3.4 Noise and Vibration

3.4.1 Introduction

Noise is one of the principal environmental impacts associated with rail construction and operation. A noise and vibration assessment is a key element of the environmental impact analysis for rail projects. This section provides a summary analysis of the *Palmdale to Burbank Project Section: Noise and Vibration Technical Report* (Noise and Vibration Technical Report) (Authority 2019), which includes additional technical information and analysis, and identifies all references used.

Noise and Vibration

Noise and vibration assessments are key elements of the environmental impact analysis process for rail projects. Noise is one of the principal environmental impacts associated with rail projects and has been identified as a public concern throughout the public involvement process.

The following resource sections in this Palmdale to Burbank Project Section Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) provide additional information related to noise and vibration:

- Section 3.7, Biological and Aquatic Resources, considers impacts on wildlife resulting from noise and vibration of the project.
- Section 3.13, Station Planning, Land Use, and Development, discusses impacts on noise-sensitive land uses adjacent to the project.
- Section 3.14, Agricultural Farmland and Forest Land, considers noise and vibration impacts to domestic grazing livestock.
- Section 3.16, Aesthetics and Visual Quality, considers the visual impacts of the implementation of project features required for noise attenuation, such as noise barriers.
- Chapter 5, Environmental Justice, evaluates whether the project results in disproportionate noise and vibration impacts on environmental justice populations (i.e., minority populations and low-income populations).

In addition, the following appendices provide more detailed information:

- Appendix 2-E, Impact Avoidance and Minimization Features (IAMF), lists IAMFs incorporated into the project.
- Appendix 3.1-C, Standardized Mitigation Measures (MM), lists standardized mitigation measures proposed for the project.
- Appendix 3.1-B, United States Forest Service (USFS) Policy Consistency Analysis, assesses the consistency of the Palmdale to Burbank Project Section with applicable laws, regulations, plans, and policies governing proposed uses and activities within the Angeles National Forest (ANF) and the San Gabriel Mountains National Monument (SGMNM).
- Appendix 3.4-A, Elevated Wentworth Street Design Change, contains noise and vibration impacts for the Build Alternatives where the proposed alignment transitions from tunnel to aerial structure in the Tujunga Wash.
- Appendix 3.4-B, Potential Impacts from Induced Winds for High-Speed Trains, discusses impacts associated with winds generated by operation of a high-speed train.
- Appendix 3.4-C, Noise and Vibration Mitigation Guidelines, contains noise and vibration mitigation guidelines outlined by the Authority and incorporates by reference the guidelines, definitions, and technical manuals recognized by the Federal Railroad Administration (FRA) as being consistent with FRA noise and vibration mitigation requirements.

In addition, the Noise and Vibration Technical Report (Authority 2019) provides additional information about the noise and vibration impacts in the Palmdale to Burbank Project Section vicinity.

During stakeholder outreach efforts, commenters expressed concern about impacts of noise and vibration generated by the Palmdale to Burbank Project Section on adjacent land uses. These issues and concerns are summarized in Section 3.4.5.6.

3.4.1.1 Key Terms

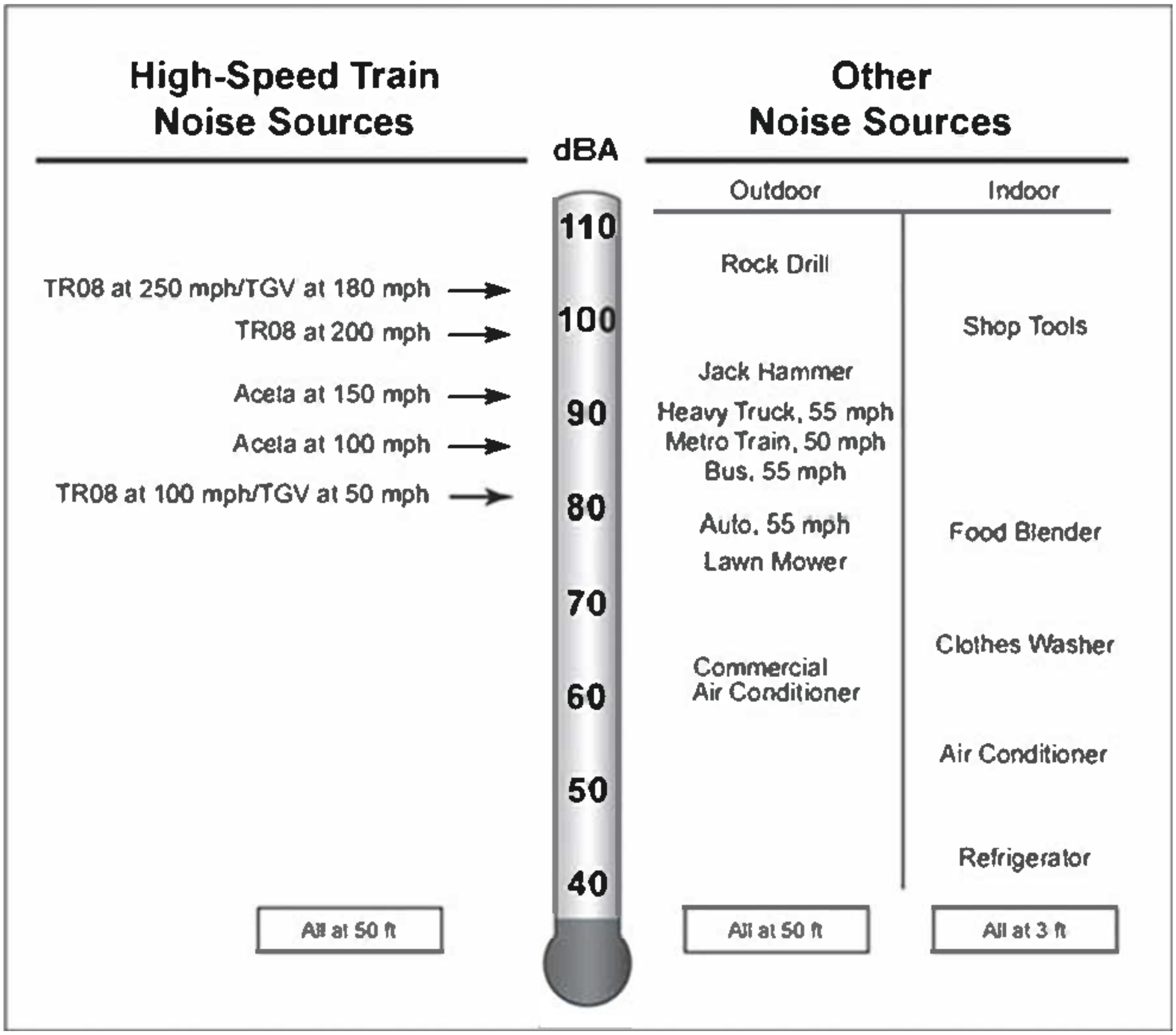
Noise and Vibration Descriptors

The following sections identify the basic descriptors and metrics used to quantify noise and vibration and to assess associated impacts. Much of this information has been adapted from FRA's *High-Speed Ground Transportation Noise and Vibration Impact Assessment* (FRA 2012) (hereinafter referred to as the FRA guidance). Where appropriate, the Federal Highway Administration's (FHWA) *Highway Traffic Noise: Analysis and Abatement Guidance* (FHWA 2011) and the Federal Transit Administration's (FTA) *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018) guidance and criteria have been used.

Noise Descriptors

The universal descriptor for environmental noise is the A-weighted sound pressure level expressed in A-weighted decibels (dBA). The sound pressure level describes the strength of noise measured at a receiver at any moment in time or for a time interval. Various A-weighted noise descriptors may be read directly from noise monitoring equipment or may be retrieved from the instrument's digital memory for later analysis. Figure 3.4-1 shows 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 of the Noise and Vibration Technical Report (Authority 2019).

As shown on Figure 3.4-1, typical A-weighted sound levels range from 40 to 105 dBA, where 40 dBA represents a quiet sound level such as outdoor ambient noise in a rural environment, and 90 dBA represents a much louder sound such as a jackhammer at 50 feet. The numeric decibel (dB) value refers to the strength of the sound, and dBA indicates sound that has been filtered to reduce the strength of very low and very high frequencies, much like the response of human hearing. Without this A-weighting, noise monitoring equipment would respond more readily to events that people cannot 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 presented in Appendix A of the Noise and Vibration Technical Report (Authority 2019).



Source: FRA, 2012

Figure 3.4-1 Typical A-Weighted Sound Pressure Levels

This section uses the following descriptors and units, based on dBA, for measuring, computing, and assessing noise:

- **Maximum Instantaneous Noise Level**—The maximum noise level (L_{max}) refers to the maximum observed or recorded noise level during a single noise event or measurement period.
- **Sound Exposure Level**—SEL is the primary descriptor of HSR vehicle noise emissions and an intermediate value in the calculation of both the equivalent sound level (L_{eq}) and day-night equivalent sound level (L_{dn}). SEL refers to the time-normalized noise emission of a source or 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.
- **Equivalent Continuous Sound Level**—L_{eq} refers to a receiver's energy-averaged noise exposure from all events over a specified period (e.g., 1 minute, 1 hour, or 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 L_{day} and the 9-hour nighttime period (10:00 p.m. to 7:00 a.m.) as L_{night}. 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 L_{day} values are generally used to assess noise impacts for nonresidential daytime-only uses.

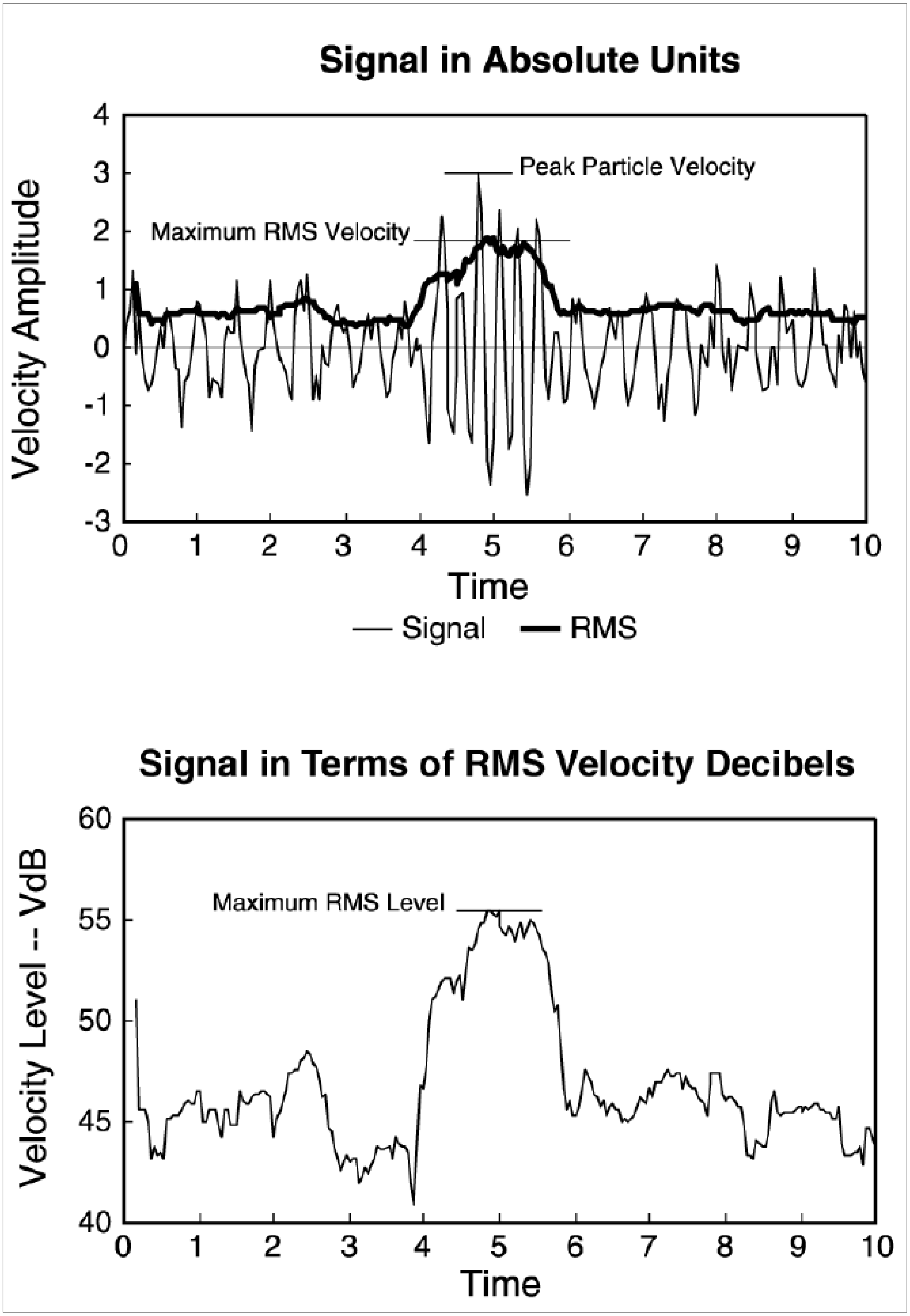
- **Day-Night Average Sound Level**—L_{dn} refers to a receiver's energy-averaged noise exposure from all events over a 24-hour period with a penalty added for nighttime noise periods. The basic unit used in calculating L_{dn} is the L_{eq} (h) for each 1-hour period. L_{dn} may be thought of as a noise exposure that is totaled after increasing by 10 dB all nighttime hourly A-weighted levels (between 10:00 p.m. and 7:00 a.m.) 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, L_{dn} is used to assess noise for residential land uses. Typical community L_{dn} values range from 40 dBA to 70 dBA, where 40 dBA represents a quiet noise environment, and 70 dBA is a noisy one.
- **Community Noise Equivalent Level**—The community noise equivalent level (CNEL) is a community noise descriptor. CNEL and L_{dn} are calculated similarly, but CNEL adds a 5-dBA penalty for evening hours (between 7:00 p.m. and 10:00 p.m.) to take residential evening activities into account. CNEL values are generally within approximately 1 dBA of L_{dn} values measured for the same noise environments.

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 occurs. 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 use either velocity or acceleration to measure ground-borne vibration, and (more importantly) the response of humans, buildings, and equipment to vibration is more appropriately described using velocity or acceleration, with velocity preferred.

The various methods used to quantify vibration are shown on Figure 3.4-2. The raw vibration signal is the lighter line-weight curve in the top graph of Figure 3.4-2. This is the instantaneous vibration velocity, which fluctuates about the zero point. The peak particle velocity (PPV) is the maximum instantaneous peak of the vibration signal. PPV often is used in monitoring vibration where it is important to note the stresses experienced by buildings.

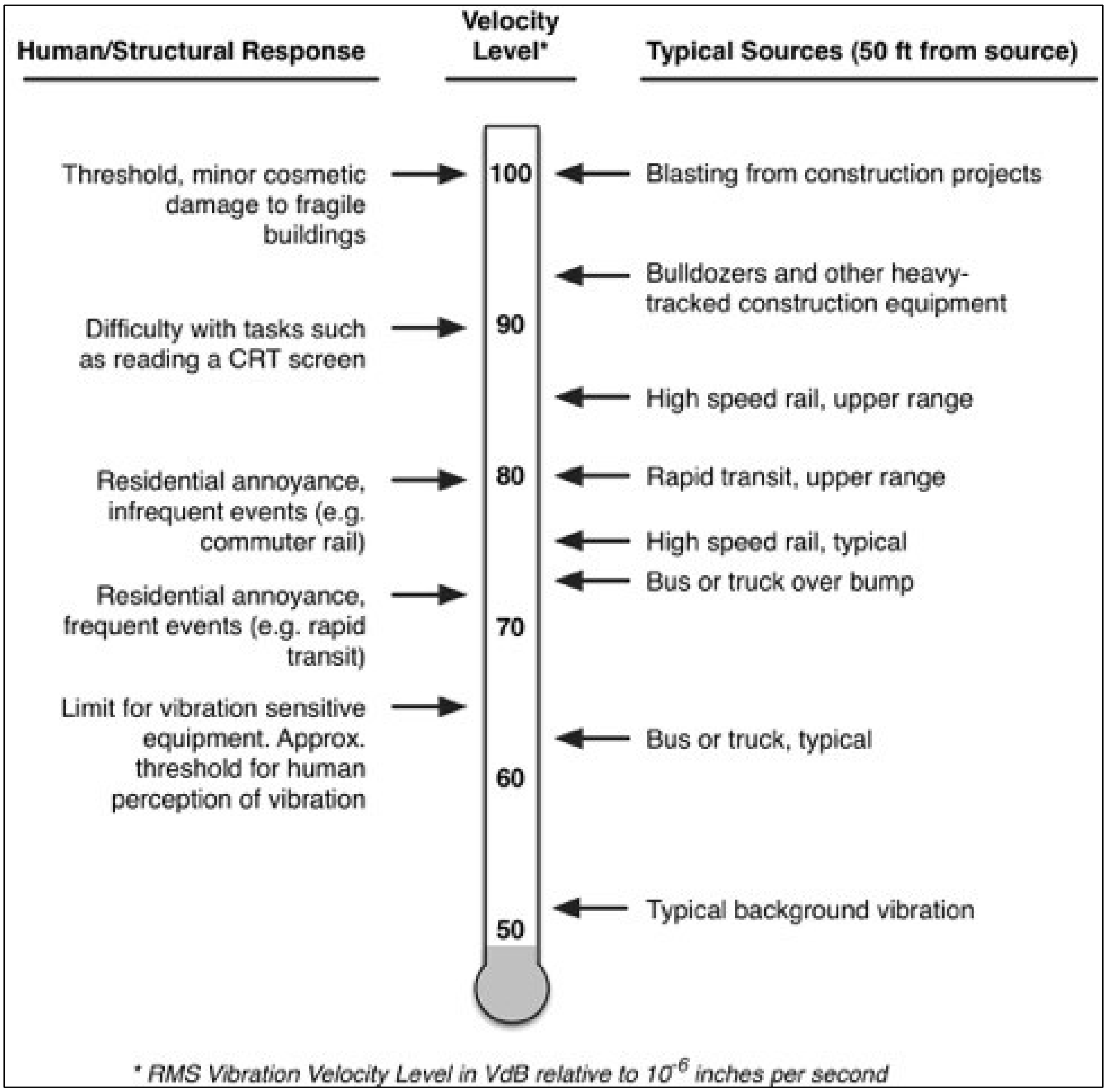


Source: FRA, 2012

Figure 3.4-2 Different Methods of Describing a Vibration Signal

Although PPV is appropriate for evaluating the potential of building damage, it is not suitable for evaluating human response. As an alternative to PPV, the root mean square amplitude of a vibration is used to describe the perceptible vibration experienced by humans. The root mean square amplitude, expressed in vibration decibels (VdB), is shown on the vibration signal on Figure 3.4-2. VdB are used in this document to discuss vibration and distinguish from sound decibels.

Common vibration sources and human and structural response to ground-borne vibration are illustrated on Figure 3.4-3. Typical vibration levels can range from below 50 VdB to 100 VdB (0.000316 inch per second [in/sec] to 0.1 in/sec) for most common sources. The human threshold of perception is approximately 65 VdB.



Source: FRA, 2012

Figure 3.4-3 Typical Levels of Ground-borne Vibration

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 dBA. Although dBA is typically the only descriptor used for community noise, potential problems exist with characterizing low-frequency noise using A-weighting because human hearing is nonlinear, and sounds dominated by low-frequency components seem louder than broadband sounds with the same A-weighted level. Thus, a ground-borne noise level of 40 dBA sounds louder than a 40-dBA broadband airborne noise. This anomaly is accounted for by setting the limits for ground-borne noise lower than the limits for broadband noise.

Ground-borne noise is typically only perceived from trains operating underground and can cause annoyance for residences and other noise-sensitive uses located at the ground surface. Recording studios are a vibration-sensitive use and are generally not well insulated from ground-borne noise but are well insulated from airborne noise. For systems where the train operates either at or above grade, the airborne noise level is notably louder than the ground-borne component, so for other than a basement room or a recording studio, the ground-borne noise is usually masked by the airborne noise.

The Palmdale to Burbank Project Section includes several tunnels, which would require operation of heavy construction equipment and tunnel boring machines that would generate ground-borne noise during construction. Train operation in tunnels would generate ground-borne noise during operation.

3.4.2 Laws, Regulations, and Orders

3.4.2.1 *Federal*

Federal Railroad Administration Railroad Noise Emission Compliance Regulations (49 Code of Federal Regulations [C.F.R.] Part 210)

FRA's *Railroad Noise Emission Compliance Regulation* (49 C.F.R. Part 210) prescribes minimum compliance regulations for enforcement of the *Noise Emission Standards for Transportation Equipment; Interstate Rail Carriers* (40 C.F.R. Part 201), as adopted by the United States Environmental Protection Agency (USEPA). FRA regulations include a process for requesting a waiver from Part 210, pursuant to a process set forth in 23 C.F.R. Part 211.2.

Procedures for Considering Environmental Impacts (64 *Federal Register* 28545)

These FRA procedures for implementing NEPA state that an EIS should consider possible impacts from noise and vibration. [1,2]

Federal Railroad Administration Guidance for Noise and Vibration Analysis

With the exception of effects on livestock and wildlife, FRA's guidance for assessing noise and vibration impacts of HSR (FRA 2012) scaled for higher train speeds is based on the FTA's *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018) (hereinafter referred to as the FTA guidance). Following are a description of the FTA guidance and more detailed information on the technical noise and vibration analysis, including the noise assessment criteria used to analyze effects on animals.

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[1] While this EIR/EIS was being prepared, FRA adopted new NEPA compliance regulations (23 C.F.R. 771). Those regulations only apply to actions initiated after November 28, 2018. See 23 C.F.R. 771.109(a)(4). Because this EIR/EIS was initiated prior to that date, it remains subject to FRA's Environmental Procedures rather than the Part 771 regulations.

[2] The Council on Environmental Quality (CEQ) issued new regulations, effective September 14, 2020, updating the NEPA implementing procedures at 40 C.F.R. 1500. However, this project initiated NEPA before the effective date and is not subject to the new regulations, relying on the 1978 regulations as they existed prior to September 14, 2020. All subsequent citations to CEQ regulations in this environmental document refer to the 1978 regulations, pursuant to 40 C.F.R. 1506.13 (2020) and the preamble at 85 Fed. Reg. 43340.

Federal Transit Administration Guidance for Noise and Vibration Analysis

The FTA guidance provides the noise and vibration impact criteria for rail operations and for associated stationary facilities such as storage and maintenance yards, passenger stations and terminals, parking facilities, and substations. FTA impact criteria for human noise annoyance compare existing outdoor noise levels with future project noise levels to determine the level of impact (i.e., no impact, moderate impact, or severe impact). A proposed project is considered to have no impact if, on average, introduction of the project would result in an insubstantial increase in the number of people highly annoyed by the new noise. A moderate impact indicates that introduction of the project would be noticeable to most people but might not cause strong reactions from the community. A severe impact indicates that a substantial percentage of people would be highly annoyed from noise resulting from the introduction of the project. Section 3.4.4, Methods for Evaluating Impacts, provides more specific information on the criteria used to establish where severe, moderate, and no impacts would occur.

Noise Control Act of 1972 (42 U.S.C. Section 4910)

The Noise Control Act of 1972 was the first comprehensive statement of national noise policy. The act declared, “It is the policy of the U.S. 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 catalyzed comprehensive studies of noise and the development of noise assessment and mitigation policies, regulations, ordinances, standards, and guidance by many states, counties, and even municipal governments. For example, the “noise elements” of community general plan documents and local noise ordinances studied as part of this EIS were largely created in response to the passage of the Noise Control Act.

Occupational Safety and Health Administration Occupational Noise Exposure (29 C.F.R. Part 1910.95)

The Occupational Safety and Health Administration regulates worker noise exposure to a time-weighted average of 90 dBA over an 8-hour work shift. Areas where noise levels exceed 85 dBA must be designated and labeled as high-noise-level areas where hearing protection is required. This noise exposure criterion would apply to worker exposure during operations and construction activities associated with the California HSR System. Noise from the project could also elevate noise levels at nearby construction sites to exceed 85 dBA and thus trigger the need for administrative/engineering controls and hearing conservation programs as detailed by the Occupational Safety and Health Administration.

United States Environmental Protection Agency Railroad Noise Emission Standards (40 C.F.R. Part 201)

Interstate rail carriers must comply with USEPA noise emission standards enumerated in 40 C.F.R. Part 201 as maximum measured noise levels. These maximum levels, as they apply to locomotives manufactured after 1979, are as follows:

- 100 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)
- 100 feet from the geometric center of a mobile locomotive: 90 dBA
- 100 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)

Whether or not these standards apply to high-speed trainsets, the analysis in this Draft EIR/EIS does not assume that Authority’s trainsets will comply with the standards because the Authority is not aware of any high-speed trainsets manufactured in the world today that meet these standards at all speeds. A noise-generation standard specific to HSR trains exists in Europe (the European Technical Specification for Interoperability standard), and a trainset manufactured to the European standard would comply with the USEPA standards (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 current technology cannot resolve to comply with the USEPA standards (if applicable). The analysis in this Draft EIR/EIS – both prior to mitigation and after mitigation – assumes a trainset generating noise in compliance with the European standard because trainsets currently manufactured and operating in Europe can meet this standard. The analysis does not assume a trainset that meets the USEPA standard.

Federal Highway Administration Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 C.F.R. Part 772)

The FHWA stipulates procedures and criteria for noise assessment studies of highway projects (23 C.F.R. Part 772). The procedures and criteria require that noise abatement measures be considered for all major transportation projects if the projects would cause a substantial increase in noise levels, or if projected noise levels approach or exceed the Noise Abatement Criteria (NAC) level for activities occurring on adjacent lands. The specific NAC are described in further detail in Section 3.4.4, Methods for Evaluating Impacts.

United States Forest Service (USFS) Authorities

Noise and vibration within the ANF, including the SGMNM, is guided by several laws and their implementing regulations, as well as policies, plans, and orders. The primary laws governing noise and vibration are the Federal Land Policy and Management Act, the National Forest Management Act, and the Antiquities Act of 1906. Appendix 3.1-B, USFS Policy Consistency Analysis, provides an analysis of the consistency of the six Build Alternatives with these laws, regulations, policies, plans, and orders.

3.4.2.2 State

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

The relevant legacy of the California Noise Control Act of 1973 was development of the required content of the Noise Element of general plans. This provides guidance to local government for the preparation of the required noise elements in city and county general plans, pursuant to California Government Code, Section 65302(f).

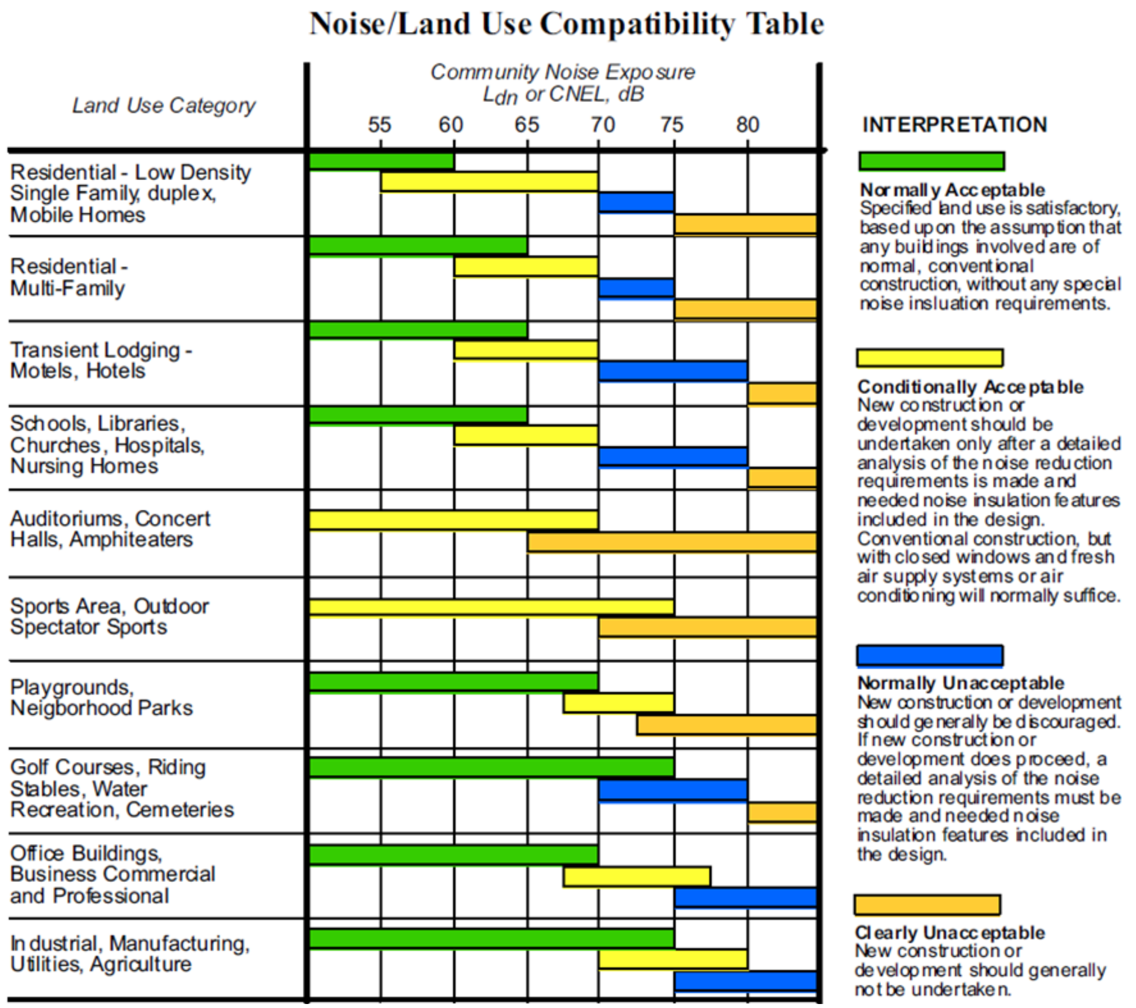
Noise Standards (21 California Code of Regulations [Cal. Code Regs.] Chapter 2.5, Subchapter 6)

The California Department of Transportation's (Caltrans) Division of Aeronautics defines a 65 dBA CNEL noise criterion as part of its "Noise Standards" for aviation traffic as measured at impacted residences near an airport. Quarterly reports of measured noise levels near an airport (prepared and submitted to determine where these requirements are satisfied) can offer insight about the surrounding ambient acoustical environment, which may help describe and/or model current existing noise levels as part of HSR noise impact assessment.

