other material handling equipment	85	6	70	7	91

dBA = A-weighted decibel; L_{eq} = equivalent sound level

Table I-5 Scenario for Elevated Structure Construction (Santa Fe Springs-Norwalk)

Equipment Type	Noise Level at 50 feet (dBA)	Number of Pieces	Usage Factor (%)	Hours per Day	L_{eq} at 50 feet (dBA)
Phase: Utility Relocation					
Concrete transit mixer	85	1	2	7	67
Haul truck	84	2	10	7	76
Front end loader	80	1	65	7	78
Trencher	80	1	20	7	72
Other material handling equipment	85	4	40	7	86
Phase: Foundation and Column Construction					
Front end loader	80	4	56	7	83
Crane	85	9	40	7	90
Drill rig	85	4	70	6	88
Concrete pumper	82	6	80	7	88
Concrete transit mixer	80	10	15	7	81
Roller	85	3	10	7	79

Equipment Type	Noise Level at 50 feet (dBA)	Number of Pieces	Usage Factor (%)	Hours per Day	L_{eq} at 50 feet (dBA)
Forklift	75	2	65	7	76
Dozer	85	2	65	6	85
Excavator	85	1	30	7	79
Other construction equipment	85	3	45	7	86
Phase: Placement of Precast Concrete Box Girders					
Crane	85	3	75	7	88
Other construction equipment	85	2	75	7	86
Other material handling equipment	85	6	70	7	91

dBA = A-weighted decibel; L_{eq} = equivalent sound level

Table I-6 Construction Scenarios for Grade Separation Roadway Improvements

Equipment Type	Noise Level at 50 feet (dBA)	Number of Pieces	Usage Factor (%)	Hours per Day	L_{eq} at 50 feet (dBA)
Level 1: Minor Work Required					
Front end loader	80	1	60	7	77
Crane	85	1	60	7	82
Flatbed truck	84	1	75	7	82
Other construction equipment	85	2	75	6	--
Level 2: Light Work Required					
Haul truck	84	5	25	7	84
Excavator	85	2	40	6	83
Front end loader	80	3	60	7	82
Concrete pumper	82	2	65	7	83
Drill rig	85	1	45	5	79
Concrete transit mixer	85	10	30	6	89
Crane	85	1	60	7	82
Other construction equipment	85	6	55	6	89
Level 3: Medium Work Required					
Haul truck	84	6	25	7	85
Excavator	85	2	55	6	84
Front end loader	80	3	65	7	82
Concrete pumper	82	2	75	7	83
Drill rig	85	2	30	5	81

Equipment Type	Noise Level at 50 feet (dBA)	Number of Pieces	Usage Factor (%)	Hours per Day	L_{eq} at 50 feet (dBA)
Concrete transit mixer	85	8	25	6	87
Crane	85	1	60	7	82
Flatbed truck	84	2	60	7	84
Other construction equipment	85	6	65	6	90
Roller	85	2	40	7	83
Backhoe	80	1	45	7	76
Plate compactor	82	6	40	7	85
Sweeper	85	1	25	4	76
Surfacing equipment	85	2	50	6	84
Level 4: Heavy Work Required					
Haul truck	84	22	25	7	91
Excavator	85	2	60	6	85
Front end loader	80	3	55	7	82
Concrete pumper	82	2	65	7	83
Drill rig	85	2	50	5	83
Concrete transit mixer	85	10	30	6	89
Crane	85	2	55	7	85
Flatbed truck	84	2	75	7	85
Other construction equipment	85	6	45	6	88
Grader	85	1	45	7	81
Roller	85	2	20	7	80
Trencher	80	1	35	7	75
Plate compactor	82	6	65	7	87
Sweeper	85	1	15	4	74
Surfacing equipment	85	2	45	6	83

dBA = A-weighted decibel; L_{eq} = equivalent sound level

Table I-7 Construction Scenarios for Water Crossings

Equipment Type	Noise Level at 50 feet (dBA)	Number of Pieces	Usage Factor (%)	Hours per Day	L_{eq} at 50 feet (dBA)
Level 1: Minor Work Required					
Crane	85	1	40	7	80
Forklift	75	2	50	7	74
Concrete transit mixer	85	3	25	7	83