California Noise Insulation Standard (24 Cal. Code Regs., Part 2, Appendix Chapter 35, Section 3501)

The California Noise Insulation Standard limits interior noise exposure levels within multifamily residential developments (not single-family detached houses) to 45 dB CNEL or 45 dB L_{dn}.

Often adopted by city and county agencies for land-use planning purposes, the State of California Department of Health Land Use Compatibility Criteria feature guidelines 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. These criteria are presented on Figure 3.4-4.



Source: Governor's Office of Planning and Research, 2003

Figure 3.4-4 State of California Land-Use Compatibility Guidelines

Caltrans Traffic Noise Analysis Protocol

The Caltrans Traffic Noise Analysis Protocol For New Highway Construction, Reconstruction, and Retrofit Barrier Projects (Traffic Noise Analysis Protocol) (Caltrans 2011) and the Technical Noise Supplement to the Traffic Noise Analysis Protocol (Technical Noise Supplement) (Caltrans 2013) establish guidelines for construction of noise barriers along highways where sensitive receivers are located. The Technical Noise Supplement specifies parameters such as barrier dimensions, locations, type of barriers, and standard aesthetic treatments. Under FHWA and Caltrans policies, a reasonable noise barrier must be cost-effective and should take into consideration the number of residences that would benefit from the barrier(s). Cost considerations for determining cost-effectiveness (reasonableness) are based on an allowance per benefitted receiver. In addition to abatement cost and noise-related factors, such as absolute noise levels and change in noise levels, many other factors are considered. These factors include the date of development along the highway; impacts of noise abatement on other resources; achievement of the noise-reduction design goal; opinions of impacted residents; and safety, social, economic, environmental, legal, and technological factors.

The noise barrier must interrupt the line of sight between the noise source (traffic on the roadway) and the receiver.[3]

The Caltrans Traffic Noise Analysis Protocol (Caltrans 2011) and FHWA (23 C.F.R. 772) policies address the timing and applicability of noise abatement measures as part of a roadway project. Noise abatement at noise-sensitive land uses must be considered as part of the project (when NAC are approached or exceeded) if noise-sensitive development was planned, designed, and programmed prior to a roadway project's date of public knowledge. A development is considered planned, designed, and programmed on the date that final approval is granted from the local jurisdiction (for example, the date on which building permits are issued by a city planning agency). The date of public knowledge of the roadway project is the date of approval of the final environmental decision document (for example, Record of Decision).

3.4.2.3 Regional and Local

Pursuant to California Government Code, Section 65302(f), California counties and cities prepare general plans that contain their land-use and noise policies as well as optional nuisance noise control ordinances. In preparing a general plan 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 (which would include the Build Alternative alignments). Noise-level contours must be mapped for these sources using either a CNEL or L_{dn} descriptor and are to be used as a guide in land-use and noise consistency decisions to minimize the exposure of community residents to excessive noise. General plan noise elements often incorporate specific allowable noise levels to achieve a quality environment. Where airports exist, general plans often include a section on airport land-use consistency with respect to noise so that new, noise-sensitive uses are not located near, or do not encroach on, areas surrounding airports. General plans may, but usually do not, address ground-borne vibration.

At the local level, the Palmdale to Burbank Project Section resource study area (RSA) encompasses one county and several municipal jurisdictions. Each has noise and/or vibration ordinances. Table 3.4-1 outlines the appropriate local general plan objectives, policies, and goals and municipal code ordinances related to noise. The criteria contained in these documents and codes were considered in this analysis.

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3 The Caltrans Traffic Noise Analysis Protocol (Caltrans 2011) incorporates and references Chapter 1100 of the *Highway Design Manua*l (Caltrans 2019) for noise barrier design considerations. Chapter 1100 provides minimum and maximum heights for noise barriers ranging from 6 feet to 16 feet and provides calculations for determining the required height of a noise barrier to obstruct the line of sight between an 11.5-foot truck exhaust stack and a 5-foot-high receiver.

Table 3.4-1 Regional and Local Plans, Policies, and Ordinances

Policy Title	Summary
Los Angeles County	
Los Angeles County General Plan 2035 (2015)	The Los Angeles Country General Plan 2035 refers to the Los Angeles County Municipal Code for direction on and definition of specific noise criteria.
Los Angeles County Municipal Code (2019)	Sections 12.08.390 and 12.08.400 provide exterior and interior noise standards, respectively, at a variety of uses based on time of day and duration of the operation in question. Section 12.08.440 provides specific requirements for construction times and exterior noise level limits, depending on the receiving land-use classification and duration of the construction activities.
City of Palmdale	
City of Palmdale General Plan (1993)	Section B of the Noise Element provides policies and implementation measures regarding exterior and interior noise level limits as well as compliance with Title 24 and the Uniform Building Code.
Palmdale Municipal Code (2019)	Section 8.28.030 provides specific requirements with regard to allowable construction times.
City of Santa Clarita	
City of Santa Clarita General Plan (2000)	Section N-33 of the Noise Element provides policies and implementation measures for exterior and interior noise level limits as well as compliance with responsible agencies.
Santa Clarita Municipal Code (2019)	Section 11.44.080 provides specific requirements on allowable construction times.
City of Los Angeles	
Los Angeles City General Plan (1999)	Section 3-1 of the Noise Element provides policies and implementation measures for exterior and interior noise level limits as well as compliance with responsible agencies.
City of Los Angeles Municipal Code (2019)	Section 41.40 provides specific requirements on construction times.
City of Burbank	
City of Burbank General Plan (1992)	Section 5-2 of the Noise Element provides policies and implementation measures for exterior and interior noise level limits as well as compliance with responsible agencies.
City of Burbank Municipal Code (2019)	Article 2 addresses definitions, policies, measurements, classifications, and operational issues pertaining to noise.

Sources: Los Angeles County, 2015; Los Angeles County, 2019; City of Palmdale; City of Santa Clarita, 2000; City of Los Angeles, 1999; City of Burbank, 1992

In terms of local standards, Los Angeles County 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 over the range of 1 to 100 Hertz." This is the only local standard that references vibration.

3.4.3 Consistency with Plans and Laws

As indicated in Section 3.1.4.3, Consistency with Plans and Laws, the California Environmental Quality Act (CEQA) and the Council on Environmental Quality regulations require a discussion of inconsistencies or conflicts between a proposed undertaking and federal, state, regional, or local plans and laws. As such, this Draft EIR/EIS evaluates inconsistencies between the six Build Alternatives and federal, state, regional, and local plans, and laws to provide planning context.

The Authority, as the lead state and federal agency proposing to construct and operate the California HSR system, is required to comply with all federal and state laws and regulations and to secure all applicable federal and state permits prior to initiating construction on the selected Build Alternative. Therefore, there would be no inconsistencies between the six Build Alternatives and these federal and state laws and regulations.

The Authority is a state agency and therefore is not required to comply with local land use and zoning regulations; however, it has endeavored to design and construct the HSR project so that it is consistent with land use and zoning regulations. For example, the proposed Build Alternatives would incorporate IAMFs that require the contractor to prepare a plan to demonstrate how construction noise and vibration impacts will be maintained below applicable standards. The Authority has also adopted statewide policies that seek to reduce noise and vibration impacts associated with new sources of noise and vibration (Appendix 3.4-C) below applicable standards.

The construction noise and vibration impact assessment completed for the Palmdale to Burbank Project Section is consistent with both FRA and FTA guidance. In general, these guidance documents provide specific criteria that construction noise and vibration may not exceed during daytime and nighttime hours. This assessment method is different than that of most local jurisdictions, which typically restrict construction to daytime hours only but do not specify specific noise level limits. However, the California HSR System is designed to be consistent with local and regional jurisdictions where feasible. A total of 12 local and regional plans and policies were reviewed. The Palmdale to Burbank Build Alternatives would be consistent with two policies and inconsistent with certain provisions of 10 of the regional and local policies and plans, as described summarized in

Table 3.4-2 below. However, mitigation measures outlined in Section 3.4.7 would ensure that construction effects associated with the Build Alternatives would be reduced to the extent feasible. In adhering to FRA and FTA guidance and implementing applicable mitigation measures, the Authority would likely meet local and regional policies and goals pertaining to construction effects.

Table 3.4-2 Regional and Local Plans and Policies Inconsistencies

Policy Title	Summary
Los Angeles County General Plan 2035 (2015)	May not be possible to meet standards
Los Angeles County Municipal Code (2019)	May not be possible to meet standards
City of Palmdale General Plan (1993)	May not be possible to meet standards
Palmdale Municipal Code (2019)	May not be possible to meet standards
City of Santa Clarita General Plan (2000)	May not be possible to meet standards
Santa Clarita Municipal Code (2019)	May not be possible to meet standards
Los Angeles City General Plan (1999)	May not be possible to meet standards
City of Los Angeles Municipal Code (2019)	May not be possible to meet standards

Policy Title	Summary
City of Burbank General Plan (1992)	May not be possible to meet standards
City of Burbank Municipal Code (2019)	May not be possible to meet standards

Sources: Los Angeles County, 2015; Los Angeles County, 2019; City of Palmdale; City of Santa Clarita, 2000; City of Los Angeles, 1999; City of Burbank, 1992

A screening level analysis of the long-term noise and vibration impacts associated with stationary-source (i.e., non-rail) operations at stations, the Maintenance Facility, and ancillary facilities was completed for the Palmdale to Burbank Project Section, and it was determined that no noise or vibration effects would occur. However, it was determined that there are sensitive receivers that would be affected by increased traffic around the stations. Section 3.4.6.3 discusses traffic effects in detail. Los Angeles County and several municipal jurisdictions within the RSA have ordinances with noise level compliance requirements.

The long-term project-related traffic noise impact assessment—the Noise and Vibration Technical Report (Authority 2019) —was completed for the Palmdale to Burbank Project Section consistent with both FRA and FTA guidance. Impacts presented in this chapter are consistent with these guidance documents and regulations.

Despite the inconsistencies, the project is consistent with the majority of regional and local policies and plans. Although it may not be possible to meet all local noise standards as outlined in

Table 3.4-2, IAMFs and mitigation measures would generally minimize noise impacts and would ultimately meet the overall objectives of the local policies.

3.4.4 Methods for Evaluating Impacts

The evaluation of impacts related to noise and vibration is a requirement of the National Environmental Policy Act (NEPA) and CEQA. The following sections summarize the RSAs and the methods used to analyze noise and vibration impacts.

Noise and vibration that would result from project construction and operation were analyzed quantitatively using guidelines established by FRA and FTA. Information on conceptual California HSR System operations and the proposed Build Alternatives was used in the noise and vibration analysis models. Field and vibration measurements along with professional judgment supplemented the FRA and FTA guidance. Noise and vibration impacts arising from construction and operation of the project were evaluated using methodology and information from the following criteria:

- High-speed ground transportation noise and vibration impacts—FRA *High-Speed Ground Transportation Noise and Vibration Impact Assessment* (FRA 2012).
- Non-high-speed transit noise and vibration impacts—FTA *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
- Highway noise impacts (from changes in traffic patterns as a result of the project)—FHWA Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 C.F.R. Part 772). The FHWA procedures are implemented as defined by the Caltrans Traffic Noise Analysis Protocol (Caltrans 2011). FHWA requires that each state write its own noise policy based on FHWA traffic noise guidance (FHWA 2011). The State policy must address noise reduction required for a wall to be feasible, cost of a feasible wall, and noise level reduction required for a receiver to benefit. The Caltrans Traffic Noise Analysis Protocol addresses these issues. The Technical Noise Supplement (Caltrans 2013) provides guidance on noise measurements, modeling, and barrier analyses. The noise chapter of the Caltrans Environmental Handbook, Volume 1 (Caltrans 2016) provides an outline for the noise report.
- Potential for increased roadway noise during California HSR System operations—Trip generation at stations based on high ridership forecasts in 2040 (Section 3.2, Transportation).

- Vibration impacts at residences, schools, hotels/motels, medical facilities, and other vibration-sensitive receivers—FRA guidance Chapter 9, Detailed Vibration Assessment (FRA 2012).
- Non-HSR track noise sources such as stations and maintenance facilities—FTA guidance (FTA 2018).

For the impact analysis, the following thresholds were used:

- FRA noise impact criteria for HSR operations and construction
- FRA detailed analysis vibration impact criteria for HSR operations
- FHWA noise abatement criteria for traffic (on roadways affected by the project)
- FTA noise impact criteria for ancillary and non-HSR noise sources

Later in this section, the FRA vibration and noise impact criteria thresholds related to construction activities are described below in Table 3.4-7 and Table 3.4-8, and the FRA vibration and noise impact criteria thresholds regarding HSR operation are described in Table 3.4-10 and Table 3.4-11 later in this section. Table 3.4-13 describes FRA noise impact criteria on domestic animals and wildlife.

The methods for evaluating impacts include defining the RSA, considering IAMFs that are incorporated into the project, applying NEPA criteria and CEQA thresholds, and determining mitigation measures to reduce significant impacts.

3.4.4.1 Definition of Resource Study Areas

As defined in Section 3.1, Introduction, RSAs are the geographic boundaries in which the environmental investigations specific to each resource topic were conducted. Chapter 2, Alternatives, provides the project description, mapping, station locations, construction information, and relevant regional and local planning information used in determining the appropriate methodology for defining the RSA.

Noise

The noise RSA is the area in which all environmental investigations specific to noise and vibration were conducted to determine the resource characteristics and impacts. The boundaries of the noise RSA extend beyond the Build Alternative footprint because the impact analysis focuses on the effects of source noise on sensitive receivers (assessed at the receiver). For direct noise impacts on sensitive receivers, the noise RSA has been determined to be 1,200 feet from the project footprint based on typical screening distances as defined by FRA and project-specific factors of the Palmdale to Burbank Project Section. Based on pertinent guidance, the RSA for noise effects near stations is 250 feet from the centerpoint of the facility, and the RSA for noise effects near access roads is 100 feet from the roadway centerline and up to 500 feet for highways. Detailed screening distances for noise impacts are provided later in Section 3.4.5 (Table 3.4-14).

Vibration

For vibration impacts, the vibration RSA is as follows: up to 275 feet from the edge of the right-of-way for the Build Alternative alignment, including existing railroads; 150 feet from the station boundary for California HSR System stations; and 50 feet from the roadway centerline for highways. Detailed screening distances for both construction and operations vibration impacts were used to identify vibration-sensitive areas, and are presented in Table 3.4-3 and Table 3.4-4.

Table 3.4-3 Approximate Screening Distances for Construction Vibration Effects

Land-Use Category	Vibration Criterion Level (VdB)	Approximate Vibration Impact Distance (feet)
Category 1: Buildings where vibration would interfere with interior operations	65	230
Category 2: Residences and buildings where people normally sleep	72	135
Category 3: Institutional land uses with primarily daytime use	75	105

Source: Authority, 2019
Authority = California High-Speed Rail Authority; VdB = vibration velocity level

Table 3.4-4 Operational Vibration Impact Screening Distances

Land Use	Screening Distance for HSR (feet from centerline)		
	Up to 100 mph	Up to 200 mph	Up to 300 mph
Residential	120 feet	220 feet	275 feet
Institutional	100 feet	160 feet	220 feet

Source: FRA, 2012
FRA = Federal Railroad Administration; HSR = high-speed rail; mph = miles per hour

3.4.4.2 Impact Avoidance and Minimization Features

IAMFs are project features that are part of the project and are included as applicable in each of the alternatives for purposes of the environmental impact analysis. The full text of the IAMFs that are applicable to the Palmdale to Burbank Project Section is provided in Volume 2, Appendix 2-E, Project Impact Avoidance and Minimization Features.

The following IAMF is incorporated into the noise and vibration analysis:

NV-IAMF#1: Noise and Vibration—This IAMF describes the Authority's commitment to minimizing construction noise and vibration impacts. Prior to construction, the 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 receivers.

3.4.4.3 Methods for NEPA and CEQA Impact Analysis

Overview of Impact Analysis

This section describes the sources and methods used by the Authority to analyze project impacts associated with each of the six Build Alternatives related to noise and vibration. These methods apply to both NEPA and CEQA analyses unless otherwise indicated. Refer to Section 3.1.4.4, Methods for Evaluating Impacts, in Section 3.1, Introduction, for a description of the general framework for evaluating impacts under NEPA and CEQA.

Several sources of noise and vibration are associated with the project. California HSR System construction would result in noise and vibration impacts at nearby sensitive receivers along the alignment, and California HSR System operation would result in noise and vibration impacts at nearby sensitive receivers along the alignment where the trains would travel at high speeds. Wildlife and human sensitive receivers could be startled or annoyed by California HSR System pass-bys, and wildlife communication could be affected by project noise. Stations and other fixed noise- and vibration-producing project components such as maintenance facilities would result in such impacts from operation of the facilities and increased automobile traffic. The methodology for analyzing noise and vibration impacts of train operations, station operations, and construction are established in relevant federal and State guidance and summarized below.

FRA and FTA use ambient-based noise criteria; the increase in future noise (future noise levels with the project compared to existing noise levels) is assessed rather than the noise caused by each passing train. The FRA *High-Speed Ground Transportation Noise and Vibration Impact Assessment* criteria also specify a comparison of future project noise with existing levels (FRA 2012).

The noise and vibration analysis discussed in this section was informed in part by field-reconnaissance and data gathering visits within the RSAs. As discussed in Section 3.4.5, noise-sensitive receivers were identified in the noise RSA, and appropriate screening distances were used to measure the existing noise environments where the six Build Alternatives would have the potential to cause noise-related impacts. As discussed in Section 3.4.5, ambient noise measurements were conducted at 23 sites throughout the noise RSA along the six Build Alternative alignments (shown on Figure 3.4-13 and Figure 3.4-14 later in this section).

Vibration-sensitive receivers identified in the vibration RSA are discussed in Section 3.4.5, Measured Vibration Levels. Vibration measurements focused on characterizing the vibration transmission characteristics of the ground along the proposed Build Alternative alignments. Vibration propagation measurements were conducted at 12 locations within the vibration RSA along the proposed Build Alternative alignments (shown on Figure 3.4-15 and Figure 3.4-16 later in this section).

Analysis Scenarios

The noise analysis used two scenarios, summarized here, and described in detail in Section 3.2.4, Method for Evaluating Impacts, in Section 3.2, Transportation to evaluate noise introduced by the Build Alternatives, including traffic noise:

- **Existing (2015) Plus Construction Conditions**—Effects would include any road closures or lane reconfigurations that would be implemented during construction. These would be both temporary impacts associated with construction and permanent impacts of the altered roadway network, including vehicle miles traveled.
- **Operational (2040) No Project and Plus Project Conditions**—Completion of Phase 1 with full ridership is indexed to the Regional Transportation Plan(s) applicable to the HSR section (per NEPA practice) and the adopted HSR Business Plan. The current horizon year for HSR is 2040.

Construction Noise and Vibration Methodology

Construction noise and impacts are assessed using a combination of the methods and construction source data contained in the FRA guidance (FRA 2012) and the *FHWA Roadway Construction Noise Model User's Guide* (FHWA 2006). Typical noise levels generated by representative pieces of equipment and their typical usage factors are listed in Table 3.4-5.

The noise exposure at a receiver location may be calculated by adding dB levels of all operating construction equipment. The combination of noise from several pieces of equipment operating during the same time is obtained from decibel addition of the L_{eq} of each single piece of equipment.

Table 3.4-5 Construction Equipment Noise Emission Levels

Equipment	Typical Noise Level (dBA) 50 Feet From Source	Typical Usage Factor (%)
Air compressor	80	40
Backhoe	80	40
Ballast equalizer	82	50

Equipment	Typical Noise Level (dBA) 50 Feet From Source	Typical Usage Factor (%)
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
Jackhammer	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 decibel; FHWA = Federal Highway Administration; FRA = Federal Railroad Administration

Construction vibration is assessed for areas where there is a potential for impact 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 3.4-6.

Table 3.4-6 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 feet (in/sec)	Approximate Lv 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
FRA = Federal Railroad Administration; in/sec = inches per second; Lv = vibration velocity level in decibels; PPV = peak particle velocity

Construction Noise Criteria

The FTA nor FRA guidance documents do not provide standardized construction noise criteria for assessing noise impacts at sensitive receivers but do outline general assessment and detailed assessment criteria.

Table 3.4-7 shows FRA noise assessment criteria for construction. The last column applies to construction activities that extend over a 30-day period near any given receiver. L_{dn} is used to assess impacts in residential areas, and 24-hr L_{eq} is used in commercial and industrial areas. The 8-hr L_{eq} and the 30-day average L_{dn} noise exposure from construction noise calculations use the noise emission levels of the construction equipment, the equipment location, and operating hours. The construction noise limits are normally assessed at the noise-sensitive receiver property line.

The criteria for station, Maintenance Facility, and rail corridor construction would be identical to those described above.

Table 3.4-7 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 decibel; FRA = Federal Railroad Administration; L_{eq} = equivalent continuous sound level; L_{dn} = day-night sound level

Construction Vibration Criteria

FRA guidance provides the basis for the construction vibration assessment. FRA construction vibration criteria have been updated to be consistent with FTA criteria. The criteria are designed primarily to prevent damage to buildings and to assess whether vibrations might interfere with vibration-sensitive activities in buildings or temporarily annoy building occupants during the construction period. FRA criteria include two ways to express vibration levels: root mean square VdB, for annoyance and activity interference; and 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 (such as optical microscopes and magnetic resonance imaging machines) inside special-use buildings, FRA recommends using the long-term vibration criteria provided above in Section 3.4.2.1, Laws, Regulation, and Orders.

Table 3.4-8 shows 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 3.4-8 Federal Railroad Administration Construction Vibration Damage Criteria

Building Category	PPV (in/sec)	Approximate Lv
I. Reinforced concrete, steel, or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Source: FRA, 2012
FRA = Federal Railroad Administration; in/sec = inches per second; Lv = vibration velocity level in decibels; PPV = peak particle velocity

Categories of High-Speed Rail

High-speed ground transportation systems include steel-wheeled, electric-powered, and fossil-fueled trains capable of maximum speeds of 90 to 250 mph; and magnetically levitated systems capable of maximum speeds up to 300 mph. Because the noise characteristics of these types of trains vary considerably as speed increases, FRA guidance subdivides these systems into three categories:

- High-speed, maximum 150 mph
- Very-high-speed, maximum 250 mph
- Magnetically levitated and powered systems, representing the upper range of speed performance up to 300 mph

The California HSR System involves steel-wheeled, electrically powered trains operating in the very-high-speed category, with a maximum operating speed of 220 mph.

Components of Noise Prediction

Noise from HSR can be evaluated in terms of a Source-Path-Receiver framework, as illustrated in Figure 3.4-5. The source of noise is a train moving on its tracks. The path describes the course between the source and the receiver wherein noise levels are reduced by distance, topographical and man-made obstacles, reflection from surfaces, atmospheric effects, and other factors. At each receiver, the noise from all sources and source paths combines to create the noise environment at that location.

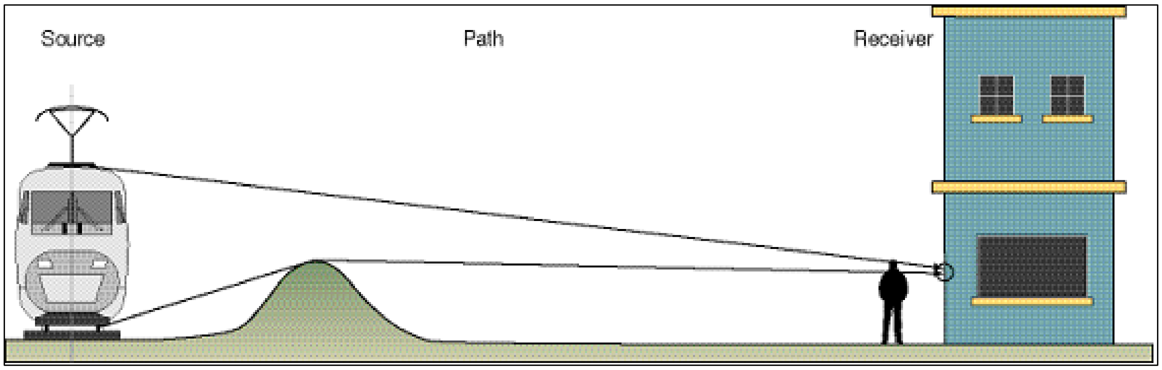


Figure 3.4-5 Source-Path-Receiver

Sources of High-Speed Rail Noise

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

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

Terms:

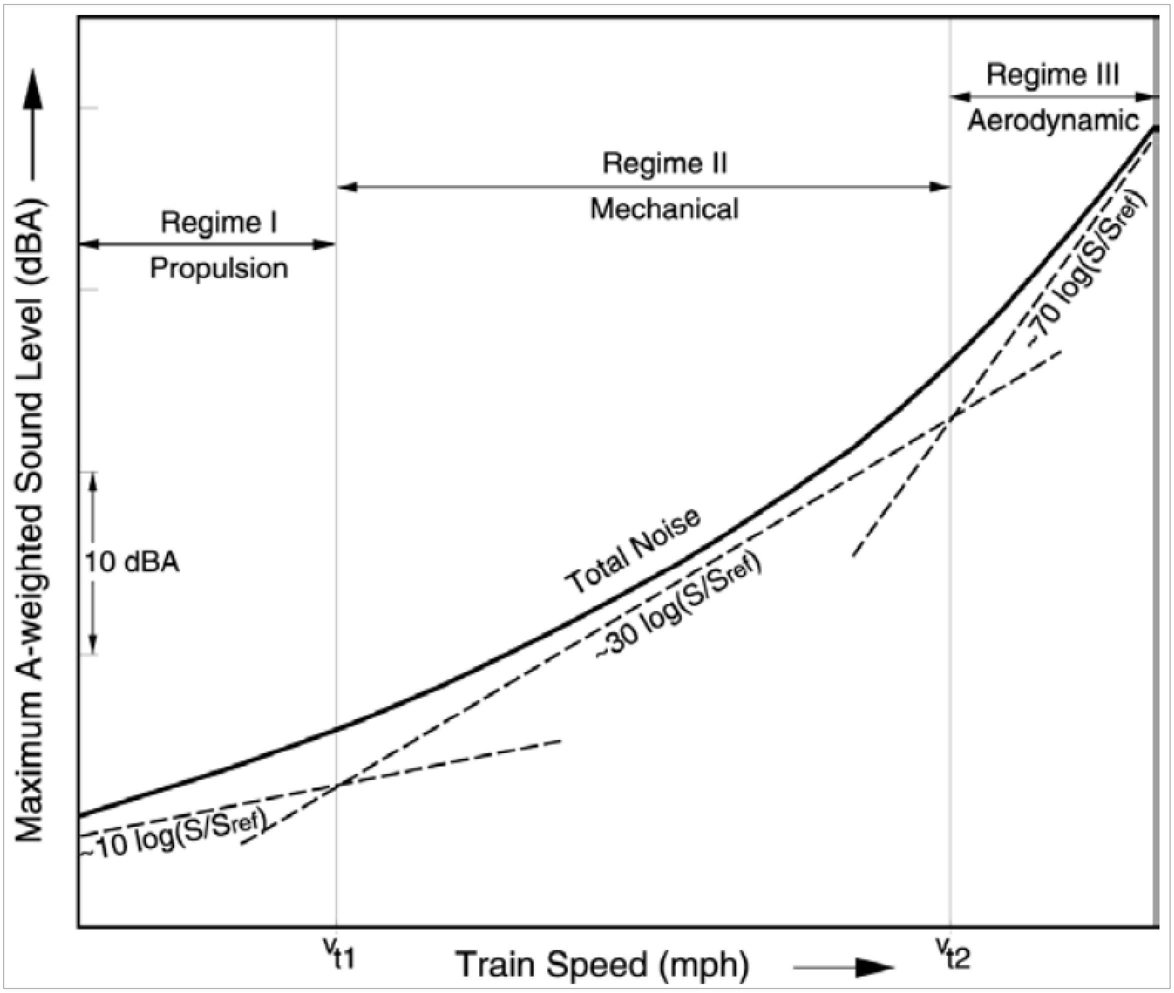
Wheel-rail: Noise generated by the contact and motion of train wheels on the steel rails of the track.

Wheel Region: The wheels and axles of each high-speed train car.

Pantograph: An apparatus mounted to the roof of an electric train to collect power from an overhead catenary wire.

These three different regimes are involved in predicting noise levels. 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 associated with the propulsion of the train (Regime I). Internal cooling fans are located near the power units at approximately 10 feet above the rails and dominate noise levels around the frequency spectrum near 1,000 hertz (Hz) (or 1 kilohertz) when the train is in motion, and 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, most of the noise falls into the frequency range from two to four kilohertz. The majority of the vibratory effects from HSR result 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) becomes a part of the overall noise level. Substantial contributions to the overall noise level from aerodynamic noise begin at 180 mph. Aerodynamic noise is generated by the airflow around the train. Discontinuities in the surface along the length of the train and inter-coach gaps are among the structural components that contribute to aerodynamic noise.

Figure 3.4-6 illustrates the generalized sound-level dependence on speed for the three regimes. V_t represents the speed of the train at which one 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 3.4-6 Regime Sound Level Dependence on Speed

The reference SEL, length, and speed relationship for each noise subsource generated by the train are used to find the total noise level propagating from the train. The source reference level is established at a given distance. Generalized noise levels need to be established for each subsource under a fixed set of operating conditions. Table 3.4-9 lists five different types of systems commonly used for determining sound levels generated by HSR. The reference SEL for each subsource is given at a reference distance of 50 feet from the centerline of the trackway for each of the six proposed Build Alternative alignments. The SEL levels in Table 3.4-9 originate from background measurements and research programs that examined noise levels from different HSR systems throughout the world. For the project, the propulsion and wheel-rail source noise levels come from the high-speed electric multiple unit (EMU) components presented in Table 3.4-9. For aerodynamic noise, the very-high-speed electric components are used to predict the project's noise levels.

Table 3.4-9 Source Reference Sound Exposure Levels (at 50 feet)

System Category	Sub-source Component	Subsource Parameters		Reference Quantities			
		Length Definition (len)	Height above Rails (feet)	SELref (dBA)[1]	Lenref (feet)	Sref (mph)	Speed Adjustment Constant (K)
HS EMU	Propulsion	len_{power}	2	86	634	--[2]	--[2]
	Wheel-rail	len_{train}	1	91	634	90	20
VHS EMU	Propulsion	len_{power}	2	86	634	--[2]	--[2]
	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	--[3]	180	60

Source: FRA, 2012
[1] The SELref values 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.
[2] Source level is not adjusted for train speed; hence, K=0.
[3] Source level is not adjusted for train length.
Aero = aerodynamic; Authority = California High-Speed Rail Authority; dBA = A-weighted decibel; FRA = Federal Railroad Administration; HS EMU = high-speed EMU (maximum speed 150 mph); K = speed adjustment constant; len = length; len_{power} = length of power car; Len_{ref} = referenced source length; len_{train} = length of train; mph = miles per hour; SELref = reference sound exposure level; Sref = reference speed; VHS EMU = very-high-speed EMU (maximum speed 250 mph)

Operating Conditions

Project 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 3.4-9 are used only as a reference in helping determine the predicted project SEL values for given speeds. 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 operating conditions:

- Number of passenger cars in the train, N_{cars} = 0 for this project (all cars are powered)
- Number of power units in the trains, N_{power} = 8 for this project (EMU power units)
- Length of one passenger car, $ulen_{car}$ (not applicable to this project)
- Length of one power unit, $ulen_{power}$ = 82.5 feet (EMU vehicles)
- Train speed in mph, S (varies by location, with maximum of 220 mph)
- Number of operations per hour for both daytime and nighttime, based on the operating schedule provided by the Authority

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 the Palmdale to Burbank Project Section, it is assumed that there would be 189 trains per day in each direction during the daytime hours (7:00 a.m. to 10:00 p.m.), 28 trains per day in each direction during the nighttime hours (10:00 p.m. to 7:00 a.m.), and 14 trains in each direction during the peak hours.

Propagation of Noise to Receivers

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

The distance between each subsource on train and noise-sensitive receivers has a unique effect on how the noise levels attenuate. Figure 3.4-7 shows the attenuation over distance for both point sources and line sources from a high-speed train. For point sources, noise levels are attenuated by 6 dB per doubling of distance. Each subsource on the HSR radiates individually as a point source. Most of the individual subsources 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.

The cross-section geometry between the subsource and the receiver is significant in determining the SEL-distance relationship. Sound attenuation resulting from ground absorption would increase as the distance between the subsource and receiver increases. The heights of both the receivers and the subsources, 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 over the distance between subsource and noise-sensitive receiver depends on the direct line of sight from one to the other and the average height between the two. As the average height decreases, the ground absorbs more noise generated by propulsion subsources and wheel-rail interaction. Ground absorption does little to attenuate aerodynamic noise.

Shielding due to terrain and to the introduction of noise barriers are important components in determining the propagation of noise to noise-sensitive receivers. If a line of sight exists from a subsource 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, ground absorption provides less attenuation, but additional attenuation would result from the break in the line of sight. The line of sight may be broken by intervening noise barriers and/or uneven terrain features in the natural topography, which allow for shielding along the noise-propagation path.

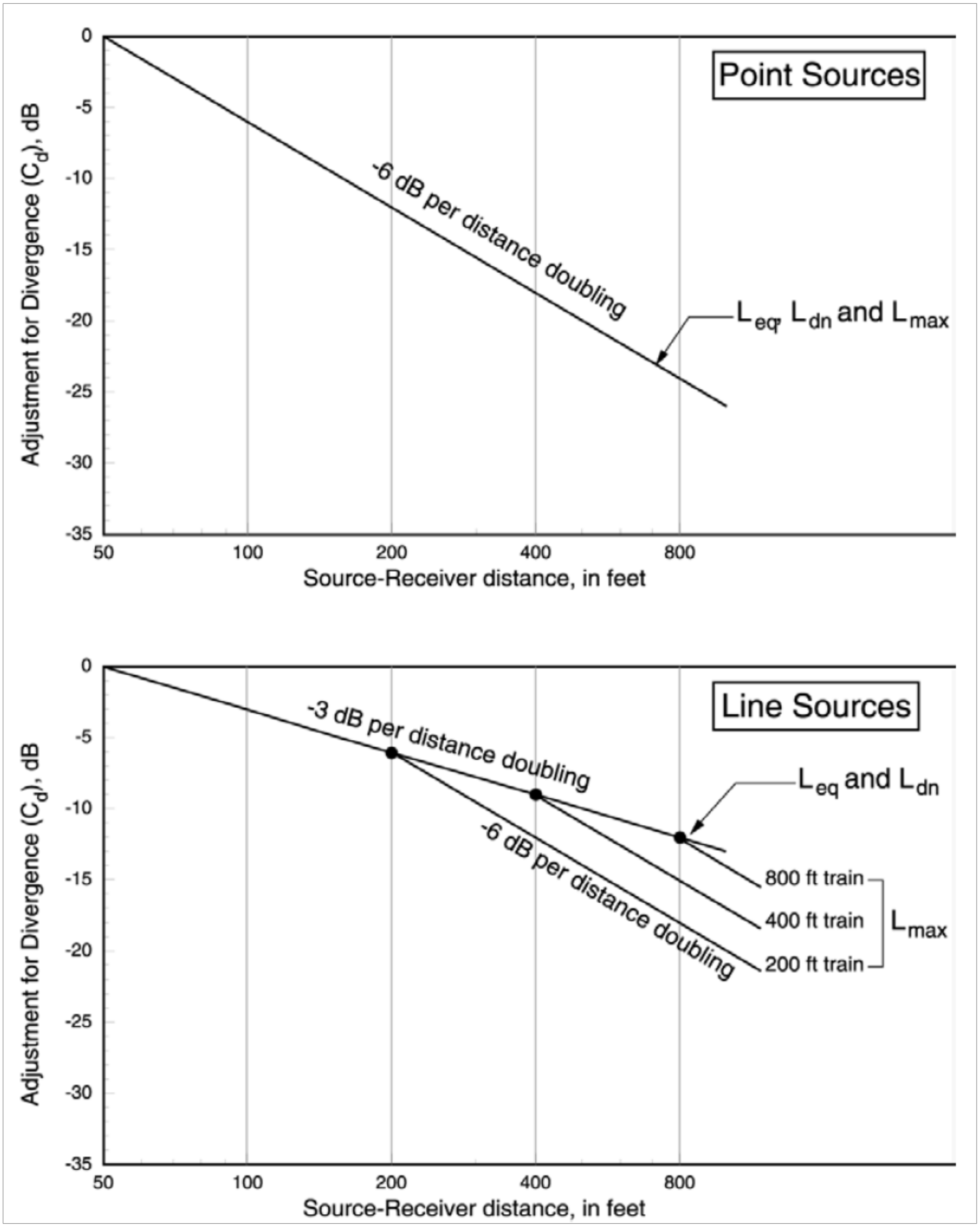
An SEL-versus-distance relationship can be established for the three HSR subsources. The total noise exposure at specific noise-sensitive receivers can be determined by using the distance from each subsource to the noise-sensitive receiver, the amount of ground absorption, the amount of attenuation provided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

Cumulative Noise Exposure

Cumulative noise exposure in this context refers to the noise exposure of the Palmdale to Burbank Project Section in combination with other past, present, and reasonably foreseeable future projects. Because FRA project noise assessment is based on a comparison of existing noise with the Palmdale to Burbank Project Section noise levels, all past and current projects are already considered, on a cumulative basis, in the existing noise levels and are accounted for in the direct effects of the Palmdale to Burbank Project Section.

Benchmark Test to Validate Noise Prediction Modeling

To calculate the future noise level from proposed California HSR System operations, the noise parameters and equations within the FRA guidance (FRA 2012) were compiled into a usable, coded noise model. During development of the model, the Authority established a series of input parameters and output results to which the noise model could be compared for accuracy. This benchmark test to validate the noise model is discussed further in the Noise and Vibration Technical Report (Authority 2019).



Source: FRA, 2012

Figure 3.4-7 Attenuation Due to Distance (Divergence)

Vibration Criteria

Vibratory motion of the ground at a specific location caused by the passage of HSR may result in two forms of human annoyance, as discussed previously (FTA 2018; FRA 2012). Ground-borne vibration is tactile movement of the ground and/or structures, and 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 passes within a given time period).

As with train passage, construction activity can 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.

Federal Railroad Administration Guidance

The FRA guidance (FRA 2012), which acknowledges the FTA guidance (FTA 2018) as its basis, provides ground-borne vibration and noise criteria for a general assessment, as shown in Table 3.4-10. These levels represent the maximum vibration level for a train event (a train passing by). In addition, the FRA guidance provides criteria for special buildings that are very sensitive to ground-borne noise and vibration, as shown in Table 3.4-11.

Table 3.4-10 Ground-Borne Vibration and Noise Impact Criteria

Land-Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 micro-in/sec)			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 = more than 70 vibration events of the same kind per day
[2] Occasional events = between 30 and 70 vibration events of the same kind per day
[3] Infrequent events = 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 decibel; FRA = Federal Railroad Administration; N/A = not applicable; VdB = vibration velocity level

Both Table 3.4-10 and Table 3.4-11 differentiate the vibration impact threshold depending on the number of vibration events per day. The data in Table 3.4-10 show that fewer than 30 vibration events per day are considered to be infrequent, 30 to 70 vibration events to be occasional, and more than 70 events to be frequent. Further, the data in Table 3.4-11 show that fewer than 70 vibration events per day are considered to be occasional or infrequent and more than 70 events to be frequent.

Table 3.4-11 Ground-Borne Vibration and Noise Impact Criteria for Special Buildings

Type of Building or Room	Ground-borne Vibration Impact Levels (VdB re 1 micro-in/sec)		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

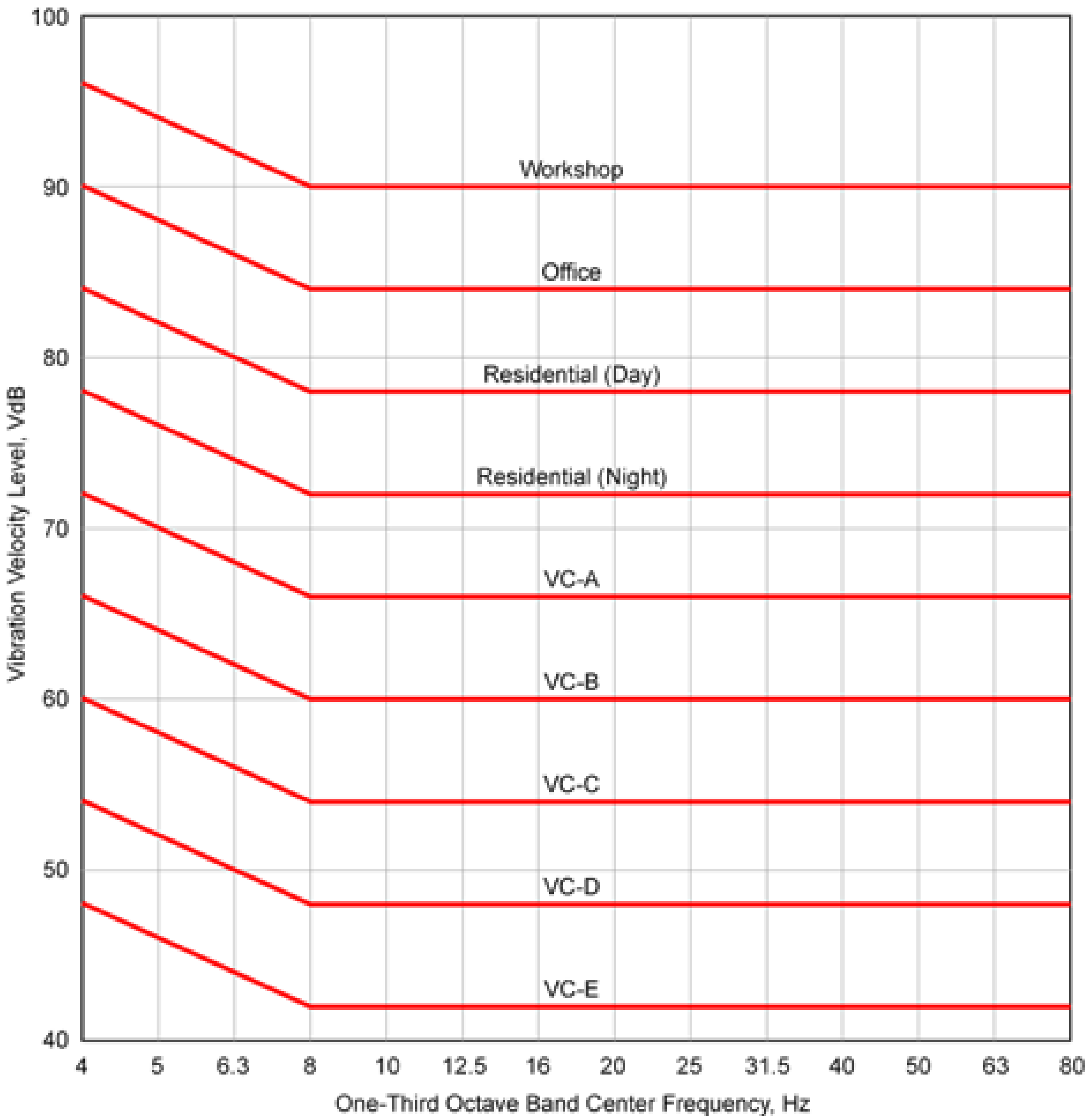
Source: FRA, 2012
[1] Frequent events = more than 70 vibration events per day
[2] Occasional or infrequent events = fewer than 70 vibration events per day
dBA = a-weighted decibel; FRA = Federal Railroad Administration; in/sec = inches per second; VdB = vibration velocity level

More refined impact criteria are required for a detailed vibration analysis than for a general assessment. The criteria for a detailed vibration assessment are expressed in terms of one-third octave band frequency spectra, based on international and industry standards. FRA criteria for a detailed vibration assessment are shown on Figure 3.4-8, below, and descriptions of the curves are shown in Table 3.4-12.

One-Third Octave Band Frequency Spectra

An octave band is a range of frequency at which the highest frequency amounts to double the lowest frequency. A one-third octave band divides the audio spectrum into 31 octave bands.

The curves on Figure 3.4-8 are applied to the projected vibration spectrum for the project. If the vibration level at any one frequency exceeds the criteria, there is impact. Conversely, if the entire proposed vibration spectrum of the project is below the curve, there is no impact.



Source: FRA, 2012

Figure 3.4-8 Federal Railroad Administration Detailed Ground-borne Vibration Impact Criteria

Table 3.4-12 Interpretation of Vibration Criteria for Detailed Analysis

Criterion Curve[1]	Max Lv(VdB)[2]	Description of Use
Workshop	90	Distinctly feelable vibration; appropriate to workshops and non-sensitive areas
Office	84	Feelable vibration; appropriate to offices and non-sensitive 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 low-sensitivity equipment
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 (1,000X), 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: Authority, 2019
[1] See Figure 3.4-8
[2] As measured in one-third-octave bands of frequency over the frequency range of 8 to 80 Hz.
VC-A through D = defined in Figure 3.4-8; Lv: the vibration velocity level in dB; Authority = California High-Speed Rail Authority; dB = decibel; Hz = hertz; VdB = vibration velocity level

Determining Existing Vibration Conditions

One factor not incorporated in the relevant criteria and guidance 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 noise events. However, HSR projects commonly use parts of existing rail corridors (not necessarily sharing tracks). The criteria given in Table 3.4-10 and Table 3.4-11 do not indicate how to account for existing vibration, a common situation for HSR projects using existing rail right-of-way. FRA and FTA have incorporated the following methods of handling various representative scenarios:

- **Infrequently used rail corridor**—Use the vibration criteria in Table 3.4-10 and Table 3.4-11 when the existing rail traffic consists of four or fewer trains per day.
- **Moderately used rail corridor**—If the existing rail traffic consists of 5 to 12 trains per day with vibration that substantially exceeds the impact criteria, there is no impact as long as the project vibration levels estimated using the procedures outlined in either Chapter 8, Preliminary Vibration Assessment, or Chapter 9, Detailed Vibration Assessment, of the FRA guidance (FRA 2012) are at least 5 VdB less than the existing vibration. Vibration from

existing trains could be estimated using the general assessment procedures in Chapter 8 of the FRA guidance; however, measuring vibration from existing train traffic is usually preferable.

- **Heavily used rail corridor**—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 significant), there would not be additional impact unless the project-generated vibration, estimated using the procedures of Chapters 8 or 9 of the FRA guidance (FRA 2012), would be higher than the existing vibration. In locations where the new trains would be operating at much higher speeds than existing rail traffic, HSR would likely generate substantially higher levels of ground-borne vibration. When a project would cause vibration more than five VdB greater than the existing source, the existing source can be ignored, and the vibration criteria in Table 3.4-10 and Table 3.4-11 can be applied to the project.
- **Moving existing tracks**—Another scenario where existing vibration can be significant is a new HSR line within an existing rail right-of-way that would require shifting the location of existing tracks. Where the track relocation would cause higher vibration levels at sensitive receivers, the projected vibration levels from both rail systems must be compared to the appropriate impact criterion to determine whether there would be a new impact. If an impact is judged to have existed prior to moving the tracks, new impacts would be assessed only if the relocation results in more than a three VdB increase in vibration level. Although the impact thresholds given in Table 3.4-10 and Table 3.4-11 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 the locomotive vibration only lasts for a few seconds, the infrequent event limit is appropriate; however, 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 ensure 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 limits are appropriate.

Federal Transit Administration Guidance

The FTA guidance (FTA 2018) forms the basis of the FRA guidance (FRA 2012) and uses the same criteria for ground-borne vibration and noise.

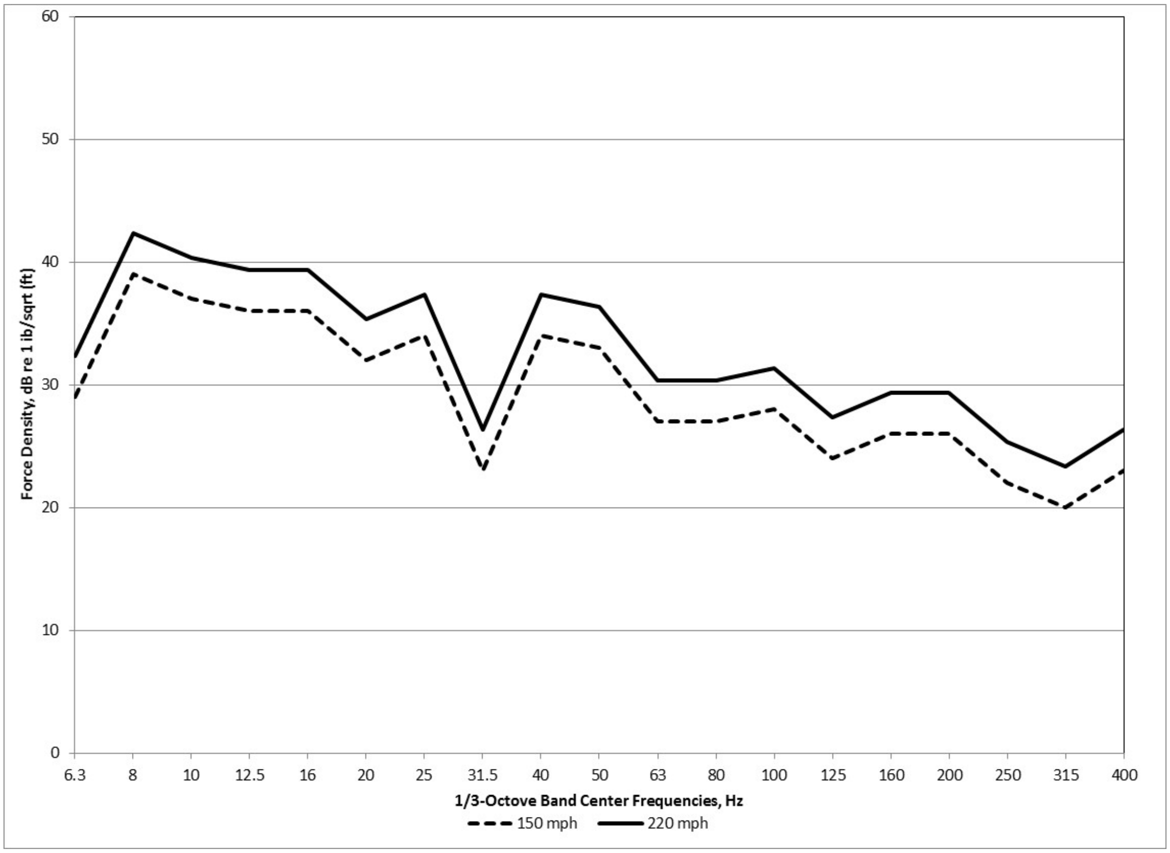
Detailed Vibration Assessment

The vibration impact and mitigation analyses for the Palmdale to Burbank Project Section were conducted using methodology from Chapter 9, Detailed Vibration Assessment, of the FRA guidance (FRA 2012). A detailed vibration assessment per the FRA guidance consists of the following:

- Surveying the effect of local ground conditions on future vibration levels
- Predicting future vibration and vibration impacts
- Developing mitigation measures to be included as part of the noise and vibration section of an EIR/EIS

Predicting Future Vibration and Vibration Impacts

Ground-borne vibration levels from California HSR System operations were projected using the detailed vibration assessment prediction methods included in the FRA guidance (Chapter 9, Detailed Vibration Assessment). The train vibration source level was based on the force density level for a comparable HSR project. This force density spectrum was combined with the line source transfer mobility data at each vibration measurement site to project ground vibration levels from future California HSR System operations using FRA detailed vibration analysis methodology. The vibration levels were adjusted from the 150 mph specified in the force density curve speed using the speed adjustment in the FRA guidance (FRA 2012), shown on Figure 3.4-9.

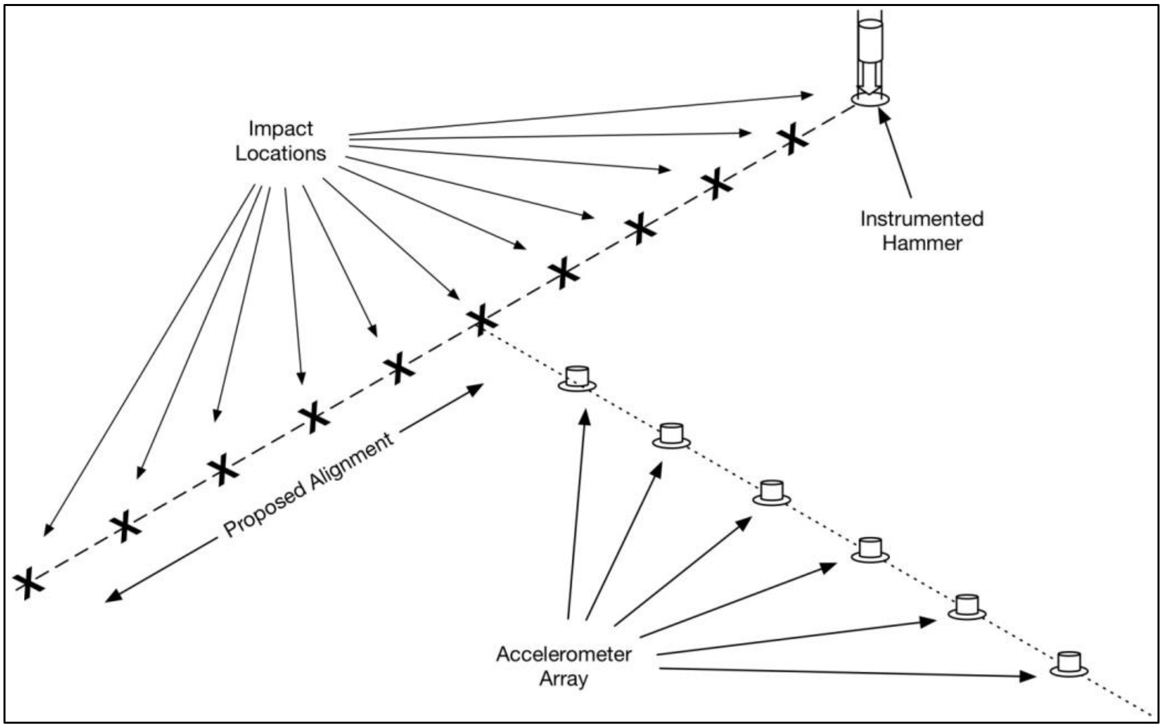


Source: FRA, 2012

Figure 3.4-9 Force Density for High-Speed Train at 150 and 220 MPH

Surveying the Existing Vibration Conditions

Ground-borne vibration tests were performed at representative locations along the six Build Alternatives to determine the vibration transmission characteristics of the ground near vibration-sensitive locations. The vibration propagation test procedure is shown schematically on Figure 3.4-10. An instrumented hammer was used to generate impulses at specific locations, spaced 15 feet apart along a line on, or parallel to, the proposed Build Alternative alignment. A line of accelerometers (typically six, spaced on 25-foot intervals) was placed perpendicular to the line of impacts as shown in 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.



Source: Authority, 2016

Figure 3.4-10 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 mobility data.
- 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.

Station Noise Methodology

The FTA guidance establishes screening distances for stations and station components such as parking facilities. A screening assessment was conducted for station facilities, and a noise assessment was conducted for any locations where the screening showed a potential for impact. One station is proposed at the Hollywood Burbank Airport. Construction of the station would entail a shift in the Metrolink tracks at San Fernando Road near the Burbank Airport Station.

Traffic and Grade-Separation Noise Criteria

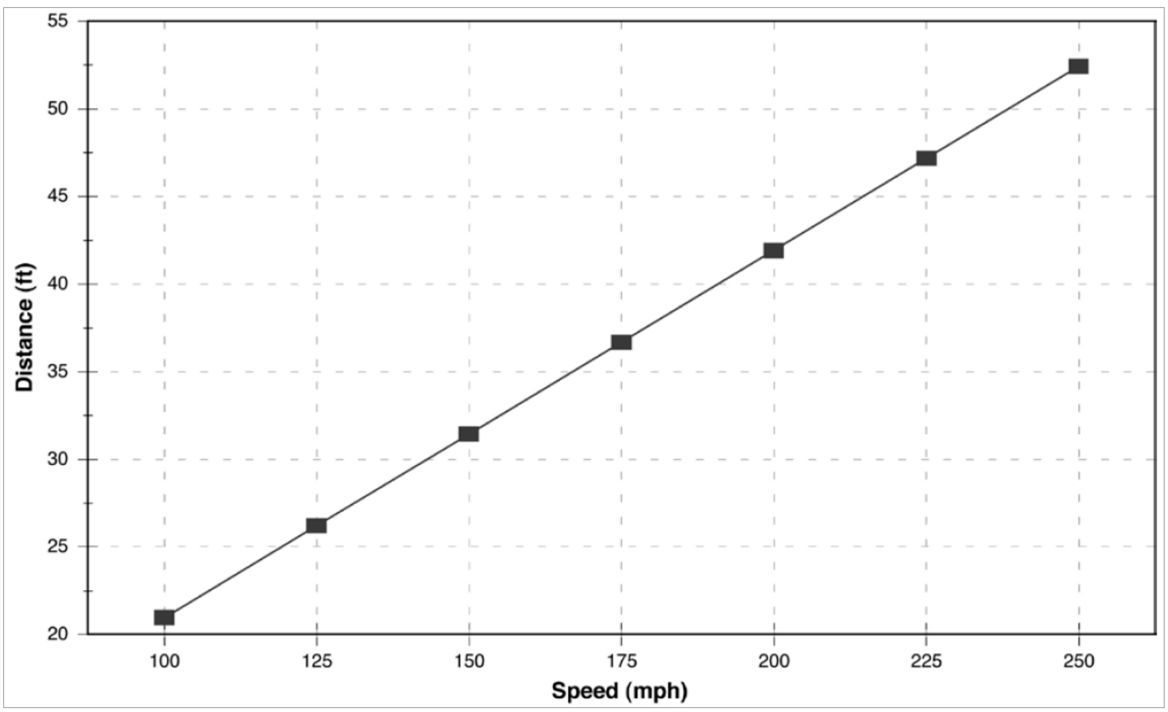
The Caltrans Traffic Noise Analysis Protocol (Caltrans 2011) and the Technical Noise Supplement (Caltrans 2013) establish guidelines for construction of noise barriers along highways where sensitive receivers are located. The Caltrans Technical Noise Supplement specifies parameters such as barrier dimensions, locations, type of barriers, and standard aesthetic treatments. Under FHWA and Caltrans policies, noise barriers should be considered for transportation improvement projects when the following criteria are met:

- The predicted worst-case hourly traffic noise level is expected to approach or exceed the FHWA NAC (e.g., 67 dBA L_{eq} for residences or other Category B land uses) or increase ambient noise levels substantially. Caltrans considers an increase of 12 dBA above the existing noise level to be substantial. Under current Caltrans policy, a noise level of 66 dBA is considered to be approaching the NAC of 67 dBA.
- A feasible noise barrier must provide a minimum noise reduction of 5 dBA to achieve a noticeable change in noise level.