Equipment Type	Noise Level at 50 feet (dBA)	Number of Pieces	Usage Factor (%)	Hours per Day	L_{eq} at 50 feet (dBA)
Concrete pumper	82	1	60	7	79
Backhoe	80	2	35	7	78
Plate compactor	82	2	20	7	77
Level 2: Light Work Required					
Haul truck	84	5	25	7	84
Excavator	85	2	45	6	83
Front end loader	80	3	75	7	83
Concrete pumper	82	2	75	7	83
Drill rig	85	2	75	5	85
Concrete transit mixer	85	6	20	6	85
Crane	85	2	45	7	84
Other construction equipment	85	3	45	6	85
Pile driver	101	2	75	6	102
Level 3: Medium Work Required					
Haul truck	84	5	25	7	84
Excavator	85	2	45	6	83
Front end loader	80	3	75	7	83
Concrete pumper	82	2	75	7	83
Drill rig	85	2	75	5	85
Concrete transit mixer	85	8	20	6	86
Crane	85	2	45	7	84
Other construction equipment	85	6	45	6	88
Pile driver	101	2	75	6	102

dBA = A-weighted decibel; L_{eq} = equivalent sound level

Table I-8 Construction Scenarios for System Sites (Traction Power Substation, Traction Power Paralleling Station, Traction Power Switching Station, and Communication Towers)

Equipment Type	Noise Level at 50 feet (dBA)	Number of Pieces	Usage Factor (%)	Hours per Day	L_{eq} at 50 feet (dBA)
Haul truck	84	3	35	8	84
Excavator	85	2	55	8	85
Front end loader	80	2	60	8	81
Concrete pumper	82	1	80	8	81
Concrete transit mixer	85	4	35	8	86

Equipment Type	Noise Level at 50 feet (dBA)	Number of Pieces	Usage Factor (%)	Hours per Day	L_{eq} at 50 feet (dBA)
Crane	85	1	40	8	81
Other construction equipment	85	6	75	8	92
Sweeper	85	1	30	8	80
Roller	85	1	40	8	81
Surfacing equipment	85	1	75	8	84

dBA = A-weighted decibel; L_{eq} = equivalent sound level

Table I-9 Scenarios for Station Construction

Equipment Type	Noise Level at 50 feet (dBA)	Number of Pieces	Usage Factor (%)	Hours per Day	L_{eq} at 50 feet (dBA)
Commerce and Buena Park Metrolink Stations					
Excavator	85	1	55	8	82
Front end loader	80	2	70	8	81
Other construction equipment	85	6	75	8	92
Grader	85	1	30	8	80
Roller	85	2	20	8	81
Backhoe	80	1	50	8	77
Plate compactors	82	2	50	8	82
Haul truck	84	4	60	8	88
Flat bed truck	84	2	75	8	86
Norwalk/Santa Fe Springs Station					
Haul truck (6 CY)	84	4	65	7	88
Excavator	85	1	45	6	80
Front end loader	80	2	65	7	81
Flat bed truck	84	2	70	7	85
Other construction equipment	85	4	65	6	88
Haul truck (18 CY)	84	6	55	7	89
Grader	85	1	75	7	83
Roller	85	2	20	7	80
Tractor with backhoe	84	2	65	7	85
Fullerton Station					
Haul truck (6 CY)	84	4	45	7	86
Excavator	85	2	60	6	85
Front end loader	80	4	60	7	83

Equipment Type	Noise Level at 50 feet (dBA)	Number of Pieces	Usage Factor (%)	Hours per Day	L_{eq} at 50 feet (dBA)
Flat bed truck	84	2	65	7	85
Other construction equipment	85	8	15	6	85
Paver	85	1	40	6	80
Grader	85	1	75	7	83
Roller	85	2	20	7	80
Plate compactors	82	3	20	7	79
Haul truck (6 CY) hot asphalt	84	6	45	7	88
Flat bed truck	84	2	65	7	85
Crane: 70 ton	85	2	70	6	85
Crane: 15 ton	85	3	50	7	86
Drill Rig: 36-inch diameter	85	2	65	7	86
Concrete transit mixer (6 CY)	80	8	15	6	80
Concrete pumper	82	4	15	7	79
ARTIC Station					
Haul truck (6 CY)	84	5	75	7	89
Excavator	85	2	65	6	85
Front end loader	80	3	80	7	83
Concrete pumper	82	2	20	7	77
Drill Rig: 36-inch diameter	85	1	30	5	78
Concrete transit mixer (10 CY)	80	10	8	7	78
Crane: 100 ton	85	1	20	7	77
Crane: 15 ton	85	1	30	7	79
Flat bed truck	84	2	40	7	82
Grader	85	1	80	7	83
Paver	85	1	85	7	84
Roller	85	1	55	7	82
Haul Truck (6 CY): hot asphalt	84	2	50	7	83
Plate compactor with generator	82	4	30	6	82
Tractor with backhoe	84	3	60	7	86
Other construction equipment	85	6	50	6	89

ARTIC = Anaheim Regional Transportation Intermodal Center; CY = cubic yards; dBA = A-weighted decibel; L_{eq} = equivalent sound level

References

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Federal Railroad Administration (FRA). 2012. High-Speed Ground Transportation Noise and Vibration Impact Assessment. Final Report DOT/FRA/ORD-12/15. September. www.fra.dot.gov/eLib/Details/L04090 (accessed September 2016).