Annoyance and Startle Effects Due to Rapid Onset Rates

As a train approaches a noise-sensitive receiver, the noise level suddenly increases. The speed with which a train approaches and passes by a receiver is referred to as a “rapid onset rate.” Train noise from rapid onset rates may cause annoyance and startle effects for noise-sensitive human and wildlife receivers. With very fast-moving trains, noise-sensitive receivers tend to be startled or surprised by the sudden approaching sound. For the purpose of analyzing noise startle effects, a unit of one train pass-by was used and is referred to in this document as a “single noise event.”

FRA has developed a distance-versus-level chart for which startle effects can occur. 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. Figure 3.4-11 shows that, for a given distance, onset rates increase at noise-sensitive receivers as the speed of the train increases. For a given speed, onset rates decrease as the distances from the trains to the noise-sensitive receivers increase.



Source: FRA, 2012

Figure 3.4-11 Distance from Tracks for Human Startle Response to High-Speed Rail Noise

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.

Domestic Animal and Wildlife Effects Methodology

The impact of noise on domestic animals and wildlife involves a number of parameters. One of the most apparent is the potential for communication masking. Wild animals depend 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 show a high degree of frequency selectivity and vocalize within a much higher frequency range than most rail noise produces.

Studies by the San Diego Association of Governments have evaluated the potential for birdsong-masking by traffic noise. These studies recognize that continuous noise levels above 60 dBA L_{eq} within habitat areas can affect the suitability of the habitat (San Diego Association of Governments 1988). Many regulatory agencies recommend that 60 dBA L_{eq} be considered an impact at the edge of suitable habitat.

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 special-status wildlife species along the proposed six Build Alternative alignments are identified in Section 3.4.5.5. Other nonprotected species of wildlife may also be present in natural areas along the project corridor and could therefore be affected by the project. Impacts to wildlife from noise and vibration are discussed in Section 3.7. Domestic animals are anticipated to generally be co-located with residential land uses, with the exception of equestrian facilities. The following public equestrian facilities have been identified:

- Pacific Crest Trail (Refined SR14 Build Alternative only)
- Vasquez Rocks Natural Area Park (Refined SR14 and SR14A Build Alternatives only)
- Hansen Dam Recreation Area (E2 and E2A Build Alternatives only)
- Stonehurst Park and Recreation Center (E2 and E2A Build Alternatives only)

Additionally, there are private equestrian facilities, particularly near the Southern California Edison (SCE) Vincent Substation in Acton and the Shadow Hills area. 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.

Startle Effects

The FRA Noise and Vibration Manual includes several parameters for addressing the startle effects of California HSR System operations on domestic animals and wildlife. Recent research has indicated that because the “startle effect” occurs with each single pass-by of a train, SEL values at animal noise-sensitive receivers are a very useful indicator of the expected type of response from specific types of animals (FRA 2012). Table 3.4-13 lists 100 dBA SEL for all domestic and wild birds and mammals as an effective criterion for determining impacts of a train pass-by. All domestic animals and wildlife located near the project corridor may be affected when trains pass by if the animals are subjected to SEL values of 100 dBA or higher.

Table 3.4-13 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
Wild	Mammals	SEL	100
	Birds	SEL	100

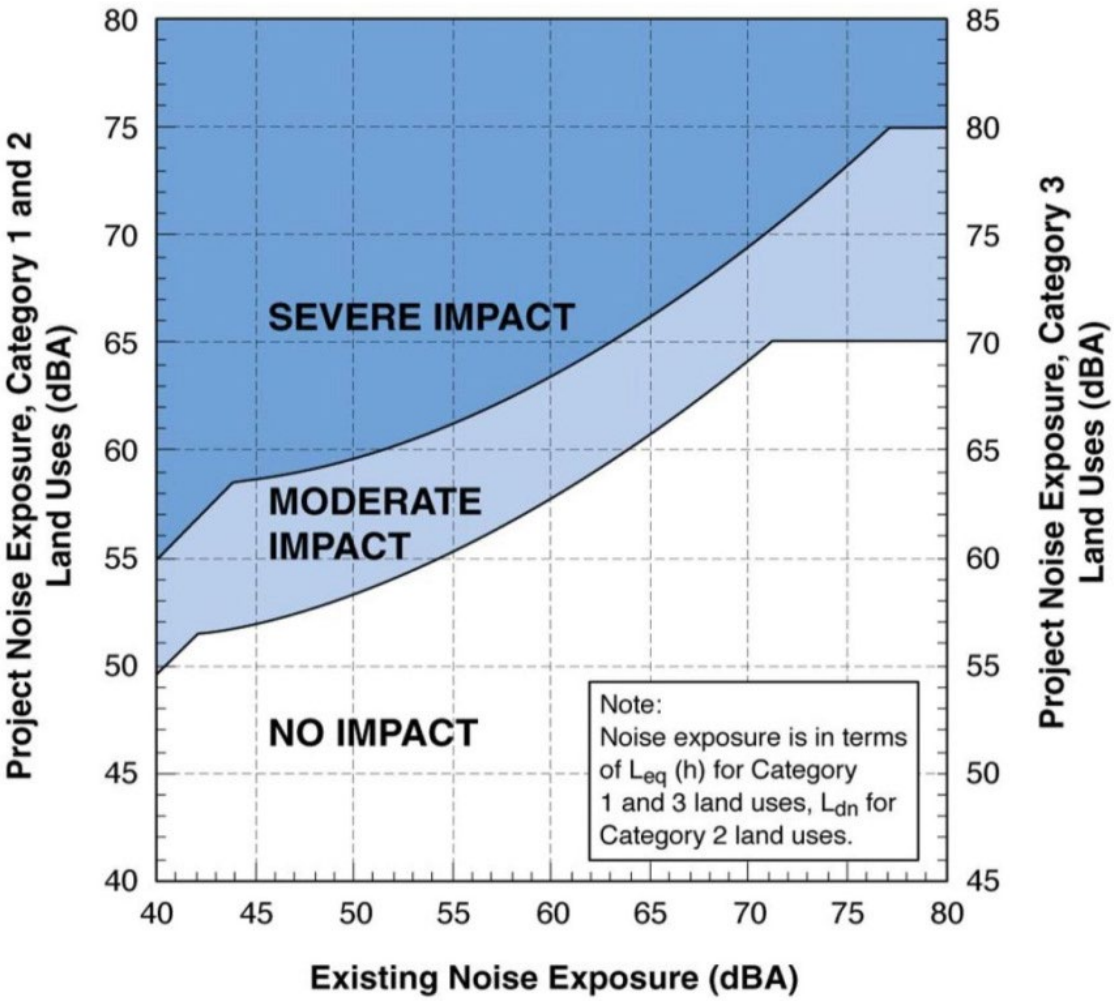
Source: FRA, 2012
Screening distance was established for startle effects on domestic animals and wildlife using FRA guidance on screening distances for human startle effects, as shown in Figure 3.4-11. Based on FRA screening distances and a maximum train speed of 220 mph, startle effects could occur within 40 to 50 feet of the right-of-way where domestic and wild animals are present.
dBA = A-weighted decibels; FRA = Federal Railroad Administration; mph = miles per hour’; SEL = sound exposure level

3.4.4.4 Method for Evaluating Impacts under NEPA

CEQ NEPA regulations (40 C.F.R. Parts 1500–1508) provide the basis for evaluating project effects (refer to Section 3.1.4.4, in Section 3.1, Introduction). As described in Section 1508.27 of these regulations, the criteria of context and intensity are considered together when determining the severity of the change introduced by the Palmdale to Burbank Project Section. “Context” is defined as the affected environment in which a proposed project occurs. “Intensity” refers to the severity of the effect, which is examined in terms of the type, quality, and sensitivity of the resource involved; location and extent of the effect; duration of the effect (short- or long-term); and other considerations of context. Beneficial effects are also considered. When no measurable effect exists, no impact is found to occur. For the purposes of NEPA compliance, the same methods used to identify and evaluate impacts under CEQA are applied here.

FRA and FTA guidelines were used to assess in detail noise and vibration effects at sensitive receivers. Criteria used in evaluating noise and vibration effects under NEPA are provided in Table 3.4-10, Table 3.4-11, Table 3.4-12, and Table 3.4-13. The Caltrans Traffic Noise Analysis Protocol (Caltrans 2011) and the Technical Noise Supplement (Caltrans 2013) guidelines were used to assess impacts from relocation of major roadways. Exceedance of recommended limits in the FRA, FTA, and Caltrans guidance were assessed to determine effects under NEPA.

Depending on the magnitude of the proposed project’s noise increase, FTA and FRA categorize effects as: (1) no impact, (2) moderate impact, or (3) severe impact. A severe impact is defined as the level at which a substantial 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. Figure 3.4-12 depicts the impact categories.



Source: FRA, 2012

Figure 3.4-12 Noise Impact Criteria for High-Speed Rail Projects

3.4.4.5 Method for Determining Significance under CEQA

The Authority is using the following thresholds to determine if a significant impact from noise and vibration would occur as a result of the California HSR System. A significant impact 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
- Expose people residing or working in the project area to excessive noise levels 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

Of these guidelines, the first two items are applicable to the California HSR System and were considered in the analysis presented in this Draft EIR/EIS. The last guideline is included because the Hollywood Burbank Airport is within the RSA. However, because the Build Alternative alignment would be in a tunnel near this medium-hub commercial airport, there would be no increase in noise where the airport generates noise (i.e., at the end of the runway).

As discussed in Section 3.4.4.3, Methods for NEPA and CEQA Impact Analysis, this analysis relies on noise and vibration standards developed by FTA and FRA to determine whether the project would result in significant noise or vibration impacts. These noise impact standards 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 and potential for physical damage. FRA standards were developed specifically to assess 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 C.F.R. Part 772), which are implemented by Caltrans through its Caltrans Traffic Noise Analysis Protocol (Caltrans 2011). 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 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 and noise abatement criteria. Therefore, the criteria provided in these documents serve as appropriate thresholds for determining whether traffic noise associated with the California HSR System would result in a significant impact.

3.4.5 Affected Environment

The project traverses a variety of land uses and ecoregions, including urban, rural, and mountainous terrain. Sources of existing noise along the six proposed Build Alternative alignments include passenger and freight trains, roadway traffic, aircraft, and local community sources.

3.4.5.1 Noise

Noise-Sensitive Receivers

Noise-sensitive receivers within the noise RSA that would be affected by project-related noise were identified through a review of existing noise-sensitive land uses (residences, schools, parks, libraries, and hospitals, etc.) within the appropriate noise impact screening distances. Screening distances were used to narrow the area within which noise-sensitive receivers could be impacted by the project. FRA screening distances for noise impacts are based on existing land uses and the speed at which the California HSR System is expected to operate in the future.

> *Obstructed and Unobstructed Views*
>
> The area between a noise source and a sensitive receiver can have a noise-reducing effect. For example, if there are buildings between a residence and HSR track, the buildings will block some amount of noise (obstructed view). Conversely, if a residence has a clear view of an HSR track (no structures are between the residence and the track), noise can travel freely from the track to the residence (unobstructed view).

For purposes of screening noise impact distances, existing noise environments are defined by the existence of rail corridors, the existing background noise environment based on the nearby population density (urban, suburban, or rural), and whether the noise-sensitive receiver has an obstructed or unobstructed view of a Build Alternative. Existing noise environments where there is a current rail corridor have smaller screening distances than existing noise environments that lack a current rail corridor. Urban and noisy suburban existing noise environments have smaller screening distances than do quiet suburban and rural areas. Unobstructed noise-sensitive receivers have larger screening distance than noise-sensitive receivers that have obstructed views of the potential noise source.

Screening distances also change based on the future speed of a high-speed train. Trains moving at speeds up to 100 mph have a smaller screening distance than trains moving at speeds up to 200 mph.

Sensitive Receivers

Noise-sensitive receivers were identified by mapping existing noise-sensitive land uses, including residences, schools, parks, libraries, recording studios, and hospitals. Therefore, in this analysis a noise-sensitive receiver does not represent an individual person, but rather a noise-sensitive structure such as a residence or a school.

Table 3.4-14 shows the noise screening distances used for the noise RSA based on typical screening distances as defined by FRA and project-specific factors of the Palmdale to Burbank Project Section. The existing environment varies throughout the corridor, so the “existing rail corridor, quiet suburban/rural” land-use condition was used as a starting point to establish screening distances, because this land use is most noise-sensitive. Areas in which noise impacts were identified extending to 1,200 feet were analyzed out to farther distances until noise impacts were no longer detected, up to 1,800 feet.

Noise measurement locations are shown on Figure 3.4-13 and Figure 3.4-14, and detailed mapping of noise effect locations is provided in Appendix E of the Noise and Vibration Technical Report (Authority 2019).

Table 3.4-14 Noise Screening Distances for Noise Assessments

Existing Noise Environment	Screening Distance for HSR (feet)[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 alignment centerline. Minimum distance is assumed to be 50 feet.
[2] Rows of buildings are assumed to be at 200, 400, 600, 800, and 1,000 feet away, parallel to the alignment.
FRA = Federal Railroad Administration; HSR = high-speed rail; mph = miles per hour

Along the proposed Build Alternative alignments, appropriate noise impact screening distances depend on the existing noise environment and maximum future speed of the trains at that location. Ambient noise level measurements were conducted at specific noise-sensitive receiver locations for each type of existing noise environment to define the current ambient noise levels.

Along the Build Alternative alignment within the established screening distances, noise-sensitive areas (NSA) were determined based on existing land use and noise levels. A total of 17 NSAs were identified for the Refined SR14 Build Alternative, 15 for the SR14A Build Alternative, 17 for the E1 Build Alternative, 17 for the E1A Build Alternative, 17 for the E2 Build Alternative, and 17 for the E2A Build Alternative.

Measured Noise Levels

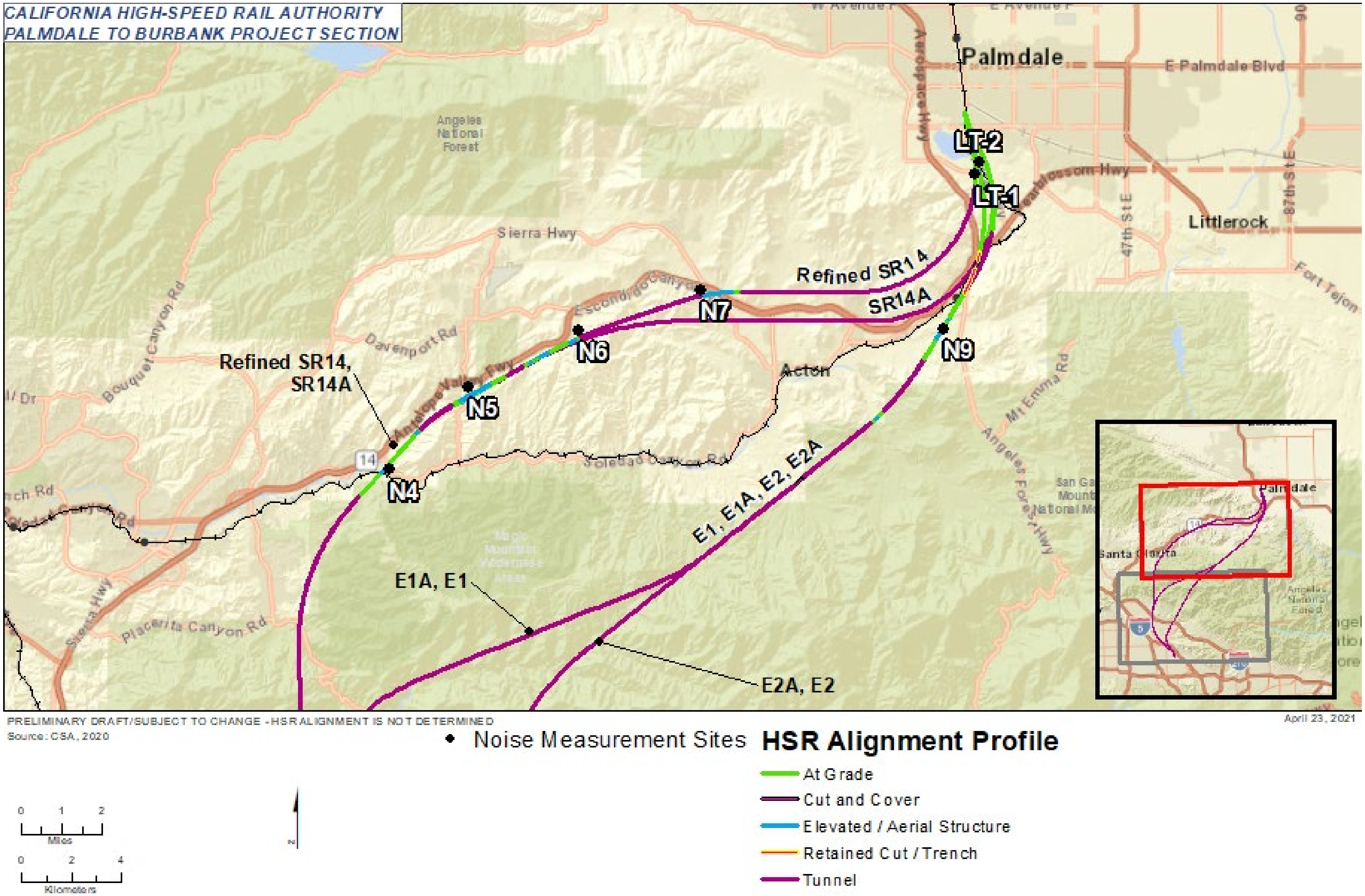
To characterize the existing noise conditions at particular NSAs, ambient noise measurements were conducted at 23 sites in the noise RSA along the proposed Build Alternative alignments. Long-term (24-hour) measurements were made at 10 sites (labeled as “LT” in Table 3.4-15) and short-term (1-hour to 3-hour) measurements were made at 8 sites (labeled with “N” in Table 3.4-15). Noise measurement locations are shown on Figure 3.4-13 and Figure 3.4-14. Short-term noise level measurements were made in areas not covered by the long-term noise level measurement locations. The nearest representative long-term noise level measurement was used to estimate the L_{dn} noise level at each short-term noise level measurement location. Descriptions of the measurement sites are provided in Table 3.4-15.

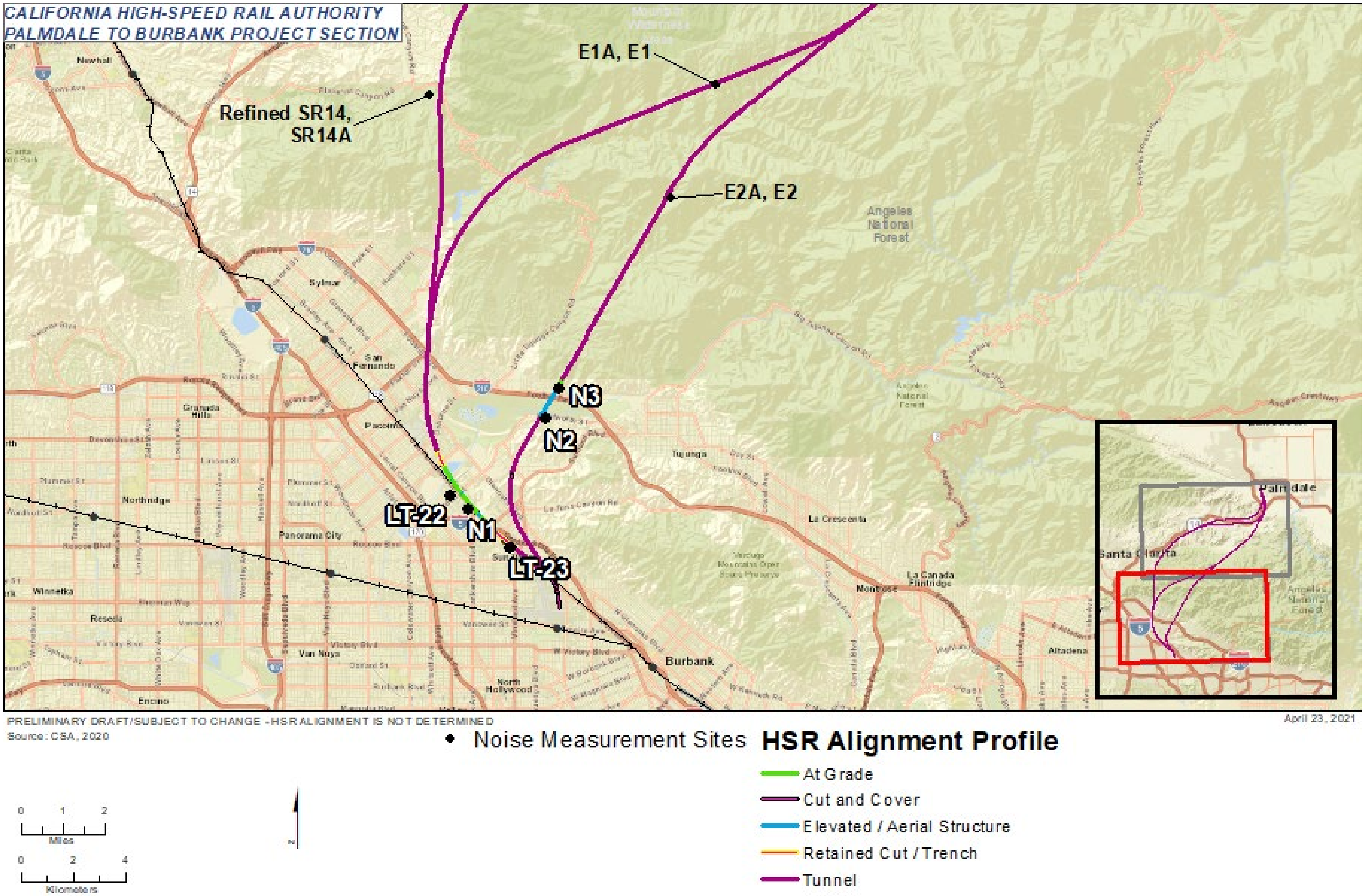
Table 3.4-15 Noise Measurement Locations

Measurement Location ID	Measurement Location	Description
LT1	36350 Burnwell Court	This noise site is representative of all noise-sensitive land uses from East Avenue S to the Soledad Siphon on both sides of the proposed alignment.
LT2	Undeveloped parcel	This noise site is representative of all noise-sensitive land uses from East Avenue S to the Soledad Siphon close to Sierra Highway on the northbound side of the proposed alignment.
LT3	37611 5th Street	This noise site is representative of all noise-sensitive land uses from East Avenue S to Soledad Siphon on both sides of the proposed alignment.
LT22	9318 Tamarack Avenue	This noise site is representative of all noise-sensitive land uses from Truesdale Street to Wicks Street.
LT23	11053 Burton Street	This site is representative of all noise-sensitive land uses from Goss Street to Winona Avenue.
N1	Snelling Street and Ilex Avenue	The noise levels were measured at the southwest corner of Snelling Street and Ilex Avenue. This site is representative of all noise-sensitive land uses from Wicks Street to Lankershim Boulevard.
N2	10730 Wheatland Avenue	The noise levels were measured at the curb in front of the property. This noise site is representative of all noise-sensitive land uses from Wentworth Street to McBroom Street on both sides of the proposed alignment.
N3	10261 Arnwood Road	The noise levels were measured at the north side of the property. This site is representative of all noise-sensitive land uses from BP and L Road to Wentworth Street on both sides of the proposed alignment.
N4	13130 Soledad Canyon Road	The noise levels were measured at the side of the road across from the trailer park. This site is representative of all noise-sensitive land uses from Soledad Canyon Road to Sand Canyon Road on both sides of the proposed alignment.
N5	Agua Dulce Canyon Road and Burke Road	The noise levels were measured at the side of the road across from Burke Road. This site is representative of all noise-sensitive land uses from Agua Dulce Canyon Road to Soledad Canyon Road on both sides of the proposed alignment.

Measurement Location ID	Measurement Location	Description
N6	Branson Street and Big Springs Road	The noise levels were measured at the side of the road across from Branson Street. This site is representative of all noise-sensitive land uses from Big Springs Road to Agua Dulce Canyon Road.
N7	Escondido Canyon Road and Ward Road	The noise levels were measured at the side of Escondido Canyon Road across from Ward Road. This site is representative of all noise-sensitive land uses from Hypotenuse Road to Clanfield Street on both sides of the proposed alignment.
N9	541 Foreston Drive	The noise levels were measured at the side of Foreston Drive. This noise site is representative of all noise-sensitive land uses from Pearblossom Highway to Aliso Canyon Road on both sides of the proposed alignment.

Source: Authority, 2019
Authority = California High-Speed Rail Authority


CALIFORNIA HIGH-SPEED RAIL AUTHORITY
PALMDALE TO BURBANK PROJECT SECTION
Palmdale
E Palmdale Blvd
Aerospace Hwy
LT-2
LT-1
Pearblossom Hwy
Littlerock
47th St E
87th St E
Fort Tejon
Angeles National Forest
Sierra Hwy
Refined SR14
SR14A
N7
N6
N5
N4
N9
Escondido Canyon
Davenport Rd
Antelope Valley Fwy
Refined SR14, SR14A
Acton
Mt Emma Rd
Angeles Forest Hwy
Bouquet Canyon Rd
Soledad Canyon Rd
E1, E1A, E2, E2A
E1A, E1
E2A, E2
Placerita Canyon Rd
Sierra Hwy
14
Palmdale
Santa Clarita
PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
Source: CSA, 2020
April 23, 2021
Noise Measurement Sites
HSR Alignment Profile
At Grade
Cut and Cover
Elevated / Aerial Structure
Retained Cut / Trench
Tunnel
0 1 2
Miles
0 2 4
Kilometers


CALIFORNIA HIGH-SPEED RAIL AUTHORITY
PALMDALE TO BURBANK PROJECT SECTION
E1A, E1
Refined SR14, SR14A
E2A, E2
Angeles National Forest
N3
N2
N1
LT-22
LT-23
Newhall
Sylmar
San Fernando
Pacoima
Granada Hills
Northridge
Panorama City
Tujunga
La Crescenta
La Canada Flintridge
Montrose
Burbank
North Hollywood
Van Nuys
Reseda
Winnetka
Encino
Altadena
Palmdale
Santa Clarita
PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
Source: CSA, 2020
April 23, 2021
Noise Measurement Sites
HSR Alignment Profile
At Grade
Cut and Cover
Elevated / Aerial Structure
Retained Cut / Trench
Tunnel
Miles
Kilometers

3.4.5.2 *Existing Noise Conditions*

The existing noise environment within the noise RSA consists of highway and local traffic, aircraft operations, train operations along the existing freight lines, and local neighborhood activities. Noise levels measured at noise-sensitive land uses throughout the noise RSA ranged from 43 to 67 dBA L_{dn}. These noise levels are typical for suburban and urban settings dominated by vehicular traffic and railroad operations.

For each of the six Build Alternatives, NSAs were identified based on a review of noise-sensitive land uses within the noise RSA. Noise-sensitive land uses include residential, institutional, and some particularly noise-sensitive uses such as recording studios. NSAs are listed below by Build Alternative. Under each Build Alternative, NSAs are presented north to south and broken down by subsection. Where subsections are identical between each of the six Build Alternatives, this is noted in the text.

For each NSA, the following characteristics are described:

- NSA location relative to the proposed alignment
- Distance from the proposed alignment to the nearest noise-sensitive receiver
- Existing noise environment
- Noise measurement location(s) used to determine the existing noise environment

In the tables below, a unique identification number and letter are assigned to each NSA. This system is used to differentiate between each of the six Build Alternatives; however, as described below, NSAs in the Palmdale Subsection and some NSAs in the Burbank Subsection are identical between each of the six Build Alternatives.

A detailed description of each Build Alternative (Refined SR14, SR14A, E1, E1A, E2 and E2A) is provided in Chapter 2, Alternatives. Figure 3.4-13 through Figure 3.4-14 show an overview of each Build Alternative.

Existing noise conditions for the Palmdale Station and Maintenance Facility were evaluated in the Bakersfield to Palmdale Project Section EIR/EIS.

Refined SR14 and SR14A Build Alternatives

Central Subsection

Descriptions of NSAs for the Refined SR14 and SR14A Build Alternatives within the Central Subsection are provided in Table 3.4-16.

Table 3.4-16 Noise-Sensitive Areas – Refined SR14 and SR14A Build Alternatives, Central Subsection

NSA ID	Description	dBA	Closest Noise-Sensitive Receiver (distance from alignment centerline) - Refined SR14	Closest Noise-Sensitive Receiver (distance from alignment centerline) - SR14A	Noise Measurement Location
3cb	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Spruce Court and East Avenue S in Palmdale. Land use is residential with open land between sensitive receivers and each proposed alignment.	65	406 feet	444 feet	LT3

NSA ID	Description	dBA	Closest Noise-Sensitive Receiver (distance from alignment centerline) - Refined SR14	Closest Noise-Sensitive Receiver (distance from alignment centerline) - SR14A	Noise Measurement Location
3cba	This area is on the northbound side of the proposed SR14A Build Alternative alignment bounded by Spruce Court and East Avenue S in Palmdale. Land use is residential with open land between sensitive receivers and the proposed SR14A Build Alternative alignment.	65	-	835 feet	LT3
4c	This area is on the northbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by East Avenue S and Soledad Siphon in Palmdale. Land use is a mixture of institutional and residential.	51	293 feet	283 feet	LT1
5c	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by East Avenue S and Soledad Siphon in Palmdale. Land use is a mixture of institutional and residential.	51	293 feet	343 feet	LT1
6c	This area is on the southbound side of the proposed SR14A Build Alternative alignment bounded by Soledad Siphon and Acton Canyon Road south of Palmdale. Land use is scattered rural housing.	60[1]	-	478 feet	LT1
10c	This area is on the northbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Hypotenuse Road and Clanfield Street. Land use is scattered rural housing.	60[1]	381 feet	-	N7
11c	This area is on the southbound side of the proposed Refined SR14 Build Alternative alignment bounded by Hypotenuse Road and Clanfield Street. Land use is scattered rural housing.	60[1]	534 feet	-	N7

NSA ID	Description	dBA	Closest Noise-Sensitive Receiver (distance from alignment centerline) - Refined SR14	Closest Noise-Sensitive Receiver (distance from alignment centerline) - SR14A	Noise Measurement Location
14c	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Big Springs Road and Agua Dulce Canyon Road. Land use is scattered rural housing.	51–60[1]	186 feet	186 feet	N5/N6
15c	This area is on the northbound side of the proposed Refined SR14 Build Alternative alignment bounded by Agua Dulce Canyon Road and Soledad Canyon Road. Land use is scattered rural housing.	60[1]	46 feet	-	N5
16c	This area is on the northbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Soledad Canyon Road and Sand Canyon Road. Land use is scattered rural housing.	60[1]	374 feet	478 feet	N4
17c	This area is on the southbound side of the proposed Refined SR14 Build Alternative alignment bounded by Soledad Canyon Road and Sand Canyon Road. Land use is scattered rural housing.	60[1]	365 feet	-	N4
26c	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Truesdale Street and Wicks Street in Sun Valley. Land use is a mixture of industrial and residential.	61	218 feet	218 feet	LT22

NSA ID	Description	dBA	Closest Noise-Sensitive Receiver (distance from alignment centerline) - Refined SR14	Closest Noise-Sensitive Receiver (distance from alignment centerline) - SR14A	Noise Measurement Location
27c	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Wicks Street and Lankershim Boulevard in Sun Valley. Land use is a mixture of commercial and residential.	53[1]	245 feet	245 feet	N1
28ca	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Goss Street and Olinda Street in Sun Valley. Land use is a mixture of commercial and residential.	58	172 feet	172 feet	LT23

Source: Authority, 2019
[1] Noise levels were measured for three different hours – 1 hour during the daytime, 1 hour during the nighttime, and 1 hour during peak-travel time.
Notes: Unless otherwise specified, noise levels were measured for 24 hours at each location (Ldn).
Authority = California High-Speed Rail Authority; dBA = A-weighted decibel; L_{dn} = day-night sound level; NSA = noise-sensitive area

Burbank Subsection

This portion of the Refined SR14 and SR14A Build Alternative alignments would be in a tunnel throughout the area, so this portion of the project would not have the potential to change the existing noise environment at the surface. Therefore, NSAs were not identified in this subsection.

E1 and E1A Build Alternatives

Central Subsection

Descriptions of NSAs for the E1 and E1A Build Alternatives within the Central Subsection are provided in Table 3.4-17.

Table 3.4-17 Noise-Sensitive Areas – E1 and E1A Build Alternatives, Central Subsection

NSA ID	Description	dBA	Closest Noise-Sensitive Receiver (distance from alignment centerline) - E1	Closest Noise-Sensitive Receiver (distance from alignment centerline) - E1A	Noise Measurement Location
3ab	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by Spruce Court and East Avenue S in Palmdale. Land use is residential with open land between sensitive receivers and the proposed alignment.	65	390 feet	444 feet	LT3

NSA ID	Description	dBA	Closest Noise-Sensitive Receiver (distance from alignment centerline) - E1	Closest Noise-Sensitive Receiver (distance from alignment centerline) - E1A	Noise Measurement Location
3aba	This area is on the northbound side of the proposed E1A Build Alternative alignment bounded by Spruce Court and East Avenue S in Palmdale. Land use is residential with open land between sensitive receivers and the proposed alignment.	65	-	-835 feet	LT3
4a	This area is on the northbound side of the proposed E1 and E1A Build Alternative alignments bounded by East Avenue S and Soledad Siphon in Palmdale. Land use is a mixture of institutional and residential.	51 – 67	293 feet	283 feet	LT1/LT2/LT3
5a	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by East Avenue S and Soledad Siphon in Palmdale. Land use is a mixture of institutional and residential.	51	293 feet	371 feet	LT1
6a	This area is on the northbound side of the proposed E1 Build Alternative alignment bounded by Soledad Siphon and Pearblossom Highway in Palmdale. Land use is scattered rural housing.	51	582 feet	-	LT1
7a	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by Soledad Siphon and Pearblossom Highway in Palmdale. Land use is scattered rural housing.	51	331 feet	1,135 feet	LT1
8a	This area is on the northbound side of the proposed E1 and E1A Build Alternative alignments bounded by Pearblossom Highway and Foreston Drive in Palmdale. Land use is scattered rural housing.	57[1]	660 feet	682 feet	N9

NSA ID	Description	dBA	Closest Noise-Sensitive Receiver (distance from alignment centerline) - E1	Closest Noise-Sensitive Receiver (distance from alignment centerline) - E1A	Noise Measurement Location
9a	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by Pearblossom Highway and Foreston Drive in Palmdale. Land use is scattered rural housing.	57[1]	210 feet	254 feet	N9
10a	This area is on the northbound side of the proposed E1 and E1A Build Alternative alignments bounded by Foreston Drive and Aliso Canyon Road. Land use is scattered rural housing.	57[1]	235 feet	235 feet	N9
11a	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by Foreston Drive and Aliso Canyon Road. Land use is scattered rural housing.	57[1]	210 feet	210 feet	N9
20a	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by Truesdale Street and Wicks Street in Sun Valley. Land use is a mixture of industrial and residential.	61	218 feet	218 feet	LT22
21a	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by Wicks Street and Lankershim Boulevard in Sun Valley. Land use is a mixture of commercial and residential.	53[1]	245 feet	245 feet	N1
22aa	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by Goss Street and Olinda Street in Sun Valley. Land use is a mixture of commercial and residential.	58	172 feet	172 feet	LT23

Source: Authority, 2019
[1]Noise levels were measured for 3 different hours – 1 hour during the daytime, 1 hour during the nighttime, and 1 hour during peak-travel time.
Notes: Unless otherwise specified, noise levels were measured for 24 hours at each location (L_{dn}).
Authority = California High-Speed Rail Authority; dBA = A-weighted decibel; L_{dn} = day-night sound level; NSA = noise-sensitive area

Burbank Subsection

The E1 and E1A Build Alternative alignments would be in a tunnel throughout this area, so the project would not have the potential to change the existing noise environment at the surface. Therefore, NSAs were not identified in this subsection.

E2 and E2A Build Alternatives

Central Subsection

Descriptions of NSAs for the E2 and E2A Build Alternative alignments within the Central Subsection are provided in Table 3.4-18 below.

Table 3.4-18 Noise-Sensitive Areas – E2 and E2A Build Alternatives, Central Subsection

NSA ID	Description	dBA	Closest Noise-Sensitive Receiver (distance from alignment centerline) - E2	Closest Noise-Sensitive Receiver (distance from alignment centerline) - E2A	Noise Measurement Location
3bb	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by Spruce Court and East Avenue S in Palmdale. Land use is residential with open land between sensitive receivers and the proposed alignments.	65	412 feet	444 feet	LT3
3bba	This area is on the northbound side of the proposed E2A Build Alternative alignment bounded by Spruce Court and East Avenue S in Palmdale. Land use is residential with open land between sensitive receivers and the proposed alignment.	65	-	835 feet	LT3
4b	This area is on the northbound side of the proposed E2 and E2A Build Alternative alignments bounded by East Avenue S and Soledad Siphon in Palmdale. Land use is a mixture of institutional and residential.	51-67	293 feet	283 feet	LT1/LT2
5b	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by East Avenue S and Soledad Siphon in Palmdale. Land use is a mixture of institutional and residential.	51	293 feet	371 feet	LT1

NSA ID	Description	dBA	Closest Noise-Sensitive Receiver (distance from alignment centerline) - E2	Closest Noise-Sensitive Receiver (distance from alignment centerline) - E2A	Noise Measurement Location
6b	This area is on the northbound side of the proposed E2 Build Alternative alignment bounded by Soledad Siphon and Pearblossom Highway in Palmdale. Land use is scattered rural housing.	51	582 feet	-	LT1
7b	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by Soledad Siphon and Pearblossom Highway in Palmdale. Land use is scattered rural housing.	51	331 feet	1,135 feet	LT1
8b	This area is on the northbound side of the proposed E2 and E2A Build Alternative alignments bounded by Pearblossom Highway and Foreston Drive in Palmdale. Land use is scattered rural housing.	57[1]	660 feet	682 feet	N9
9b	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by Pearblossom Highway and Foreston Drive in Palmdale. Land use is scattered rural housing.	57[1]	210 feet	254 feet	N9
10b	This area is on the northbound side of the proposed E2 and E2A Build Alternative alignments bounded by Foreston Drive and Aliso Canyon Road. Land use is scattered rural housing.	57[1]	235 feet	235 feet	N9
11b	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by Foreston Drive and Aliso Canyon Road. Land use is scattered rural housing.	57[1]	192 feet	192 feet	N9
13b	This area is on the northbound side of the proposed E2 and E2A Build Alternative alignments bounded by BP and L Road and Wentworth Street. Land use is single-family residences.	57[1]	256 feet	256 feet	N3

NSA ID	Description	dBA	Closest Noise-Sensitive Receiver (distance from alignment centerline) - E2	Closest Noise-Sensitive Receiver (distance from alignment centerline) - E2A	Noise Measurement Location
14b	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by BP and L Road and Wentworth Street. Land use is single-family residences.	57[1]	187 feet	187 feet	N3
15b	This area is on the northbound side of the proposed E2 and E2A Build Alternative alignments bounded by Wentworth Street and McBroom Street. Land use is single-family residences.	54[1]	169 feet	169 feet	N2

Source: Authority, 2019
[1]Noise levels were measured for three different hours – 1 hour during the daytime, 1 hour during the nighttime, and 1 hour during peak-travel time.
Notes: Unless otherwise specified, noise levels were measured for 24 hours at each location (L_{dn}).
Authority = California High-Speed Rail Authority; dBA = A-weighted decibel; L_{dn} = day-night sound level; NSA = noise-sensitive area

Burbank Subsection

The E2 and E2A Build Alternatives include a connection to Burbank Airport Station. The E2 and E2A Build Alternative alignments would be in a tunnel throughout this area, so the project would not have the potential to change the existing noise environment at the surface. Therefore, NSAs were not identified in this subsection.

3.4.5.3 Vibration

Vibration-Sensitive Receivers

Vibration has the potential to damage certain types of buildings, interfere with vibration-sensitive activities or equipment in buildings, or temporarily annoy building occupants during the construction period. Areas that could be affected by vibration from the Palmdale to Burbank Project Section were identified along the Build Alternative alignments and are referred to as vibration-sensitive areas (VSA). Vibration impact screening distances for both construction and operational vibration were used to identify VSAs and are presented in Section 3.4.4, Methods for Evaluating Impacts, in Table 3.4-3 and Table 3.4-4.

A total of 33 VSAs were identified for the Refined SR14 Build Alternative, 28 for the SR14A Build Alternative, 23 for the E1 Build Alternative, 23 for the E1A Build Alternative, 29 for the E2 Build Alternative, and 29 for the E2A Build Alternative.

Measured Vibration Levels

The only substantial sources of existing ground vibration along each of the six Build Alternative alignments are passenger and freight trains. For the purpose of predicting future HSR vibration levels, the vibration measurements focused on characterizing the vibration transmission characteristics of the ground along the six Build Alternative alignments. Vibration propagation measurements were made at 12 locations within the vibration RSA along the six Build Alternative alignments. Descriptions of the measurement sites are provided in Table 3.4-19, and the measurement locations are shown on Figure 3.4-15 and Figure 3.4-16. Detailed vibration propagation data are provided in Appendix G of the Noise and Vibration Technical Report (Authority 2019).

Table 3.4-19 Vibration Measurement Locations

Measurement Location ID	Measurement Location	Description
VP-A	Southwest corner of 6th Street E and Avenue Q-3 in Palmdale	The measurement site is representative of vibration-sensitive land uses for all of the Palmdale Subsection and for the Central Subsection up to the Soledad Siphon along the Refined SR14 and SR14A Build Alternative alignments and up to Pearblossom Highway along the E1, E1A, E2, and E2A Build Alternative alignments.
VP-C	Northwest corner of Desert Road and Aspen Street in Acton	The measurement site is representative of all vibration-sensitive land uses from the Soledad Siphon to Big Springs Road along the Refined SR14 and SR14A Build Alternative alignments and from Pearblossom Highway to Aliso Canyon Road along the E1, E1A, E2, and E2A Build Alternative alignments.
VP-D	Northwest corner of Saddleback Road and Canyon Ends Road in Canyon Country	The measurement site is representative of all vibration-sensitive land uses from Big Springs Road to Sand Canyon Road along the Refined SR14 and SR14A Build Alternative alignments.
VP-E	Northeast corner of Harding Street and Eldridge Avenue in Sylmar	The measurement site is representative of all vibration-sensitive land uses from Gavina Avenue to Valley Vista Way along the Refined SR14 and SR14A Build Alternative alignments and from Via Santa Barbara to Valley Vista Way along the E1 and E1A Build Alternative alignments.
VP-F	In the park on the north side of Dronfield Avenue close to the Dronfield Avenue and Mercer Street intersection in Pacoima	The measurement site is representative of all vibration-sensitive land uses from the Foothill Freeway (I-210) to Osborne Street along the Refined SR14, SR14A, E1, and E1A Build Alternative alignments.
VP-G	Southeast corner of Arnwood Road and Jimenez Street in Lake View Terrace	The measurement site is representative of all vibration-sensitive land uses from Forest Route 3N29 to Peoria Street along the E2 and E2A Build Alternative alignments.
VP-H	Southwest corner of Norris Avenue and Montague Street in Pacoima	The measurement site is representative of all vibration-sensitive land uses from Glenoaks Boulevard to Montague Street along the Refined SR14, SR14A, E1, and E1A Build Alternative alignments.
VP-J	Southwest corner of Art Street and San Fernando Road in Sun Valley	The measurement site is representative of all vibration-sensitive land uses from Truesdale Street to Lankershim Boulevard along the Refined SR14, SR14A, E1, and E1A Build Alternative alignments.
VP-K	Northeast corner of Lehigh Avenue and Nettleton Street in Sun Valley	The measurement site is representative of all vibration-sensitive land uses from Goss Street to Wheatland Avenue along the Refined SR14, SR14A, E1, and E1A Build Alternative alignments and from Fleetwood Street to Lockheed Drive along the E2 and E2A Build Alternative alignments.

Measurement Location ID	Measurement Location	Description
VP-L	Southwest corner of Keswick Street and Delia Avenue in Sun Valley	The measurement site is representative of all vibration-sensitive land uses from Wheatland Avenue to North Hollywood Way along the Refined SR14, SR14A, E1, and E1A Build Alternative alignments and from Lanark Street to Winona Avenue along the E2 and E2A Build Alternative alignments.

Source: Authority, 2019
Authority = California High-Speed Rail Authority

3.4.5.4 Existing Vibration Conditions

VSA locations are presented in this section along with descriptions of vibration measurement locations for each VSA.

Measured vibration levels for the Refined SR14 Build Alternative Central Subsection ranged from approximately 25 VdB in rural areas to 39 VdB in developed areas. This included approximately 29 VdB (at 6.3 Hz) south of Palmdale, 25 VdB (at 6.3 and 25 Hz) near Sand Canyon Road in ANF, 28 VdB (at 31.5 Hz) east of Sylmar, 38 VdB (at 31.5 Hz) near Foothill Boulevard, 39 VdB (at 31.5 Hz) south of Whiteman Airport, and 31 VdB (at 40 Hz) along San Fernando Road.

Measured vibration levels for the Central Subsection for the SR14A Build Alternative ranged from approximately 25 VdB in rural areas to 39 VdB in developed areas. This included approximately 29 VdB (at 6.3 Hz) south of Palmdale, 25 VdB (at 6.3 and 25 Hz) near Sand Canyon Road in the ANF, including SGMNM, 28 VdB (at 31.5 Hz) east of Sylmar, 38 VdB (at 31.5 Hz) near Foothill Boulevard, 39 VdB (at 31.5 Hz) south of Whiteman Airport, and 31 VdB (at 40 Hz) along San Fernando Road.

Vibration levels for the E1 Build Alternative Central Subsection were measured in developed areas and ranged from approximately 31 VdB to 39 VdB. This included approximately 38 VdB (at 31.5 Hz) near Foothill Boulevard, 39 VdB (at 31.5 Hz) south of Whiteman Airport, and 31 VdB (at 40 Hz) along San Fernando Road.

Vibration levels for the Central Subsection for the E1A Build Alternative were measured in developed areas and ranged from approximately 31 VdB to 39 VdB. This included approximately 38 VdB (at 31.5 Hz) near Foothill Boulevard, 39 VdB (at 31.5 Hz) south of Whiteman Airport, and 31 VdB (at 40 Hz) along San Fernando Road.

Measured vibration levels for the E2 Build Alternative Central Subsection were taken in developed areas and ranged from approximately 32 VdB (at 25 Hz) near Lake View Terrace to 39 VdB (at 40 Hz) in Sun Valley north of Interstate 5.

Measured vibration levels for the Central Subsection for the E2A Build Alternative were taken in developed areas and ranged from approximately 32 VdB (at 25 Hz) near Lake View Terrace to 39 VdB (at 40 Hz) in Sun Valley north of Interstate 5.

Measured vibration levels in the Burbank Subsection ranged from approximately 35 VdB (at 31.5 Hz) north of the Hollywood Burbank Airport to approximately 38 VdB (at 31.5 and 40 Hz) east of the Hollywood Burbank Airport.

Detailed mapping of VSAs is provided in Appendix E of the Noise and Vibration Technical Report (Authority 2019). Land uses surrounding the VSAs are generally consistent with NSA land uses described above.

VSAs and vibration measurement descriptions for the Palmdale Station and Lancaster Maintenance Facility are evaluated in the Bakersfield to Palmdale Project Section EIR/EIS.

Refined SR14 and SR14A Build Alternatives

Central Subsection

VSAs and vibration measurement descriptions for the Refined SR14 and SR14A Build Alternative alignments within the Central Subsection are listed in Table 3.4-20.

Table 3.4-20 Vibration-Sensitive Areas – Refined SR14 and SR14A Build Alternatives, Central Subsection

VSA ID	VSA Location	Closest Vibration-Sensitive Receiver - Refined SR14[1]	Closest Vibration-Sensitive Receiver - SR14A[1]	Measurement Locations
3cb	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Spruce Court and East Avenue S in Palmdale.	406 feet	444 feet	VP-A
3cba	This area is on the northbound side of the proposed SR14A Build Alternative alignment bound by Spruce Court and East Avenue S in Palmdale.	-	835 feet	VP-A
4c	This area is on the northbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by East Avenue S and Soledad Siphon in Palmdale.	293 feet	283 feet	VP-A
5c	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by East Avenue S and Soledad Siphon in Palmdale.	293 feet	343 feet	VP-A
6c	This area is on the northbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Soledad Siphon and Acton Canyon Road.	256 feet	179 feet	VP-C
7c	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Soledad Siphon and Acton Canyon Road.	287 feet	179 feet	VP-C
8c	This area is on the northbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Acton Canyon Road and Hypotenuse Road.	258 feet	187 feet	VP-C
9c	This area is on the southbound side of the proposed Refined SR14 Build Alternative alignment bounded by Acton Canyon Road and Hypotenuse Road.	119 feet	-	VP-C
10c	This area is on the northbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Hypotenuse Road and Clanfield Street.	381 feet	187 feet	VP-C

VSA ID	VSA Location	Closest Vibration-Sensitive Receiver - Refined SR14[1]	Closest Vibration-Sensitive Receiver - SR14A[1]	Measurement Locations
11c	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Hypotenuse Road and Clanfield Street.	534 feet	218 feet	VP-C
12c	This area is on the northbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Clanfield Street and Big Springs Road.	289 feet	179 feet	VP-C
13c	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Clanfield Street and Big Springs Road.	286 feet	179 feet	VP-C
14c	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Big Springs Road and Agua Dulce Canyon Road.	186 feet	197 feet	VP-D
15c	This area is on the northbound side of the proposed Refined SR14 Build Alternative alignment bounded by Agua Dulce Canyon Road and Soledad Canyon Road.	46 feet	-	VP-D
16c	This area is on the northbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Soledad Canyon Road and Sand Canyon Road.	374 feet	478 feet	VP-D
17c	This area is on the southbound side of the proposed Refined SR14 Build Alternative alignment bounded by Soledad Canyon Road and Sand Canyon Road.	365 feet	-	VP-D
18c	This area is on the northbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Gavina Avenue and Valley Vista Way.	133 feet	133 feet	VP-E
19c	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Gavina Avenue and Valley Vista Way.	134 feet	134 feet	VP-E
20c	This area is on the northbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Foothill Freeway and Glenoaks Boulevard in Pacoima.	162 feet	162 feet	VP-F

VSA ID	VSA Location	Closest Vibration-Sensitive Receiver - Refined SR14[1]	Closest Vibration-Sensitive Receiver - SR14A[1]	Measurement Locations
21c	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by the Foothill Freeway and Glenoaks Boulevard in Pacoima. This area includes Maclay Middle School, Hillery Broadous Early Educational Center, and Hillery T. Broadous Elementary School.	164 feet	164 feet	VP-F
22c	This area is on the northbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Glenoaks Boulevard and Osborne Street in Pacoima.	195 feet	195 feet	VP-F/VP-H
23c	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Glenoaks Boulevard and Osborne Street in Pacoima.	195 feet	195 feet	VP-F/VP-H
24c	This area is on the northbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Osborne Street and Montague Street in Pacoima.	78 feet	78 feet	VP-H
25c	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Osborne Street and Montague Street in Pacoima.	81 feet	81 feet	VP-H
26c	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Truesdale Street and Wicks Street in Sun Valley.	218 feet	218 feet	VP-J
27c	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Wicks Street and Lankershim Boulevard in Sun Valley.	245 feet	245 feet	VP-J
28ca	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Goss Street and Olinda Street in Sun Valley.	172 feet	172 feet	VP-K
28cb	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Olinda Street and Sunland Boulevard in Sun Valley.	164 feet	164 feet	VP-K
29c	This area is on the northbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Sunland Boulevard and North Clybourn Avenue in Sun Valley. The closest vibration-sensitive receiver is Iglesia De Cristo Ministerios.	157 feet	157 feet	VP-K

VSA ID	VSA Location	Closest Vibration-Sensitive Receiver - Refined SR14[1]	Closest Vibration-Sensitive Receiver - SR14A[1]	Measurement Locations
30c	This area is on the southbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Sunland Boulevard and Wheatland Avenue in Sun Valley. This area includes Roscoe Elementary School.	101 feet	101 feet	VP-K
31c	This area is on the northbound side of the proposed Refined SR14 and SR14A Build Alternative alignments bounded by Wheatland Avenue and Lockheed Drive in Burbank. This area includes Burbank Islamic Center.	263 feet	263 feet	VP-L

Source: Authority, 2019
[1]Distance from proposed alignment centerline.
Authority = California High-Speed Rail Authority; VSA = vibration-sensitive area

Burbank Subsection

There are no vibration-sensitive receivers for the Refined SR14 and SR14A Build Alternatives within the Burbank Subsection.

E1 and E1A Build Alternatives

Central Subsection

VSAs and vibration measurements for the E1 and E1A Build Alternative within the Central Subsection are listed in Table 3.4-21.

Table 3.4-21 Vibration-Sensitive Areas – E1 and E1A Build Alternatives, Central Subsection

VSA ID	VSA Location	Closest Vibration-Sensitive Receiver - E1[1]	Closest Vibration-Sensitive Receiver - E1A[1]	Measurement Locations
3ab	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by Spruce Court and East Avenue S in Palmdale.	390 feet	444 feet	VP-A
3aba	This area is on the northbound side of the proposed E1A Build Alternative alignment bound by Spruce Court and East Avenue S in Palmdale.	-	835 feet	VP-A
4a	This area is on the northbound side of the proposed E1 and E1A Build Alternative alignments bounded by East Avenue S and Soledad Siphon in Palmdale.	293 feet	283 feet	VP-A
5a	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by East Avenue S and Soledad Siphon in Palmdale.	293 feet	371 feet	VP-A
6a	This area is on the northbound side of the proposed E1 Build Alternative alignment bounded by Soledad Siphon and Pearblossom Highway in Palmdale.	582 feet	-	VP-A

VSA ID	VSA Location	Closest Vibration-Sensitive Receiver - E1[1]	Closest Vibration-Sensitive Receiver - E1A[1]	Measurement Locations
7a	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by Soledad Siphon and Pearblossom Highway in Palmdale.	331 feet	1,135 feet	VP-A
8a	This area is on the northbound side of the proposed E1 and E1A Build Alternative alignments bounded by Pearblossom Highway and Foreston Drive in Palmdale.	660 feet	189 feet	VP-A/VP-C
9a	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by Pearblossom Highway and Foreston Drive in Palmdale.	210 feet	175 feet	VP-A/VP-C
10a	This area is on the northbound side of the proposed E1 and E1A Build Alternative alignments bounded by Foreston Drive and Aliso Canyon Road.	235 feet	235 feet	VP-C
11a	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by Foreston Drive and Aliso Canyon Road.	210 feet	210 feet	VP-C
12a	This area is on the northbound side of the proposed E1 and E1A Build Alternative alignments bounded by Via Santa Barbara and Valley Vista Way in Sylmar.	151 feet	151 feet	VP-E
13a	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by Via Santa Barbara and Valley Vista Way in Sylmar.	123 feet	123 feet	VP-E
14a	This area is on the northbound side of the proposed E1 and E1A Build Alternative alignments bounded by Foothill Freeway and Glenoaks Boulevard in Pacoima.	162 feet	162 feet	VP-F
15a	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by Foothill Freeway and Glenoaks Boulevard in Pacoima. This area includes Maclay Middle School, Hillery Broadous Early Educational Center, and Hillery T. Broadous Elementary School.	164 feet	164 feet	VP-F
16a	This area is on the northbound side of the proposed E1 and E1A Build Alternative alignments bounded by Glenoaks Boulevard and Osborne Street in Pacoima.	195 feet	195 feet	VP-F/VP-H
17a	This area is on the southbound side of the proposed E1 and E1A Build Alternatives alignment bounded by Glenoaks Boulevard and Osborne Street in Pacoima.	195 feet	195 feet	VP-F/VP-H
18a	This area is on the northbound side of the proposed E1 and E1A Build Alternative alignments bounded by Osborne Street and Montague Street in Pacoima.	78 feet	78 feet	VP-H

VSA ID	VSA Location	Closest Vibration-Sensitive Receiver - E1[1]	Closest Vibration-Sensitive Receiver - E1A[1]	Measurement Locations
19a	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by Osborne Street and Montague Street in Pacoima.	81 feet	81 feet	VP-H
20a	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by Truesdale Street and Wicks Street in Sun Valley.	218 feet	218 feet	VP-J
21a	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by Wicks Street and Lankershim Boulevard in Sun Valley.	245 feet	245 feet	VP-J
22aa	This area is on the southbound side of the proposed E1 and E1A Build Alternative alignments bounded by Goss Street and Olinda Street in Sun Valley.	172 feet	172 feet	VP-K

Source: Authority, 2019
[1]Distance from proposed alignment centerline.
Authority = California High-Speed Rail Authority; VSA = vibration-sensitive area

Burbank Subsection

There are no vibration-sensitive receivers near the E1 and E1A Build Alternative alignments within Burbank Subsection.

E2 and E2A Build Alternatives

Central Subsection

VSAs and vibration measurement descriptions for the E2 and E2A Build Alternative alignments within the Central Subsection are listed in Table 3.4-22.

Table 3.4-22 Vibration-Sensitive Areas – E2 and E2A Build Alternatives, Central Subsection

VSA ID	VSA Location	Closest Vibration-Sensitive Receiver - E2[1]	Closest Vibration-Sensitive Receiver - E2A[1]	Measurement Locations
3bb	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by Spruce Court and East Avenue S in Palmdale.	412 feet	444 feet	VP-A
3bba	This area is on the northbound side of the proposed E2A Build Alternative alignment bound by Spruce Court and East Avenue S in Palmdale.	-	835 feet	VP-A
4b	This area is on the northbound side of the proposed E2 and E2A Build Alternative alignments bounded by East Avenue S and Soledad Siphon in Palmdale.	293 feet	283 feet	VP-A
5b	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by East Avenue S and Soledad Siphon in Palmdale.	293 feet	371 feet	VP-A

VSA ID	VSA Location	Closest Vibration-Sensitive Receiver - E2[1]	Closest Vibration-Sensitive Receiver - E2A[1]	Measurement Locations
6b	This area is on the northbound side of the proposed E2 Build Alternative alignment bounded by Soledad Siphon and Pearblossom Highway in Palmdale.	582 feet	-	VP-A
7b	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by Soledad Siphon and Pearblossom Highway in Palmdale.	331 feet	1,135 feet	VP-A
8b	This area is on the northbound side of the proposed E2 and E2A Build Alternative alignments bounded by Pearblossom Highway and Foreston Drive in Palmdale.	660 feet	189 feet	VP-A/VP-C
9b	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by Pearblossom Highway and Foreston Drive in Palmdale.	210 feet	175 feet	VP-A/VP-C
10b	This area is on the northbound side of the proposed E2 and E2A Build Alternative alignments bounded by Foreston Drive and Aliso Canyon Road.	235 feet	235 feet	VP-C
11b	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by Foreston Drive and Aliso Canyon Road.	192 feet	192 feet	VP-C
12b	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by Forest Route 3N29 to BP and L Road.	403 feet	403 feet	VP-G
13b	This area is on the northbound side of the proposed E2 and E2A Build Alternative alignments bounded by BP and L Road and Wentworth Street.	256 feet	256 feet	VP-G
14b	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by BP and L Road and Wentworth Street.	187 feet	187 feet	VP-G
15b	This area is on the northbound side of the proposed E2 and E2A Build Alternative alignments bounded by Wentworth Street and McBroom Street.	169 feet	169 feet	VP-G
16b	This area is on the northbound side of the proposed E2 and E2A Build Alternative alignments bounded by McBroom Street and Wicks Street.	73 feet	73 feet	VP-G
17b	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by McBroom Street and Wicks Street.	70 feet	70 feet	VP-G
18b	This area is on the northbound side of the proposed E2 and E2A Build Alternative alignments bounded by Wicks Street and Peoria Street. This area includes Stonehurst Avenue Elementary School.	79 feet	79 feet	VP-G

VSA ID	VSA Location	Closest Vibration-Sensitive Receiver - E2[1]	Closest Vibration-Sensitive Receiver - E2A[1]	Measurement Locations
19b	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by Wicks Street and Peoria Street.	74 feet	74 feet	VP-G
20b	This area is on the northbound side of the proposed E2 and E2A Build Alternative alignments bounded by Fleetwood Street and Olinda Street.	147 feet	147 feet	VP-K
21b	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by Fleetwood Street and Olinda Street.	147 feet	147 feet	VP-K
22b	This area is on the northbound side of the proposed E2 and E2A Build Alternative alignments bounded by Olinda Street and Golden State Freeway.	165 feet	165 feet	VP-K
23b	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by Olinda Street and Golden State Freeway.	166 feet	166 feet	VP-K
24b	This area is on the northbound side of the proposed E2 and E2A Build Alternative alignments bounded by Golden State Freeway and Lanark Street.	187 feet	187 feet	VP-K
25b	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by Golden State Freeway and Lanark Street.	186 feet	186 feet	VP-K
26b	This area is on the northbound side of the proposed E2 and E2A Build Alternative alignments bounded by Lanark Street and Lockheed Drive.	191 feet	191 feet	VP-K/VP-L
27b	This area is on the southbound side of the proposed E2 and E2A Build Alternative alignments bounded by Lanark Street and Lockheed Drive. This area includes The Greenery Studio.	192 feet	192 feet	VP-K/VP-L

Source: Authority, 2019
[1]Distance from proposed alignment centerline
Authority = California High-Speed Rail Authority; VSA = vibration-sensitive area

Burbank Subsection

VSAs and vibration measurement descriptions for the E2 and E2A Build Alternatives within the Burbank Subsection are listed in Table 3.4-23.

Table 3.4-23 Vibration-Sensitive Areas – E2 and E2A Build Alternatives, Burbank Subsection

VSA ID	VSA Location	Closest Vibration-Sensitive Receiver[1] - E2	Closest Vibration-Sensitive Receiver - E2A	Measurement Locations
28b	This area is on the northbound side of the proposed alignment bounded by Lockheed Drive and Winona Avenue. The closest vibration-sensitive receiver is Hasbro Studios.	366 feet	366 feet	VP-L

Source: Authority, 2019
[1]Distance from proposed alignment centerline
Authority = California High-Speed Rail Authority; VSA = vibration-sensitive area

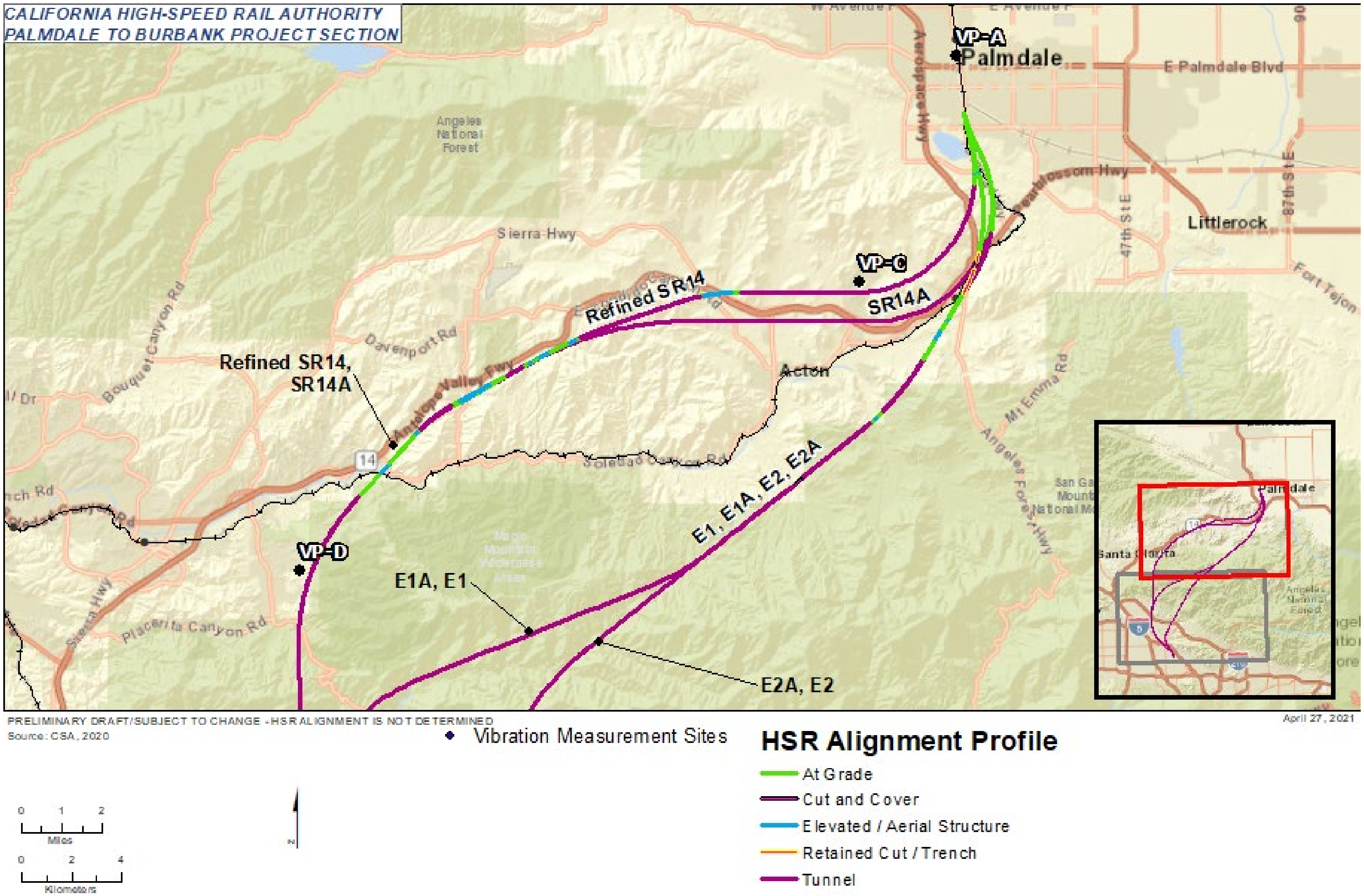


Figure 3.4-15 Vibration Propagation Measurement Locations (Map 1 of 2)

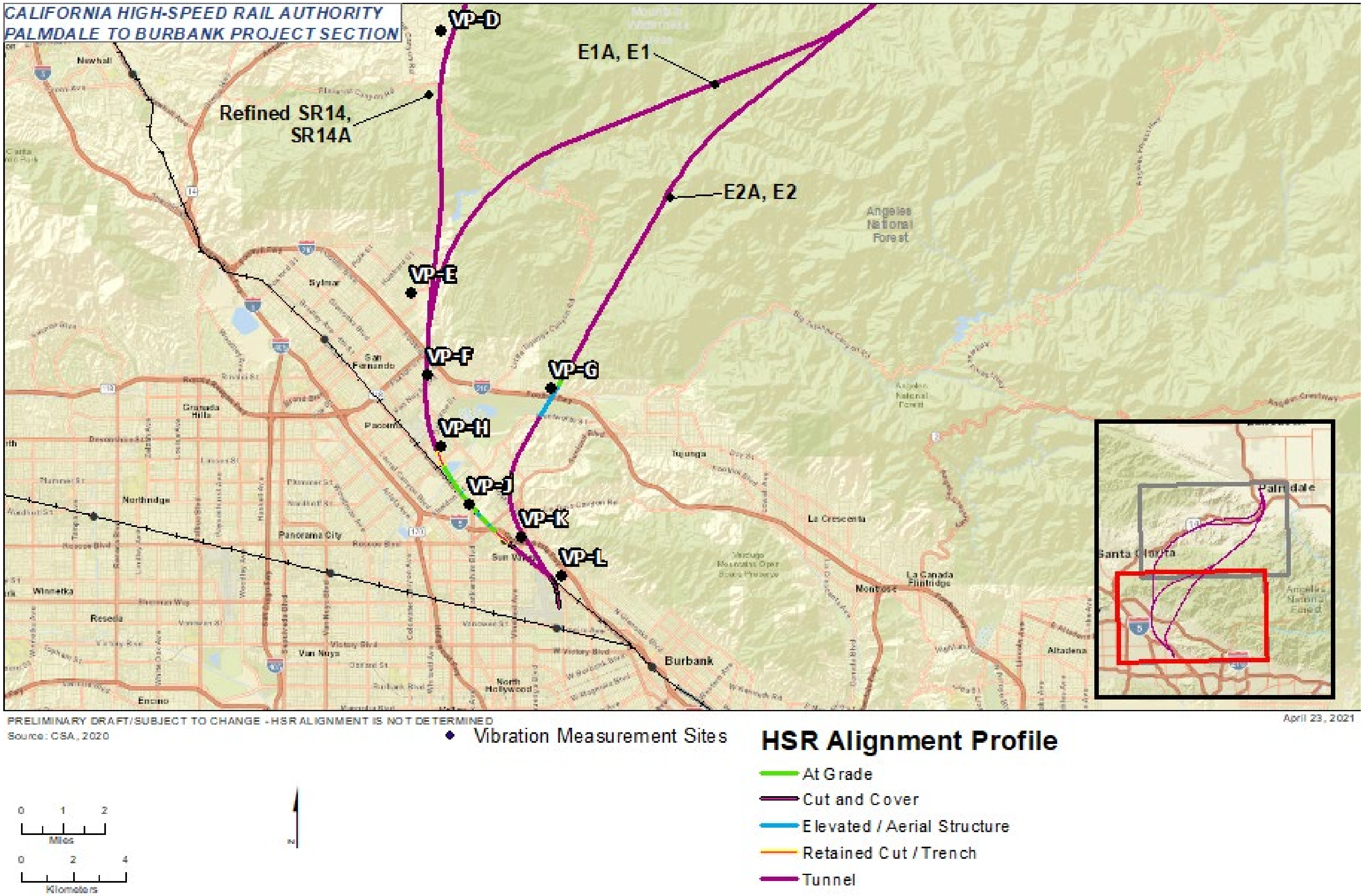


Figure 3.4-16 Vibration Propagation Measurement Locations (Map 2 of 2)

3.4.5.5 Noise Environment for Domestic Animals and Wildlife

Using the established maximum screening distance of 1,300 feet from the Build Alternative centerline for sensitive receivers, it is assumed that noise-sensitive domestic animals and/or wildlife could be present throughout the noise RSA. Based on a threshold of SEL ≥100 dBA for startle effects for domestic animals and wildlife, as discussed in Section 3.4.4.3, domestic animals and wildlife could experience startle effects within a distance of 40 to 50 feet from the alignment centerline. Section 3.7, Biological Resources and Aquatic Resources, provides a more detailed discussion of the particular animal species that may be affected by construction and operational noise and where these species are found along the above-ground portions of the Build Alternative alignments.

The Authority reviewed trails, parks, wildlife refuges, and other public recreation areas where wild animals and domestic animals such as horses are likely to be present within 50 feet of the alignment centerline. This review screened for public recreation areas and trails that permit equestrian activities and/or have equestrian facilities, such as riding stables. The following public recreation areas were identified within 50 feet of the alignment centerline where rapid onset of HSR noise (SEL ≥100 dBA) would have the potential to startle domestic animals (horses) or wildlife:

- Pacific Crest Trail (Refined SR14 Build Alternative only)
- Vasquez Rocks Natural Area Park (Refined SR14 and SR14A Build Alternatives only)
- Hansen Dam Recreation area (E2 and E2A Build Alternatives only)
- Stonehurst Park and Recreation Center (E2 and E2A Build Alternatives only)

Additionally, there are private equestrian facilities, particularly near the SCE Vincent Substation and the Shadow Hills area.

3.4.5.6 Stakeholder Issues and Concerns

The Authority has conducted extensive public outreach efforts. Noise and vibration have consistently been major issues of public concern for the Palmdale to Burbank Project Section. These concerns have been raised by residents, businesses, stakeholders, and community groups. Noise and vibration comments have largely come from people in the communities of Acton, Sunland-Tujunga, Shadow Hills, and throughout the Northeast San Fernando Valley.

Community concerns focus on noise and vibration impacts on schools, homes, pets, horses, wildlife, community life, and properties. Residents of Shadow Hills, Sunland-Tujunga, and Lake View Terrace communities are most concerned with the noise impacts on domestic animals such as pets and horses. Concerns about vibration were less prevalent than those related to noise, but vibration impact concerns were expressed by residents in the Pacoima, Lake View Terrace, and Acton areas.

3.4.6 Environmental Consequences

3.4.6.1 Overview

This section evaluates noise and vibration impacts for the No Project Alternative and the six Build Alternatives. Construction impacts for the six Build Alternatives were each evaluated and are presented as one analysis because the characteristics of impacts would be similar for all six Build Alternatives. Operation road traffic noise impacts, startle effects on humans and animals, and noise impacts from the operation of stations and other stationary facilities would be similar for all six Build Alternatives; therefore, these impacts are analyzed together. Noise and vibration impacts from California HSR System operations in the rail corridor would differ among each of the six Build Alternatives; therefore, each Build Alternative is analyzed separately.

This section addresses construction and operational impacts as follows:

- **Construction Impacts**
  - Impact N&V#1: Construction Noise Impacts on Sensitive Receivers.
  - Impact N&V#2: Spoils Haul Route Noise Impacts on Sensitive Receivers.
  - Impact N&V#3: Construction Vibration Impacts on Sensitive Receivers.
- **Operations Impacts**
  - Impact N&V#4: Operational Traffic Noise Impacts on Sensitive Receivers.
  - Impact N&V#5: Operational Annoyance and Startle Effects on Humans.
  - Impact N&V#6: Operational Train Noise Impacts.
  - Impact N&V#7: Noise and Vibration Impacts on Domestic Animals.
  - Impact N&V#8: Operational Train Vibration and Ground-Borne Noise Impacts.
  - Impact N&V#9: Noise and Vibration from High-Speed Rail Stationary Facilities.

3.4.6.2 No Project Alternative

The No Project Alternative assumes the Palmdale to Burbank Project Section would not be constructed. In assessing future conditions, it was assumed that all currently known, programmed, and funded improvements to the intercity transportation system (highway, rail, and transit) and reasonably foreseeable local development projects (with funding sources already identified) would be developed as planned by 2040.

The No Project Alternative is based on a review of all city and county general plans, regional transportation plans for all modes of travel, and agency-provided lists of pending and approved projects within Los Angeles County. Changes to the existing noise and vibration environment resulting from implementation of other plans and projects were analyzed in the environmental documents prepared for those projects and would occur under the No Project Alternative. Other new noise or vibration impacts are not anticipated under the No Project Alternative.

Noise

The existing noise environment generated by operation of existing highways, airports, and railways would continue under the No Project Alternative. Over time, highways would experience greater vehicle miles traveled effects under the No Project Alternative, which would gradually increase noise levels in the noise RSA.[4] The No Project Alternative would include future development reported in the general plans of the cities and counties within the Palmdale to Burbank Project Section, including both suburban expansion and development in existing urban areas. Under the No Project Alternative, noise levels would increase chiefly within existing urban/suburban communities that contain the highest concentration of transportation infrastructure. However, noise levels would also increase along major transportation corridors throughout undeveloped areas between Palmdale and Burbank. Within the ANF, proposed actions associated with the ANF Land Management Plan would result in increased noise under the No Project Alternative as a result of construction and maintenance activities, but would not significantly alter the existing noise setting (United States Department of Agriculture 2005). Future planned and committed projects that may influence the future noise and vibration environment with the RSA are described in Section 3.19, Cumulative Impacts.

Vibration

The No Project Alternative includes reasonably foreseeable improvements to transportation infrastructure in and near the Palmdale to Burbank Project Section. Existing vibration conditions would continue from existing rail lines. Under the No Project Alternative conditions, noise levels

[4] Chapter 2, Alternatives, outlines the No Project growth assumptions for rail service, which consider programmed changes in Metrolink service and known freight rail projects in the area. However, many planned changes in freight rail service are not public, and freight rail service can change over time based on market demands; therefore, assumptions regarding possible future changes (increases or decreases) in freight traffic are speculative.

would increase chiefly within existing urban/suburban communities that contain the highest concentration of transportation and rail infrastructure. However, vibration levels would also increase along major transportation corridors throughout undeveloped areas between Palmdale and Burbank.

3.4.6.3 Build Alternatives

Construction Impacts

Impact N&V#1: Construction Noise Impacts on Sensitive Receivers.

The construction schedule for all six Build Alternatives would entail several construction phases: mobilization, site preparation and roadway construction, earthmoving, cut-and-cover structure construction, demolition, tunneling, retaining wall construction, station construction, grade-separation construction, aerial track structure construction, at-grade track construction, railway systems construction, and demobilization. Each phase would use a unique set of construction equipment. Appendix H of the Noise and Vibration Technical Report (Authority 2019*)* lists the construction equipment that may be used during each phase.

Although the duration, location, and intensity of construction noise would vary according to the Build Alternative, impacts would be consistent among all six Build Alternatives. Construction noise impacts were assessed based on screening distances for various construction activities as shown in Table 3.4-24.

Screening distances to sensitive receivers were developed using the methodology described in Section 3.4.4, Methods for Evaluating Impacts. Construction activities would employ essentially the same types of equipment for each of the six Build Alternatives and construction areas. The screening distance captures the maximum extent of construction noise, assuming all construction equipment for a given construction phase would operate near the same location over an 8-hour period. Thus, the screening distances provide the most conservative scenario for the extent of construction noise under all six Build Alternatives, and construction noise and construction noise impacts are described holistically below for all six Build Alternatives. Table 3.4-24 lists screening distances for daytime and nighttime work for each phase of construction. To capture the maximum possible impact, screening distance estimates did not assume topography or ground effects, which would result in sound attenuation effects between the noise source and potential receiver. Sensitive receivers exist within the daytime and nighttime screening distances for all phases of construction activity. The noise criteria (80 dBA L_{eq}/70 dBA L_{eq}) featured in Table 3.4-24 is based upon noise criteria for residential land uses detailed in FRA guidance (FRA 2012). Each construction phase is described in the subsections below.

Table 3.4-24 Residential Noise Impact Screening Distances for High-Speed Rail Construction Activities

Construction Activity	Time Period	dBA L_{eq} at 50 Feet	Daytime 80 dBA L_{eq} (feet)	Nighttime 70 dBA L_{eq} (feet)
Mobilization	1 year	91	176	555
Site preparation and roadway construction	3 years	90	161	510
Earthmoving[1]	4 years and 6 months	88	128	406
Cut-and-cover structure construction	6 months	89	138	436
Demolition	8 months	89	140	444

Construction Activity	Time Period	dBA L_{eq} at 50 Feet	Daytime 80 dBA L_{eq} (feet)	Nighttime 70 dBA L_{eq} (feet)
Tunneling	5 years and 6 months	90	151	478
Retaining wall construction	3 years and 6 months	88	123	388
Station construction	3 years	88	119	376
Grade-separation construction	3 years	90	151	478
Aerial track structure construction	2 years and 8 months	89	143	454
At-grade track construction	2 years and 6 months	88	128	404
Railway systems construction	1 year	87	110	348
Demobilization	2 years	91	177	555

Source: Authority, 2019

[1] Earthmoving activities would increase and decrease in intensity over the construction duration. These screening distances conservatively estimate a constant level of activity.

Authority = California High-Speed Rail Authority; dBA = A-weighted decibel; L_{eq} = equivalent continuous sound level

Construction Impact Summary

The FRA noise criteria are 80 dBA for daytime noise levels for the 8-hour L_{eq}, and 70 dBA for nighttime noise levels. Noise levels from construction of each of the six Build Alternatives would exceed these criteria for both daytime and nighttime activities for some sensitive receptors. As shown in Table 3.4-25 and Table 3.4-26, depending on the construction phase and the Build Alternative selected, construction would temporarily affect between 476 and 1,423 sensitive receptors during daytime hours and between 698 and 1,923 sensitive receptors during nighttime hours. The FTA identified specific land uses by category. Category 1 land uses are highly sensitive and are land uses 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. Category 2 is applicable to all residential land uses and buildings where people normally sleep, such as hotels and hospitals. Category 3 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.

Table 3.4-25 Summary of Daytime Construction Noise Impacts on Sensitive Receivers

Project Subsection	Build Alternative	Number of Category 1 Impacts	Number of Category 2 Impacts	Number of Category 3 Impacts
Central	Refined SR14	0	1,417	6
	E1	0	1,316	6
	E2	0	475	1
	SR14A	0	1,358	6
	E1A	0	1,315	6
	E2A	0	498	1
Burbank	Refined SR14	0	0	0
	E1	0	0	0
	E2	0	0	0
	SR14A	0	0	0
	E1A	0	0	0
	E2A	0	0	0

Source: Authority, 2019
Authority = California High-Speed Rail Authority

Table 3.4-26 Summary of Nighttime Construction Noise Impacts on Sensitive Receivers

Project Subsection	Alignment Alternative	Number of Category 1 Impacts	Number of Category 2 Impacts	Number of Category 3 Impacts
Central	Refined SR14	1	1,916	6
	E1	1	1,849	6
	E2	1	696	2
	SR14A	1	1,846	6
	E1A	1	1,801	6
	E2A	1	694	2
Burbank	Refined SR14	0	0	0
	E1	0	15	0
	E2	1	0	0
	SR14A	0	0	0
	E1A	0	15	0
	E2A	1	0	0

Source: Authority, 2019
Authority = California High-Speed Rail Authority

Construction Activities within the ANF

The construction activities described above would not result in noise impacts within the ANF, including portions of the SGMNM, as the majority of the Build Alternative alignments in this area would occur within tunnels. Tunnel construction would not result in noise impacts at the surface because of the depths of the tunnels beneath the surface of the ANF. Some portions of the Build Alternative alignments would entail surface construction activities (e.g., portals and construction of adits) within and immediately adjacent to the ANF, including the SGMNM. As discussed above, construction activities would generate noise at the screening distances listed in Table 3.4-24. Construction activities within and adjacent to the ANF, including the SGMNM, would result in perceptible noise effects during construction activities. However, this does not represent an adverse effect because the USFS-managed lands adjacent to California HSR System facilities do not contain designated recreational areas (e.g., trails, and campgrounds) and are not considered sensitive receivers.

CEQA Conclusion

NV-IAMF#1 requires the contractor to prepare a noise and vibration technical memorandum documenting how the FTA and FRA guidelines for minimizing construction noise impacts will be employed when work is conducted within 1,000 feet of sensitive receivers. Although NV-IAMF#1 would reduce construction noise, the construction-related impacts would be significant under CEQA because residences within the screening distances identified above would be exposed to construction noise that exceeds the recommended FRA construction noise criteria of 80 dBA L_{eq} during daytime hours and 70 dBA L_{eq} during nighttime hours. Therefore, mitigation is required under CEQA. Mitigation Measure N&V-MM#1 (discussed in Section 3.4.7, Mitigation Measures) requires the contractor to prepare a noise-monitoring program describing how the contractor will monitor construction noise to verify compliance with the noise limits. The noise-monitoring program will describe the actions required of the contractor to meet required noise limits of 80 dBA L_{eq} during daytime hours and 70 dBA L_{eq} during nighttime hours. However, due to the Build Alternatives' proximity to sensitive receivers, some receivers may still experience noise that would exceed acceptable limits. This represents a significant and unavoidable impact for the Refined SR14, SR14A, E1, E1A, E2, and E2A Build Alternatives after mitigation.

Impact N&V#2: Spoils Haul Route Noise Impacts on Sensitive Receivers.

Removal of spoils from tunnel portals is anticipated to take place over a period of up to 6.4 years, with specific time periods varying depending on the Build Alternative and portal. Most spoils would be hauled from tunnel portals to disposal sites, but some spoils would be transported by conveyor systems. A detailed description of tunnel portals and spoils hauling is provided in Chapter 2, Alternatives.

For each of the six Build Alternatives, a noise assessment was conducted to determine the impacts of spoils haul trucks operating on roadways between the portals and major roadways connecting to the spoils site. To determine the noise impacts of spoils hauling, the noise assessment calculated the existing noise levels based on existing traffic volumes on roadways and compared existing levels with the projected noise levels from haul trucks operating on the roadways.

The results of the assessment indicate that there would be noise impacts from trucks on the haul routes for all six Build Alternatives. Figure 3.4-17 through Figure 3.4-35 show the locations of moderate and severe noise impacts for the Refined SR14, SR14A, E1, E1A, E2, and E2A Build Alternatives. Table 3.4-27 summarizes severe noise impacts from truck traffic on spoils haul routes for each of the six Build Alternatives. Portals and adits where there would not be severe noise impacts from truck traffic on spoils haul routes are not included in Table 3.4-27.

Table 3.4-27 Construction Noise from Spoils Haul Routes

Build Alternative	Severe Impacts: Location(s)	Portal(s)	Adits
Refined SR14	Big Springs Road near Acton	Portal P4, Portal P5	None
SR14A	None	None	None
E1	Portals: Aliso Canyon Road, Soledad Canyon Road, and Crown Valley Road south of Palmdale Adit: Sand Canyon Road and Placerita Canyon Road in ANF	Portal P2, Portal P3/IW1	San Gabriel Adit
E1A	Portals: Aliso Canyon Road, Soledad Canyon Road, and Crown Valley Road south of Palmdale Adit: Sand Canyon Road and Placerita Canyon Road in ANF	Portal P2, Portal P3/IW1	San Gabriel Adit
E2	Wheatland Avenue in the Shadow Hills neighborhood; Foothill Boulevard in the Lake View Terrace neighborhood; Aliso Canyon Road, Soledad Canyon Road, and Crown Valley Road south of Palmdale	Portal P4, Portal P5, Portal P2, Portal P3/IW1	None
E2A	Wheatland Avenue in the Shadow Hills neighborhood; Foothill Boulevard in the Lake View Terrace neighborhood; Aliso Canyon Road, Soledad Canyon Road, and Crown Valley Road south of Palmdale	Portal P4, Portal P5, Portal P2, Portal P3/IW1	None

Source: Authority, 2019
ANF = Angeles National Forest; Authority = California High-Speed Rail Authority

Spoils hauling would be required within the ANF to haul spoils material from HSR construction sites to deposition areas. There would be one severe noise impact from truck traffic on spoils haul routes that would occur within ANF boundaries, which would occur at the intersection of Sand Canyon Road and Placerita Canyon Road. Residences in this area would experience noise effects. In order to minimize this effect, the project would implement NV-IAMF#1 to reduce construction-period noise effects on sensitive receivers near this intersection.

CEQA Conclusion

NV-IAMF#1 requires the contractor to prepare a noise and vibration technical memorandum documenting how the FTA and FRA guidelines for minimizing construction noise impacts will be employed when work is being conducted within 1,000 feet of sensitive receivers. No severe construction noise impacts from spoils hauling are anticipated for the SR14A Build Alternative. Although NV-IAMF#1 would reduce construction noise, noise impacts from truck traffic along spoils haul routes would temporarily or periodically substantially increase ambient noise levels in the project vicinity above levels existing without the project. This represents a significant impact under CEQA, and mitigation is required. Mitigation Measure N&V-MM#1 (discussed in Section 3.4.7) will require the contractor to prepare a noise-monitoring program describing how the contractor will monitor construction noise and noise from truck traffic to verify compliance with the noise limits. In addition, the noise-monitoring program will describe the actions required of the contractor to meet required noise limits. However, due to the Build Alternatives' proximity to sensitive receivers, some receivers may still experience noise in exceedance of acceptable noise limits. This represents a significant and unavoidable impact for the Refined SR14, E1, E1A, E2, and E2A Build Alternatives after mitigation.

Impact N&V#3: Construction Vibration Impacts on Sensitive Receivers.

During construction, some activities—most notably drilling for bored-pile viaduct foundations, excavation for trenching and vibro-compaction for ground improvements—may cause ground-borne vibration. Construction equipment associated with these activities can produce vibration levels ranging from 87 VdB to 94 VdB at a distance of 25 feet from construction activities. Although it is unlikely that such equipment would be used close enough to sensitive structures to cause substantial damage, there could be potential for vibration annoyance or interference with the use of sensitive equipment (such as optical microscopes and magnetic resonance imaging machines).

Table 3.4-28 lists the approximate distances within which receivers could experience construction-related vibration annoyance effects. The actual distance would vary depending on the type of soil or rock encountered at the specific site. The following locations could experience vibration impacts from construction-related pile driving:

- Intermediate Window south of I-210 (Refined SR14, SR14A, E1, and E1A Build Alternatives)
- Montage Street to Spreading Grounds (Refined SR14, SR14A, E1, and E1A Build Alternatives)
- Lowered road profile in San Fernando Road/Sheldon Street intersection (Refined SR14, SR14A, E1, and E1A Build Alternatives)
- Lowered road profile Tuxford Street (Refined SR14, SR14A, E1, and E1A Build Alternatives)
- Retained cut I-5 to Olinda Street (Refined SR14, SR14A, E1, and E1A Build Alternatives)
- Retaining walls along East Barrel Springs Road (Refined SR14 Build Alternative)

Table 3.4-28 Approximate Screening Distances for Construction Vibration Impacts

Land-Use Category[1]	Vibration Criterion Level (VdB)	Approximate Vibration Impact Distance (feet)
Category 1: Buildings where vibration would interfere with interior operations	65	230
Category 2: Residences and buildings where people normally sleep	72	135
Category 3: Institutional land uses with primarily daytime use	75	105

Source: Authority, 2019
[1] See Table 3.4-10 for a description of the categories.
Authority = California High-Speed Rail Authority; VdB = vibration velocity level

There is also potential for construction vibration impacts in areas where tunnels would be bored underground beneath residences and other vibration-sensitive buildings at depths ranging from 70 to 500 feet. Details of tunnels are provided in Chapter 2, Alternatives. Beneath residences and other vibration-sensitive buildings, tunnel boring machine operation could cause perceptible vibrations in those buildings. The potential for vibration impacts is highly variable and dependent on the depth of the tunneling and the ground composition. Given the depth at which tunnels would be bored, it is unlikely vibration would be perceptible. Further, any such vibration would be transitory in nature as tunneling progresses and would likely affect any given location for only a few days. In addition, conveyors would be used for transporting excavated material from the tunnel boring machines, avoiding the use of muck trains (high-powered wheelbarrows) which is typically the major concern regarding vibration impacts from tunneling operations.

Tunnel construction within the ANF would not result in vibration impacts at the surface because of the depths of the tunnels beneath the surface of the ANF. Some portions of the Build Alternative alignments would entail surface construction activities (e.g. construction of adits) within and immediately adjacent to the ANF, including the SGMNM. Surface construction activities may cause ground-borne vibration levels that range from 87 VdB to 94 VdB at a distance of 25 feet from construction activities. However, this does not represent an adverse effect because the USFS-managed lands adjacent to California HSR System facilities do not contain designated recreational areas (e.g., trails, and campgrounds) and are not considered sensitive receivers.

CEQA Conclusion

NV-IAMF#1 requires the contractor to prepare a noise and vibration technical memorandum documenting how the FTA and FRA guidelines for minimizing construction vibration impacts will be employed when work is being conducted within 1,000 feet of sensitive receivers. Although NV-IAMF#1 would reduce construction vibration, construction-related activities would generate excessive ground-borne vibration exceeding federal criteria for annoyance and building damage. This represents a significant impact under CEQA, and mitigation is required. However, in any given location along the Build Alternative alignments, construction vibration would be temporary and intermittent and would cease once work is complete. Mitigation Measure N&V-MM#2 (described in Section 3.4.7, Mitigation Measures), requires the contractor, prior to construction activity, to create a vibration technical memorandum stipulating vibration-reduction methods for pile driving. Damage is not expected to result from construction if pile-driving activities occur more than 50 feet from buildings or if alternative methods such as push piling or auger piling are used. When a construction scenario has been established, pre-construction surveys will be conducted by the contractor at locations within 50 feet of pile driving to document the existing condition of buildings in case damage is reported during or after construction. The contractor will arrange for the repair of damaged buildings or provide compensation to the property owner. As such, impacts resulting from sensitive receiver annoyance and building damage would be effectively reduced. By implementing Mitigation Measure N&V-MM#2, the impact would be less than significant under CEQA for the Refined SR14, SR14A, E1, E1A, E2, and E2A Build Alternatives.

Operations Impacts

Impact N&V#4: Operational Traffic Noise Impacts on Sensitive Receivers.

Each of the six Build Alternatives was evaluated for potential increases in traffic noise in the RSA and in areas surrounding the Burbank Airport Station. This analysis includes the Palmdale Subsection for reference; however, this area was previously evaluated in the Bakersfield to Palmdale Project Section EIR/EIS. Traffic noise in the noise RSA was evaluated using the existing and future volumes obtained from the *Palmdale to Burbank Project Section: Transportation Technical Report* (Authority 2019b), based on a high ridership forecast scenario. The impact analysis considers two conditions:

- For locations where there would be a substantial change in the horizontal or vertical alignment or location of an existing highway or roadway, traffic noise modeling was conducted using FHWA Traffic Noise Model 2.5 (TNM 2.5) software and is consistent with FHWA and Caltrans guidance. A substantial change in horizontal distance would be relocation of the roadway to half the former distance from sensitive receivers, and a substantial change in vertical alignment would be a notable change in noise shielding for sensitive receivers.
- For all other locations where existing highways and roadways would not be substantially modified, and/or where traffic volumes are anticipated to increase under the six Build Alternatives, a noise assessment was conducted at:

- Locations where traffic volumes increased by a substantial amount (a doubling of volume) under the six Build Alternatives[5]
- Locations where roadways were relocated closer, but less than half the current distance, to sensitive receivers

This analysis showed that changes in noise caused by increased traffic would occur only near the Palmdale Station. For the area around Burbank Airport Station, roadway changes do not meet the above criteria. The indirect noise impacts from operation of the Burbank Airport Station are included in the analysis of stationary facilities (Impact N&V#8). In all other cases, the changes in volumes or locations were insubstantial compared to the traffic noise environment without implementation of the Build Alternatives.

Operational traffic noise effects near Palmdale Station would be identical within each of the six Build Alternatives, and therefore, they are discussed collectively.

The assessment of impacts from traffic noise is summarized in Table 3.4-29 for residential land uses. Traffic noise impacts were assessed using the FHWA TNM 2.5 criteria. The criteria used to determine moderate and severe noise impacts as a result of increased noise from the project differ for each location and are provided in Table 3.4-29.

The results indicate that traffic noise would exceed noise impact criteria at the following residential areas located near Palmdale Station:

- Sierra Highway from East Avenue N-12 to Rancho Vista Boulevard
- Sierra Highway from Rancho Vista Boulevard to East Avenue P-8
- 10th Street East from East Avenue Q to Palmdale Boulevard
- 5th Street East from East Avenue Q to Palmdale Boulevard
- 10th Street East from East Avenue R to E Avenue S
- Sierra Highway from East Avenue S to Soledad Siphon

The only residential area near the Palmdale Station that occurs within the Palmdale to Burbank Project Section is Sierra Highway from East Avenue S to Soledad Siphon.

Table 3.4-29 Operational Traffic Noise – Residential Impacts

Location[1]	Existing Noise Level, L_{dn} (dBA)	Project Noise Level Increase (dB)	Noise Impact Increase Criteria (dBA)		Number of Effects[1]	
			Mod	Sev	Mod	Sev
Sierra Highway from East Avenue N-12 to Rancho Vista Boulevard – southbound	57	3	2.6	6.2	**12**	**0**
Sierra Highway from Rancho Vista Boulevard to E Avenue P-8 – southbound	60	3	2	5.1	**20**	**0**
10th Street East from East Avenue Q to Palmdale Boulevard – northbound	65	3	1.4	3.7	**367**	**0**
10th Street East from East Avenue Q to Palmdale Boulevard – Southbound	65	3	1.4	3.7	**249**	**0**
5th Street East from East Avenue Q to Palmdale Boulevard – southbound	59	8	2.2	5.4	**63**	**90**

[5] The analysis of the potential for increased roadway noise during California HSR System operations is based on trip-generation at the stations under high ridership forecasts in 2040 (refer to Section 3.2, Transportation).

Location[1]	Existing Noise Level, L_{dn} (dBA)	Project Noise Level Increase (dB)	Noise Impact Increase Criteria (dBA)		Number of Effects[1]	
			Mod	Sev	Mod	Sev
10th Street East from East Avenue R to E Avenue S - northbound	55	2	3.2	7.2	**129**	**0**
10th Street East from East Avenue R to E Avenue S – southbound	55	2	3.2	7.2	**2**	**0**
Palmdale Boulevard Grade Separation[2] - southbound	61	0.3	12		**0**	
Sierra Highway from East Avenue S to Soledad Siphon[2,3] - northbound	50	13	12		**5**	

Source: Authority, 2019
[1]The Number of Effects indicates locations where the noise level threshold is exceeded at noise measurement locations.
[2]These locations were assessed with FHWA TNM 2.5 and effect criteria.
[3]Sierra Highway from East Avenue S to Soledad Siphon is located in the Palmdale to Burbank Project Section. All other locations are included for reference and are analyzed in the Bakersfield to Palmdale Project Section EIR/EIS.
Authority = California High-Speed Rail Authority; dB = decibel; dBA = A-weighted decibel; FHWA = Federal Highway Administration; Mod = moderate; Sev = severe; TNM = Traffic Noise Model

No impacts on institutional uses (e.g., schools, libraries, theaters, and churches) were identified; all increases in traffic noise at institutional receivers were below the moderate-impact threshold of a 6.5 dBA increase identified in the Noise and Vibration Technical Report (Authority 2019). The greatest increase at institutional uses would be approximately two dBA, which is generally below the threshold of human perception (FHWA 2012). Refer to the technical report referenced above for a detailed analysis of traffic noise impacts on institutional land uses.

CEQA Conclusion

Noise impacts related to traffic noise would be significant under CEQA, as noise due to traffic generated by the Palmdale Station during project operations would increase noise levels at nearby residential receivers. Operational traffic would permanently substantially increase ambient noise levels in the vicinity of Sierra Highway from East Avenue S to Soledad Siphon above levels existing without the project. This represents a significant impact under CEQA and mitigation is required. Mitigation Measure N&V-MM#3 (discussed in Section 3.4.7) requires preparation of an operational noise report to determine where noise barriers or other methods of noise insulation are needed to minimize noise impacts. This location would not meet the criteria to implement noise barriers as there are less than 10 severe impacts, but it would be eligible for other methods of noise reduction because described in Mitigation Measure N&V-MM#3. While implementation of Mitigation Measure N&V-MM#3 could reduce noise, it is unlikely it would fully mitigate impacts. This represents a significant and unavoidable impact for the Refined SR14, SR14A, E1, E1A, E2, and E2A Build Alternatives.

Impact N&V#5: Operational Annoyance and Startle Effects on Humans.

Because of the rapid onset of noise from HSR trains, annoyance and startle effects on humans were evaluated. An onset rate of 15 dB per second at a distance of 90 feet would result in annoyance, and an onset rate of 30 dB per second at a distance of 45 feet would result in startle effects. Noise-sensitive human receivers within 90 feet of the alignment centerline would experience annoyance from onset rates caused by the California HSR System. In addition, noise-sensitive human receivers within 45 feet of the alignment centerline would experience startle effects from onset rates caused by the California HSR System. Because all six Build Alternatives would include HSR operations, these effects are discussed collectively for all six Build Alternatives.

Based on FRA screening distances, as shown in Figure 3.4-11 and Table 3.4-13, startle effects resulting from rapid onset of noise would be limited to locations within 45 feet of the Build Alternative alignment centerline. This area is typically within the California HSR System right-of-way and would not contain human noise-sensitive receivers such as residences. Passengers may be on HSR platforms closer than 23 feet from the centerline of the tracks. However, there would be advance warning of trains approaching with announcements, horns, bells, and signage, so substantial, ongoing startle effects would not occur there with train passage. Therefore, increased annoyance due to startle would not occur.

Based on the current tunnel designs, it is anticipated that roughly half of the sound generated in the tunnel would pass out through the portal, and the other half would propagate into the interior of the tunnel. The effect would be a rapid rise in sound level as the train leaves the tunnel and portal, forewarned by a propagating wave ahead of the train. Depending on the shape of the portal, shape of the train nose, and blockage ratio, the rate of pressure rise may be substantial. The pressure wave front rate of rise is reduced by friction between the moving air column and tunnel wall, so that the pressure wave does not easily develop into a shock wave. This portal noise effect has been studied theoretically and experimentally and is well understood. Attenuation of the portal noise is achieved with long, flared portals and low blockage ratios. In-tunnel cross-passages and vents can reduce pressure magnitudes and rates of rise, though passage of these vents may generate additional propagating and steepening wave fronts. These tunnel and tunnel portal design features will be used to attenuate any additional noise associated with a train entering or exiting a tunnel.

CEQA Conclusion

Because startle effects during operation would be limited to locations within 45 feet of the alignment centerline, which is typically within the right-of-way and would not contain human noise-sensitive receivers, the project would not result in annoyance or startle effects. This impact would be less than significant under CEQA for the Refined SR14, SR14A, E1, E1A, E2, and E2A Build Alternatives, Therefore, CEQA does not require any mitigation.

Impact N&V#6: Operational Train Noise Impacts.

The analysis below presents assessments of noise impacts from California HSR System operation for each of the six Build Alternatives. Only areas of the Build Alternative alignment that contain sensitive receivers are discussed below because areas of the alignment where there are no sensitive receivers would not experience noise impacts as described in Section 3.4.5, Affected Environment. Similarly, locations where the Build Alternative alignment would be in a tunnel are omitted from the noise impact discussions because there would be no increase in surface noise where trains would operate in a tunnel (Authority 2019).

In calculating future noise levels, maximum train speeds were used that range from 150 to 220 mph, depending on the location along the Build Alternative alignment. Noise impacts would result from the proximity of the receivers to the proposed track (or aerial structure) and the speed of the train.

The results of noise analysis by Build Alternative are summarized in Table 3.4-30. This table calculates impacted sensitive receivers by Build Alternative and alignment subsection prior to mitigation. Unmitigated noise impacts are mapped along the project alignment as shown in Figure 3.4-17 through Figure 3.4-35.

Table 3.4-30 Summary of Operational Train Noise Impacts

Build Alternative	Subsection	Affected Noise-Sensitive Receivers	
		Moderate	Severe
Refined SR14	Central	129	55
	Burbank Airport Station	0	0
	Total	**129**	**55**

Build Alternative	Subsection	Affected Noise-Sensitive Receivers	
		Moderate	Severe
SR14A	Central	99	19
	Burbank Airport Station	0	0
	Total	**99**	**19**
E1	Central	143	108
	Burbank Airport Station	0	0
	Total	**143**	**108**
E1A	Central	173	44
	Burbank Airport Station	0	0
	Total	**173**	**44**
E2	Central	141	164
	Burbank Airport Station	0	0
	Total	**141**	**164**
E2A	Central	168	102
	Burbank Airport Station	0	0
	Total	**168**	**102**

Source: Authority, 2019
Authority = California High-Speed Rail Authority

Refined SR14 and SR14A Build Alternatives

For the Burbank Subsection where no moderate or severe noise impacts would occur, detailed analysis of existing noise levels, future noise levels, and impact criteria are provided in the Noise and Vibration Technical Report (Authority 2019*),* and conclusions are summarized in this section. Figure 3.4-17 through Figure 3.4-23 show the noise impact locations for the Refined SR14 Build Alternative. Figure 3.4-21 through Figure 3.4-23 show the noise impact locations for the SR14A Build Alternative.

Central Subsection

The results of noise impact assessment for California HSR System operational noise for the Refined SR14 and SR14A Build Alternatives within the Central Subsection, before mitigation, are summarized in Table 3.4-31 for residential land uses. No noise impacts were identified on institutional uses (e.g., schools, libraries, theaters, and churches) for the Refined SR14 and SR14A Build Alternatives within the Central Subsection.

Table 3.4-31 Operational Noise Impacts – Residential: Refined SR14 and SR14A Build Alternatives, Central Subsection

Location	Side of Track	Closest Receiver(s) Distance to Near Track (feet) Refined SR14	Closest Receiver(s) Distance to Near Track (feet) SR14A	Existing Noise Level (dBA) Refined SR14	Existing Noise Level (dBA) SR14A	Project Noise Level (dBA) Refined SR14	Project Noise Level (dBA) SR14A	Noise Impact Criteria (dBA Refined SR14)		Noise Impact Criteria (dBA SR14A)		Number of Effects Refined SR14[1]		Number of Effects SR14A[1]	
								Mod	Sev	Mod	Sev	Mod	Sev	Mod	Sev
Spruce Court to East Avenue S	NB	-	835	-	65	-	64	-	66	61	66	**-**	**-**	**1**	**0**
Spruce Court to East Avenue S	SB	405	444	65	65	68	67	61	66	61	66	**10**	**10**	**11**	**8**
East Avenue S to Soledad Siphon	NB	268	283	65	65	69	65	61	66	61	66	**25**	**2**	**9**	**0**
East Avenue S to Soledad Siphon	SB	122	343	51	67	69	64	54	60	62	67	**20**	**11**	**12**	**0**
Soledad Siphon to Acton Canyon Road	SB	-	988	-	51	-	54	-	60	54	60	**-**	**-**	**1**	**0**
Hypotenuse Road to Clanfield Street	NB	369	-	60	-	71	-	58	64	-	-	**4**	**7**	**-**	**-**
Hypotenuse Road to Clanfield Street	SB	532	-	60	-	69	-	58	64	-	-	**2**	**4**	**-**	**-**

Location	Side of Track	Closest Receiver(s) Distance to Near Track (feet) Refined SR14	Closest Receiver(s) Distance to Near Track (feet) SR14A	Existing Noise Level (dBA) Refined SR14	Existing Noise Level (dBA) SR14A	Project Noise Level (dBA) Refined SR14	Project Noise Level (dBA) SR14A	Noise Impact Criteria (dBA Refined SR14)		Noise Impact Criteria (dBA SR14A)		Number of Effects Refined SR14[1]		Number of Effects SR14A[1]	
								Mod	Sev	Mod	Sev	Mod	Sev	Mod	Sev
Big Springs Road to Agua Dulce Canyon Road	SB	186	268	60	60	76	72	58	63	58	63	**3**	**13**	**0**	**4**
Agua Dulce Canyon Road to Soledad Canyon Road	NB	46	-	60	-	81	-	58	63	-	-	**0**	**1**	**-**	**-**
Soledad Canyon Road to Sand Canyon Road	NB	443	478	60	60	72	70	58	63	58	63	**0**	**1**	**0**	**1**
Osborne Street to Montague Street	SB	183	183	66	66	55	55	61	67	61	67	**0**	**0**	**0**	**0**
Truesdale Street to Wicks Street	SB	293	293	61	61	67	67	58	64	58	64	**62**	**6**	**62**	**6**
Wicks Street to Lankershim Boulevard	SB	330	330	53	53	55	55	54	60	54	60	**3**	**0**	**3**	**0**

Location	Side of Track	Closest Receiver(s) Distance to Near Track (feet) Refined SR14	Closest Receiver(s) Distance to Near Track (feet) SR14A	Existing Noise Level (dBA) Refined SR14	Existing Noise Level (dBA) SR14A	Project Noise Level (dBA) Refined SR14	Project Noise Level (dBA) SR14A	Noise Impact Criteria (dBA Refined SR14)		Noise Impact Criteria (dBA SR14A)		Number of Effects Refined SR14[1]		Number of Effects SR14A[1]	
								Mod	Sev	Mod	Sev	Mod	Sev	Mod	Sev
Goss Street to Olinda Street	SB	254	254	58	58	53	53	57	62	57	62	**0**	**0**	**0**	**0**
Olinda Street to Sunland Boulevard	SB	309	309	58	58	52	52	57	62	57	62	**0**	**0**	**0**	**0**

Source: Authority, 2019
[1]The Number of Effects indicates locations where the noise level threshold is exceeded at noise measurement locations.
Authority = California High-Speed Rail Authority; dBA = A-weighted decibel; Mod = moderate; NB = northbound; SB = southbound; Sev = severe

Within the ANF, including portions of the SGMNM, the Refined SR14 and SR14A Build Alternative alignments would be in tunnel; therefore, operations would not produce perceptible noise effects aboveground. Operation of HSR trains adjacent to the ANF, including portions of the SGMNM, could generate noise on USFS lands; however, there are no designated recreational areas, formal campgrounds, or other sensitive receivers located within these areas.

Burbank Subsection

There would be no noise effects for the Refined SR14 and SR14A Build Alternatives within the Burbank Subsection as there are few noise-sensitive receptors, and project noise levels would not exceed the threshold for sensitive receivers.

CEQA Conclusion

Operation of the Refined SR14 and SR14A Build Alternatives would not encounter noise-sensitive receivers in the Burbank Subsection. Operation of the Refined SR14 and SR14A Build Alternatives in the Central Subsection would not exceed noise impact criteria at institutional land uses but would result in severe noise levels at residential receivers. Severe noise impacts represent a significant impact under CEQA, and mitigation is required. Mitigation Measures N&V-MM#3, N&V-MM#4, N&V-MM#5, and N&V-MM#6 (discussed in Section 3.4.7) would reduce noise from California HSR System operation. These mitigation measures would reduce noise by reducing rail gaps and turnouts, by ensuring vehicles meet federal noise regulations to the extent technologically available, and by implementing noise barriers. Noise barriers included in N&V-MM#3, in most cases, would effectively reduce exterior noise below applicable thresholds. The Refined SR14 Build Alternative includes two proposed noise barriers, one of which eliminates all severe noise impacts where it is proposed while the other does not (two residual severe noise impacts would remain). For the SR14A Build Alternative in the Central Subsection one noise barrier is proposed which would eliminate all severe noise impacts at that location. However, for both Build Alternatives, there are scattered and isolated residences that would experience severe noise impacts for which noise barriers would not meet the criteria discussed in Section 3.4.7. The Refined SR14 and SR14A Build Alternatives would have 34 and 11 of these impacts, respectively. In such cases, other noise-reducing measures discussed in Mitigation Measures N&V-MM#3, such as sound insulation and noise easements, would reduce impacts but may not completely reduce noise below thresholds at every location. The areas where noise barrier criteria is not met, combined with areas where there remain severe residuals after implementation of mitigation measures would result in a total of 36 and 11 severe effects for the Refined SR14 and SR14A Build Alternatives, respectively. This represents a significant and unavoidable impact for the Refined SR14 and SR14A Build Alternatives.

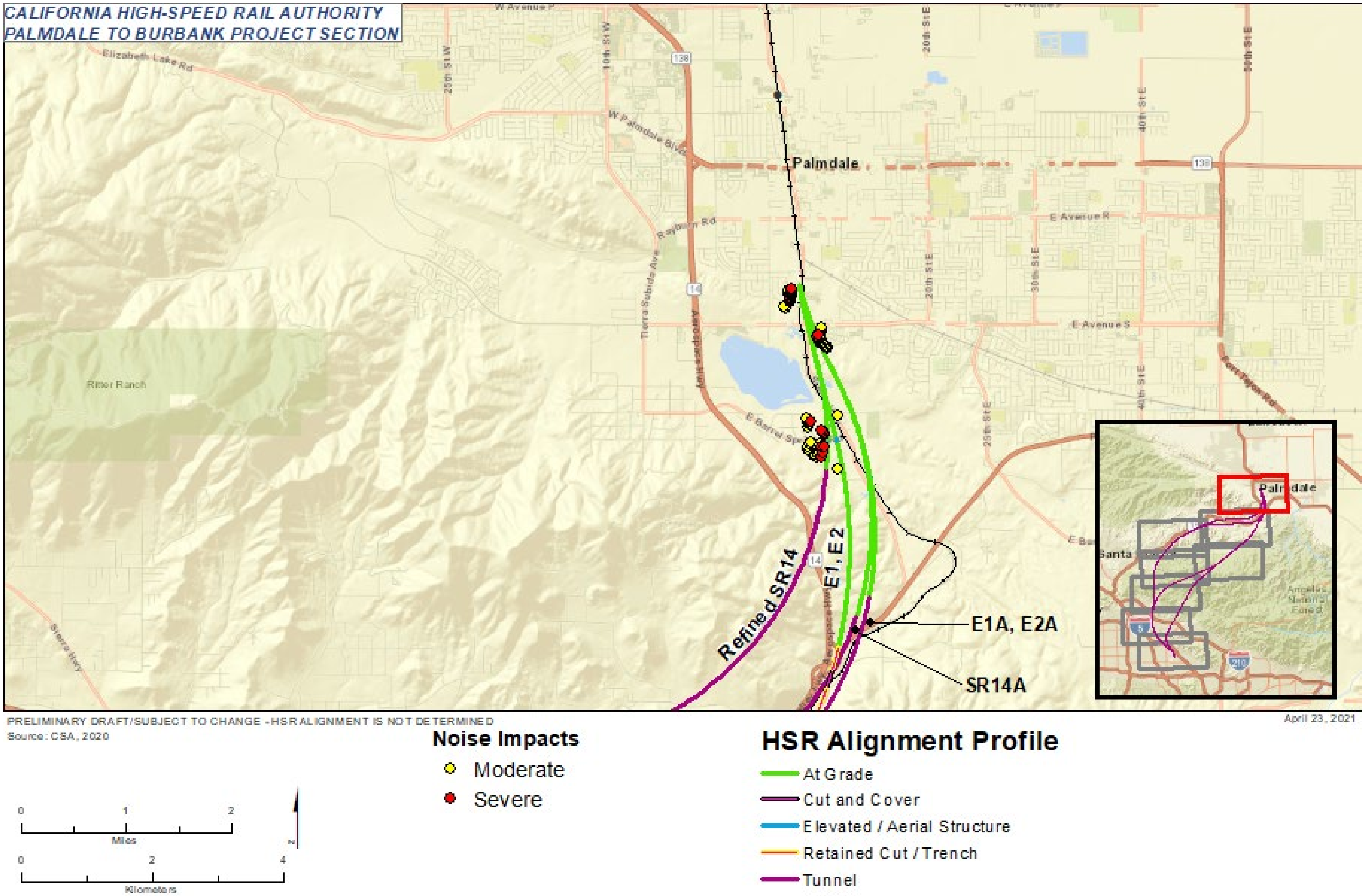


Figure 3.4-17 Noise Impact Locations for the Refined SR14 Build Alternative (Map 1 of 4)

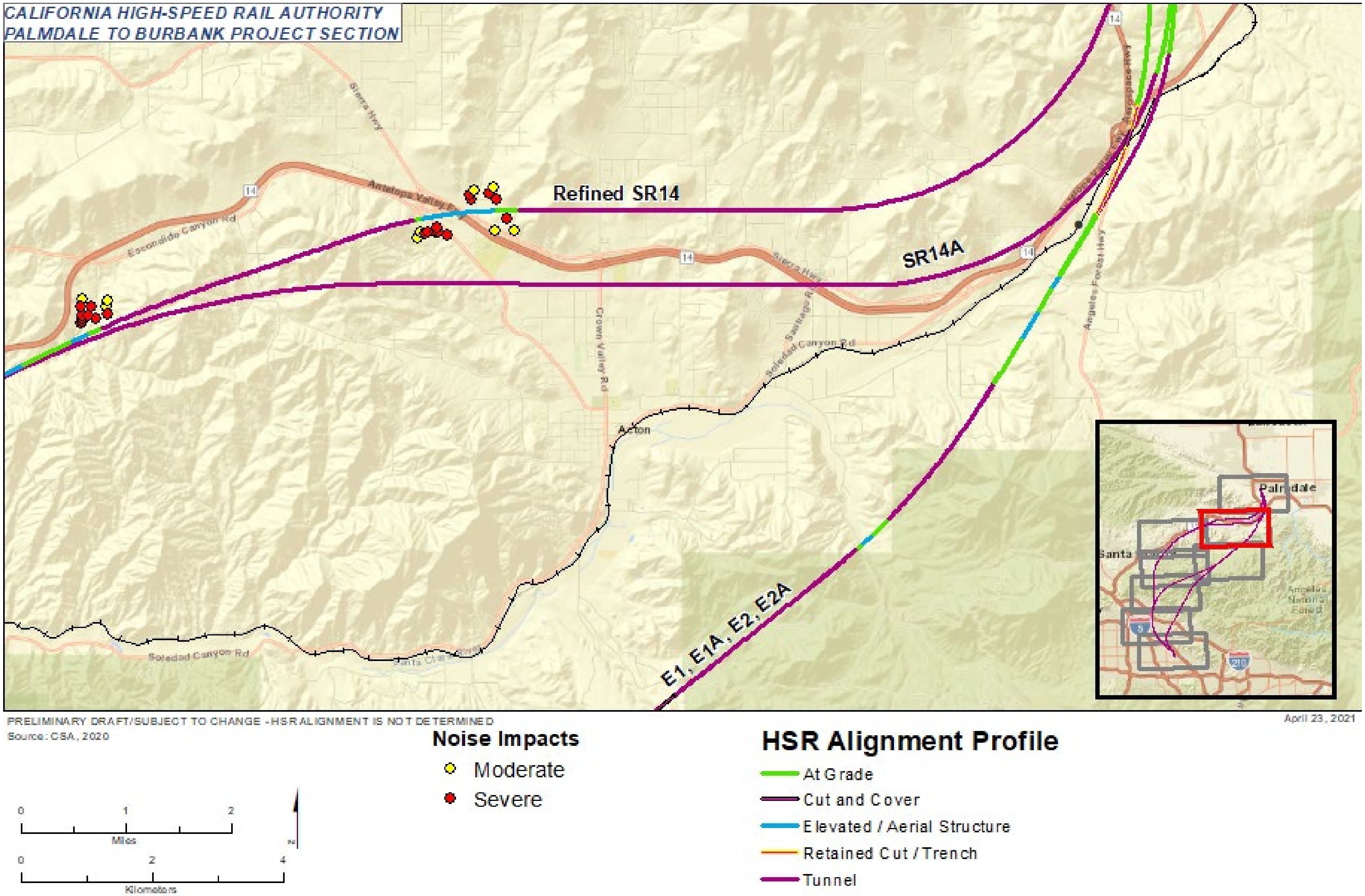


Figure 3.4-18 Noise Impact Locations for the Refined SR14 Build Alternative (Map 2 of 4)

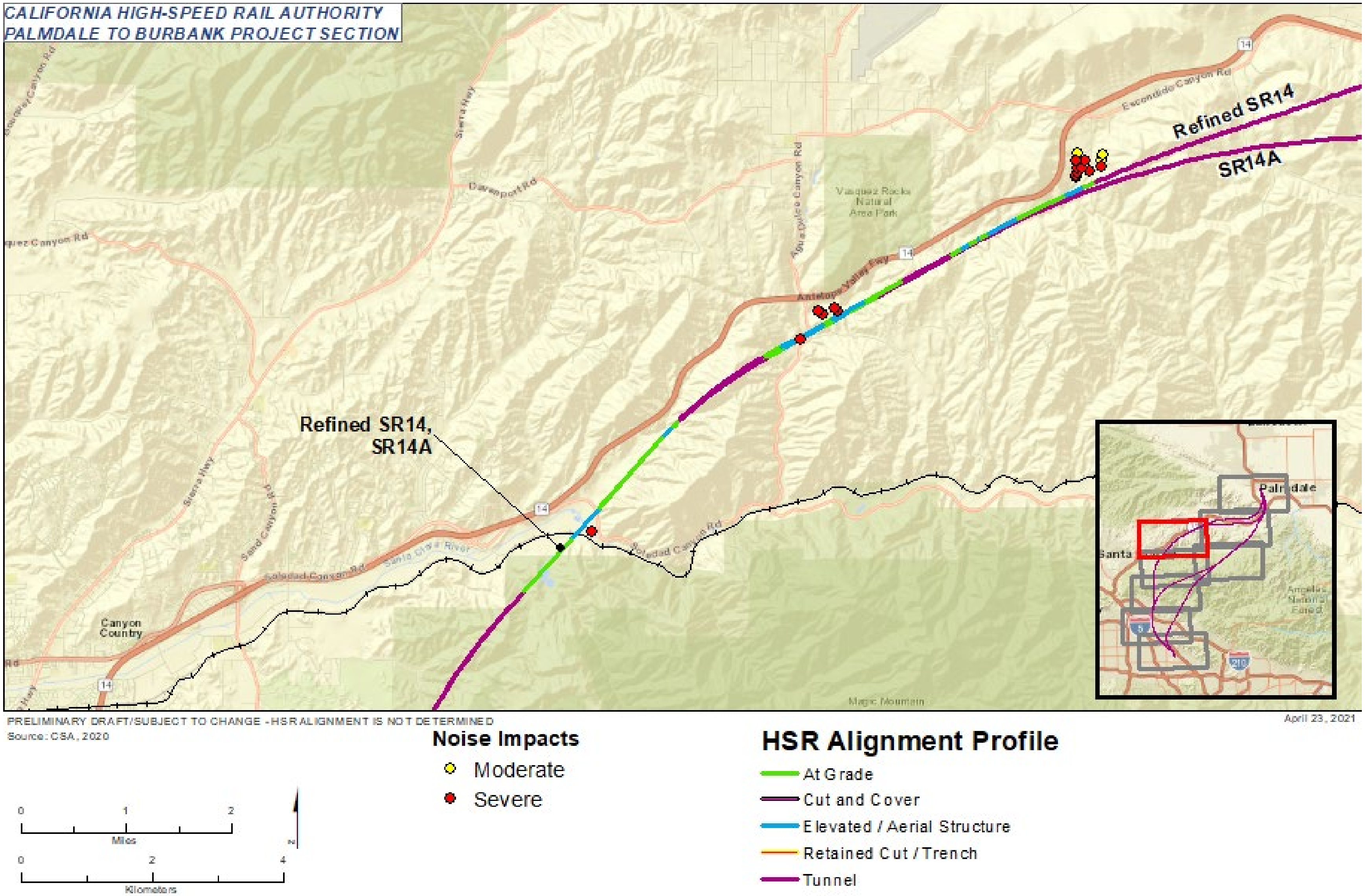


Figure 3.4-19 Noise Impact Locations for the Refined SR14 Build Alternative (Map 3 of 4)

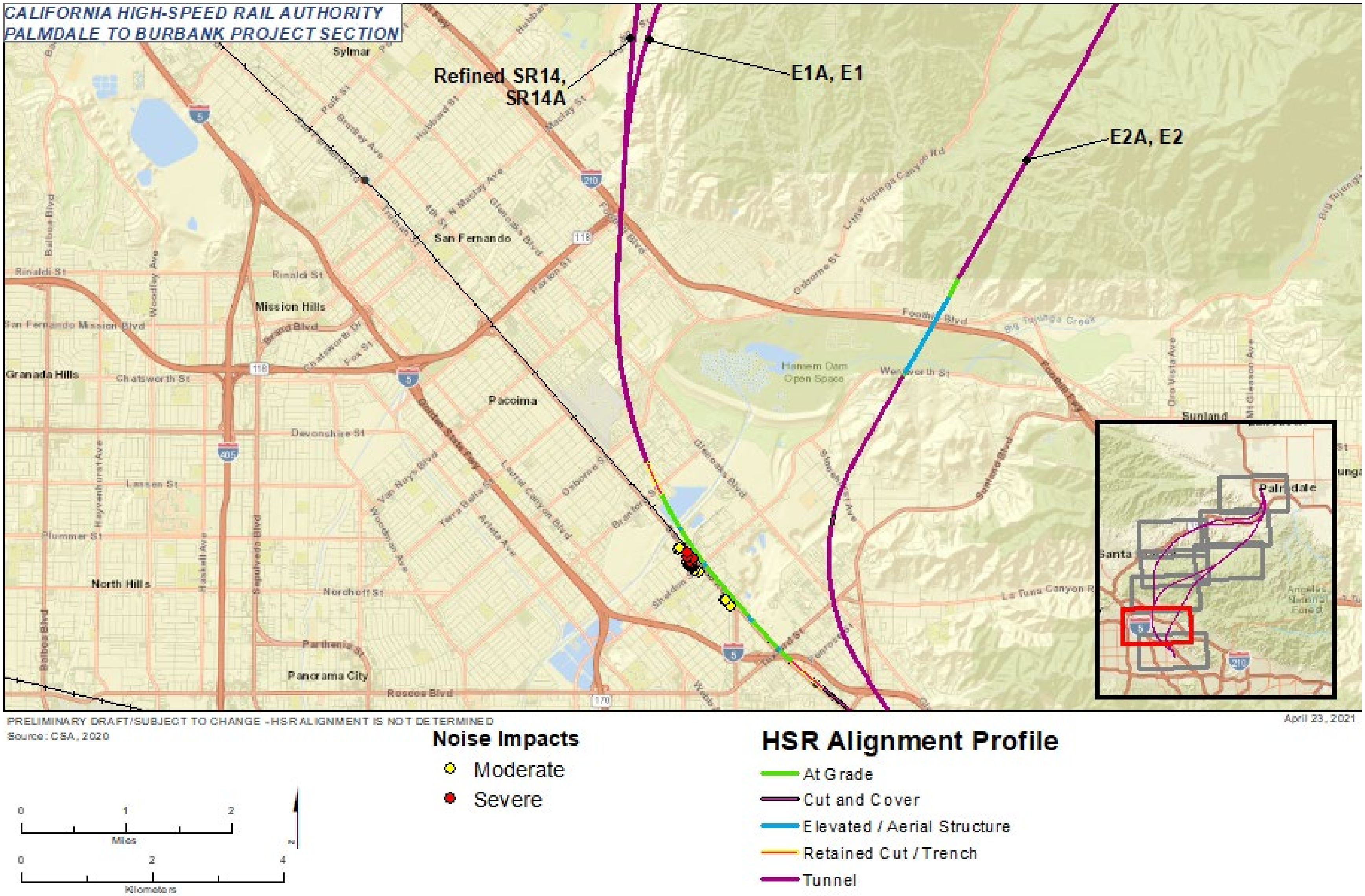


Figure 3.4-20 Noise Impact Locations for the Refined SR14 Build Alternative (Map 4 of 4)

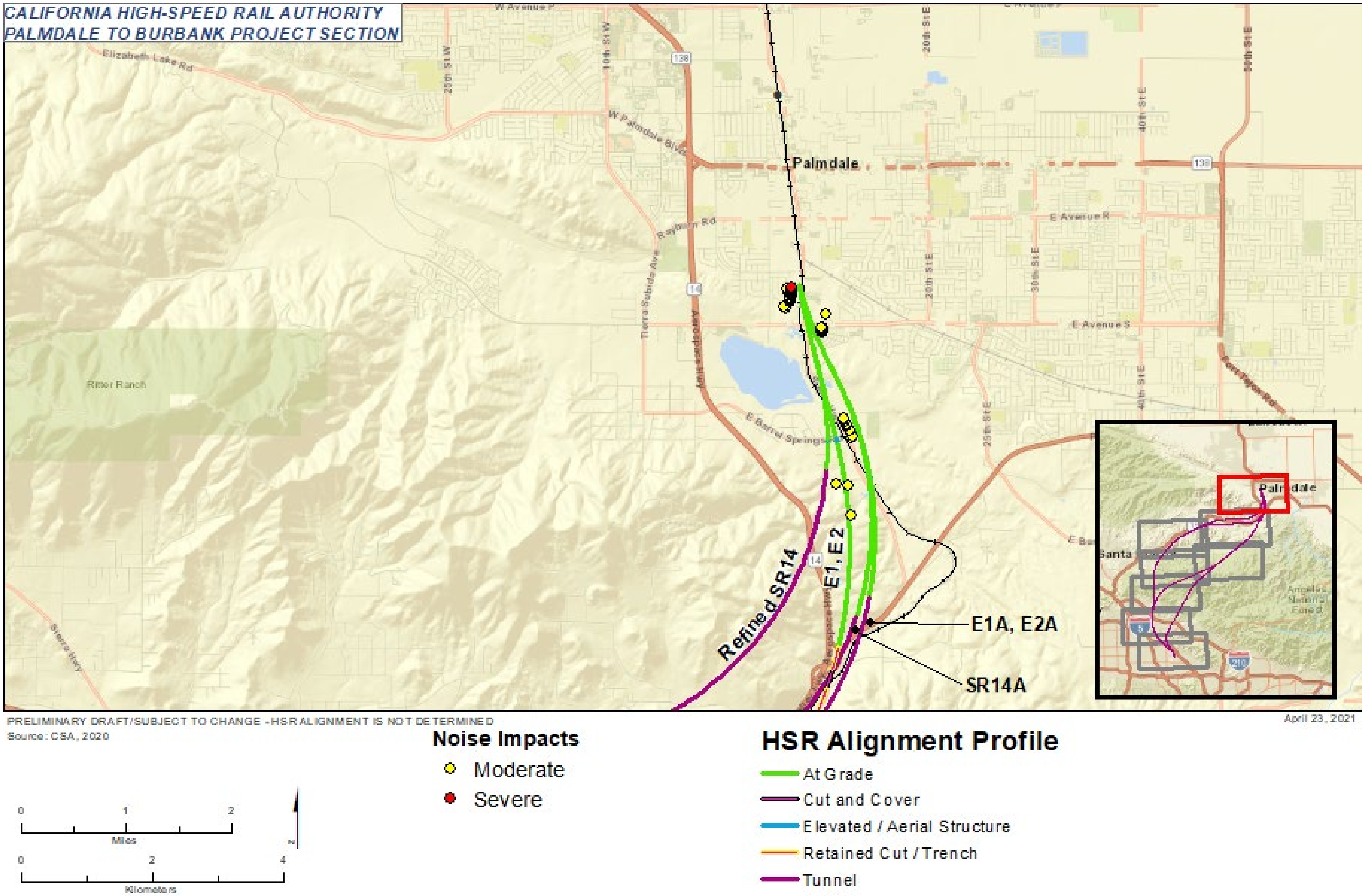


Figure 3.4-21 Noise Impact Locations for the SR14A Build Alternative (Map 1 of 3)

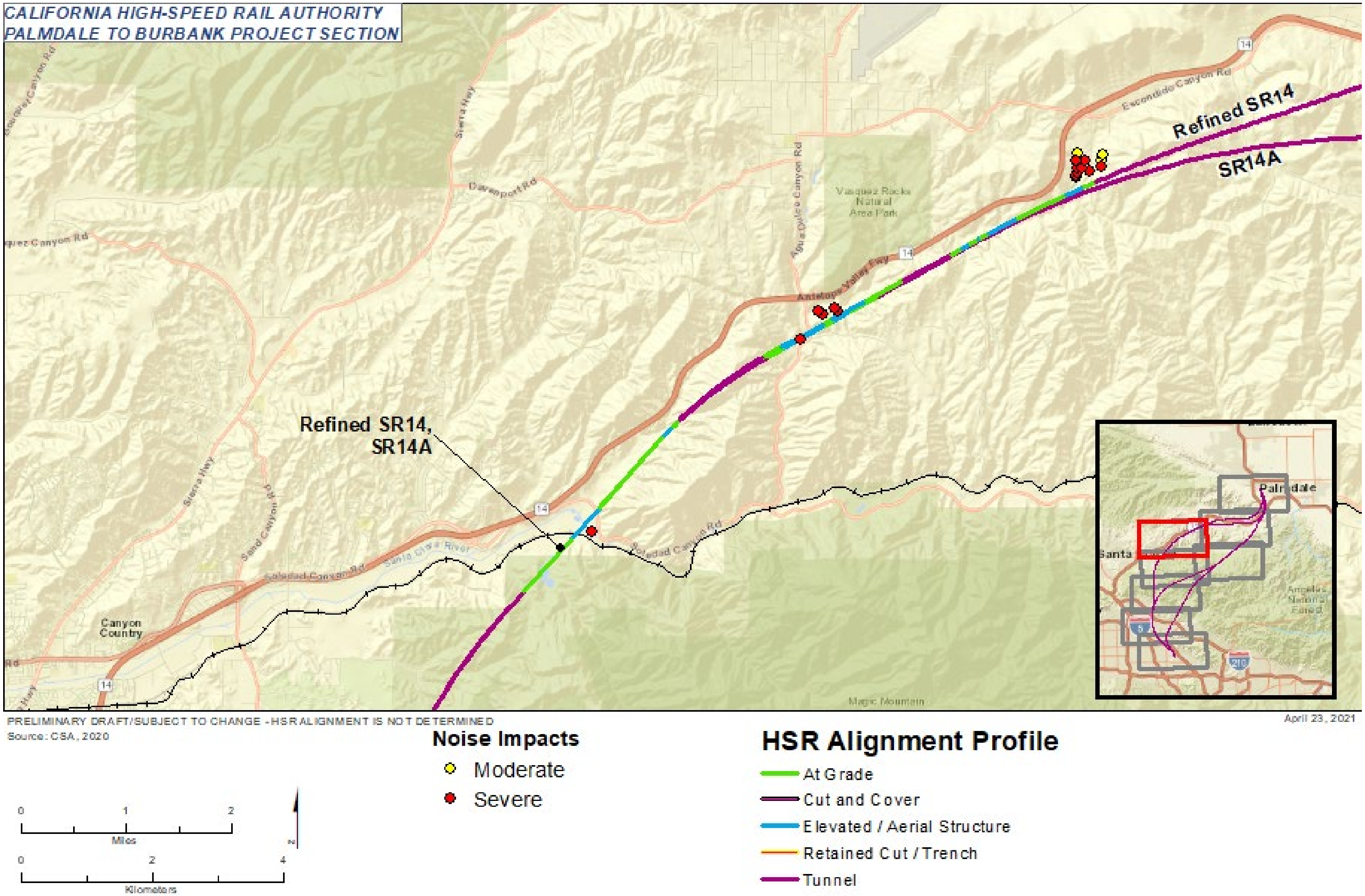


Figure 3.4-22 Noise Impact Locations for the SR14A Build Alternative (Map 2 of 3)

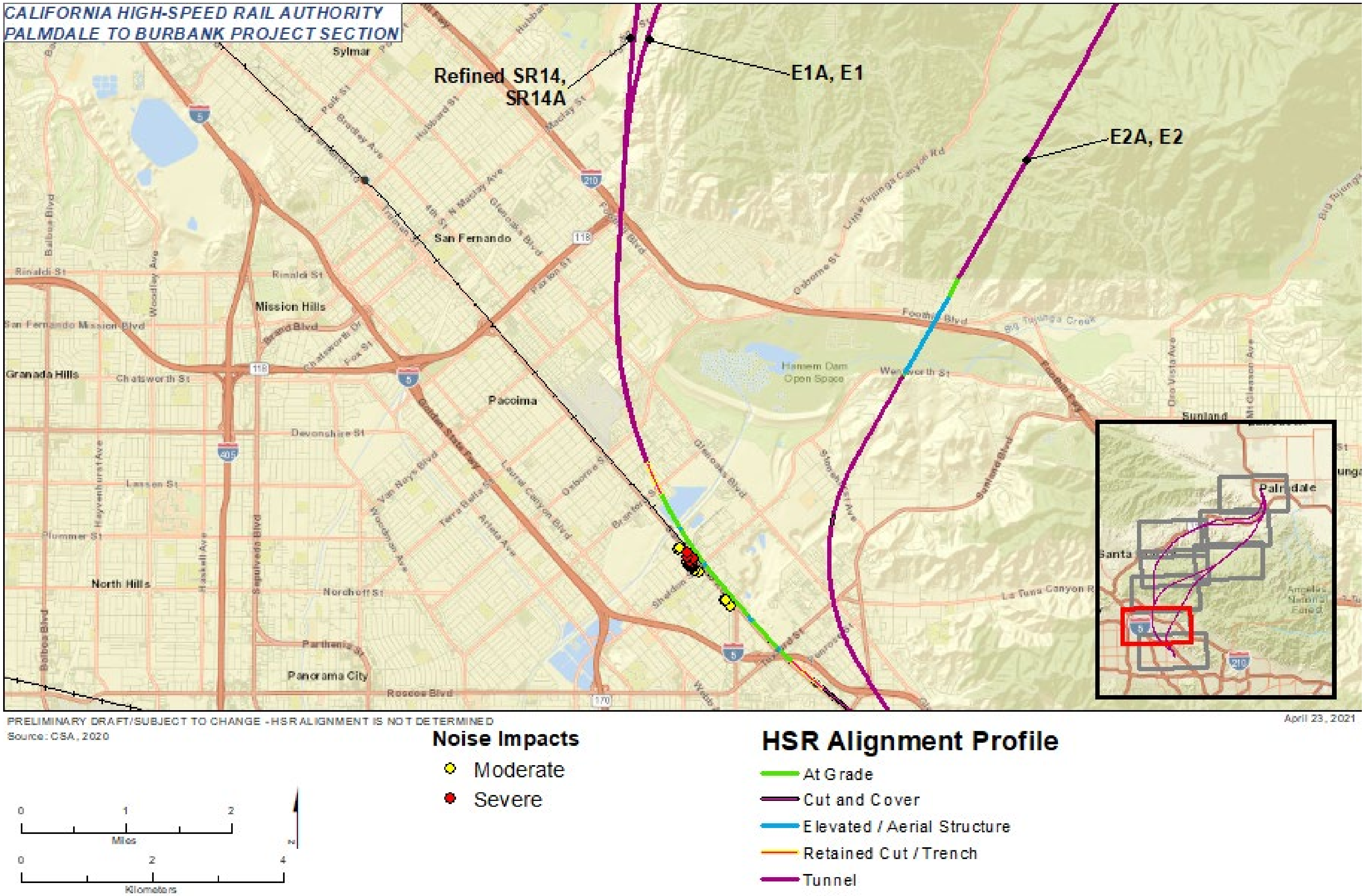


Figure 3.4-23 Noise Impact Locations for the SR14A Build Alternative (Map 3 of 3)

E1 and E1A Build Alternatives

Figure 3.4-24 through Figure 3.4-26 show the noise impact locations for the E1 Build Alternative. Figure 3.4-27 through Figure 3.4-29 show the noise impact locations for the E1A Build Alternative.

Central Subsection

The results of the assessment of California HSR System operational noise impacts for the E1 and E1A Build Alternative within the Central Subsection, before mitigation, are summarized in Table 3.4-32 for residential land uses. No noise impacts on institutional uses (e.g., schools, libraries, theaters, and churches) were identified for the E1 and E1A Build Alternatives within the Central Subsection.

Table 3.4-32 Operational Noise Impacts – Residential: E1 and E1A Build Alternatives, Central Subsection

Location	Side of Track	Closest Receiver(s) Distance to Near Track (feet) E1	Closest Receiver(s) Distance to Near Track (feet)E1A	Existing Noise Level (dBA) E1	Existing Noise Level (dBA) E1A	Project Noise Level (dBA) E1	Project Noise Level (dBA) E1A	Noise Impact Criteria (dBA) E1		Noise Impact Criteria (dBA) E1A		Number of Effects E1[1]		Number of Effects E1A[1]	
								Mod	Sev	Mod	Sev	Mod	Sev	Mod	Sev
Spruce Court to East Avenue S	NB	-	835	-	65	-	64	-	-	61	66	**-**	**-**	**1**	**0**
Spruce Court to East Avenue S	SB	412	444	65	65	68	67	61	66	61	66	**10**	**10**	**11**	**8**
East Avenue S to Soledad Siphon	NB	293	283	67	65	71	65	62	67	61	66	**65**	**37**	**9**	**0**
East Avenue S to Soledad Siphon	SB	258	371	51	67	71	68	54	60	62	67	**0**	**27**	**80**	**3**
Soledad Siphon to Pearblossom Highway	SB	-	1,135	-	51	-	58	-	-	58	63	**-**	**-**	**3**	**0**
Pearblossom Highway to Foreston Drive	NB	659	682	57	57	63	65	56	62	56	62	**0**	**1**	**0**	**1**
Pearblossom Highway to Foreston Drive	SB	209	254	57	57	72	73	56	62	56	62	**4**	**24**	**5**	**23**
Foreston Drive to Aliso Canyon Road	SB	470	470	57	57	67	67	56	62	56	62	**0**	**3**	**0**	**3**
Osborne Street to Montague Street	SB	238	238	66	66	53	53	61	67	61	67	**0**	**0**	**0**	**0**
Truesdale Street to Wicks Street	SB	293	293	61	61	67	67	58	64	58	64	**62**	**6**	**62**	**6**
Wicks Street to Lankershim Boulevard	SB	330	330	53	53	55	55	54	60	54	60	**2**	**0**	**2**	**0**
Goss Street to Olinda Street	SB	254	254	58	58	53	53	57	62	57	62	**0**	**0**	**0**	**0**
Olinda Street to Sunland Boulevard	SB	309	309	58	58	52	52	57	62	57	62	**0**	**0**	**0**	**0**

Source: Authority, 2019
[1]The Number of Effects indicated locations where the noise level threshold is exceeded at noise measurement locations
Authority = California High-Speed Rail Authority; dBA = A-weighted decibel; Mod = moderate; NB = northbound; SB = southbound; Sev = severe

Within the ANF, including portions of the SGMNM, the E1 Build Alternative and E1A Build Alternative alignments would be in tunnel; therefore, operations would not produce perceptible noise effects aboveground. Operation of HSR trains adjacent to the ANF, including portions of the SGMNM, could generate noise on USFS lands; however, there are no designated recreational areas, formal campgrounds, or other sensitive receivers located within these areas.

Burbank Subsection

There would be no noise effects for either the E1 Build Alternative or the E1A Build Alternative within the Burbank Subsection as there are few noise-sensitive receptors, and project noise levels would not exceed the threshold for sensitive receivers.

CEQA Conclusion

There are no noise-sensitive receivers for the E1 Build Alternative or the E1A Build Alternative within the Burbank Subsection. Operation of the E1 and E1A Build Alternatives in the Central Subsection would result in severe noise impacts at residential receivers. This exceedance of noise standards represents a significant impact under CEQA, and mitigation is required. Mitigation Measures N&V-MM#3, N&V-MM#4, N&V-MM#5, and N&V-MM#6 (discussed in Section 3.4.7) would reduce noise from HSR operations. These mitigation measures would reduce noise by reducing rail gaps and turnouts, by ensuring that vehicles meet federal noise regulations to the extent technologically available, and by implementing noise barriers. Independent of the other noise mitigation measures, the noise barriers included in Mitigation Measure N&V-MM# 3, in most cases, would effectively reduce exterior noise below applicable thresholds. Section 3.4.7 includes an analysis of feasible noise barriers. For the E1 Build Alternative five noise barriers were evaluated. Three of the five proposed noise barriers, would eliminate all severe noise impacts at their respective locations within the Central Subsection. One barrier was determined to not be reasonable, and one would not reduce all impacts (15 residual severe noise impacts would remain).

For the E1A Build Alternative two noise barriers were evaluated. One would eliminate all severe noise impacts at its location while the other was determined to not be reasonable.

Additionally, for both Build Alternatives, there are scattered and isolated residences that would experience severe noise impacts for which noise barriers would not meet the criteria discussed in Section 3.4.7. The E1 and E1A Build Alternatives have 38 and 37 of these impacts, respectively. Because noise barriers are either not reasonable or do not eliminate all severe noise impacts, other noise-reducing measures discussed in Mitigation Measure N&V-MM#3, such as sound insulation and noise easements would be applied. While these measures would reduce impacts they may not completely reduce noise levels to below thresholds in all locations. The areas where noise barrier criteria is not met, combined with areas where there remain severe residuals after implementation of mitigation measures would result in a total of 53 and 37 severe effects for the E1 and E1A Build Alternatives, respectively. As a result, this represents a significant and unavoidable impact for the E1 Build Alternative and the E1A Build Alternative.

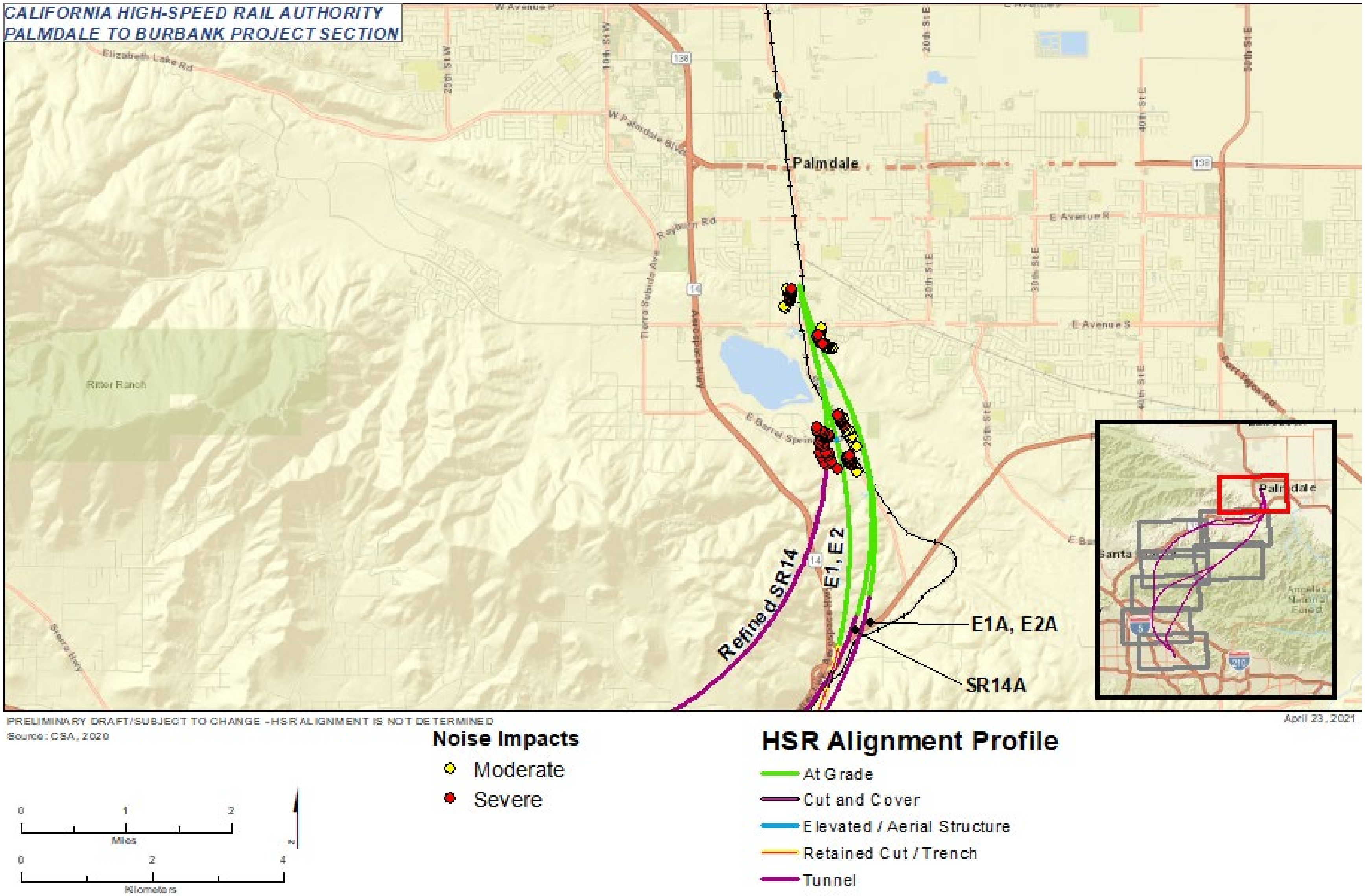


Figure 3.4-24 Noise Impact Locations for the E1 Build Alternative (Map 1 of 3)

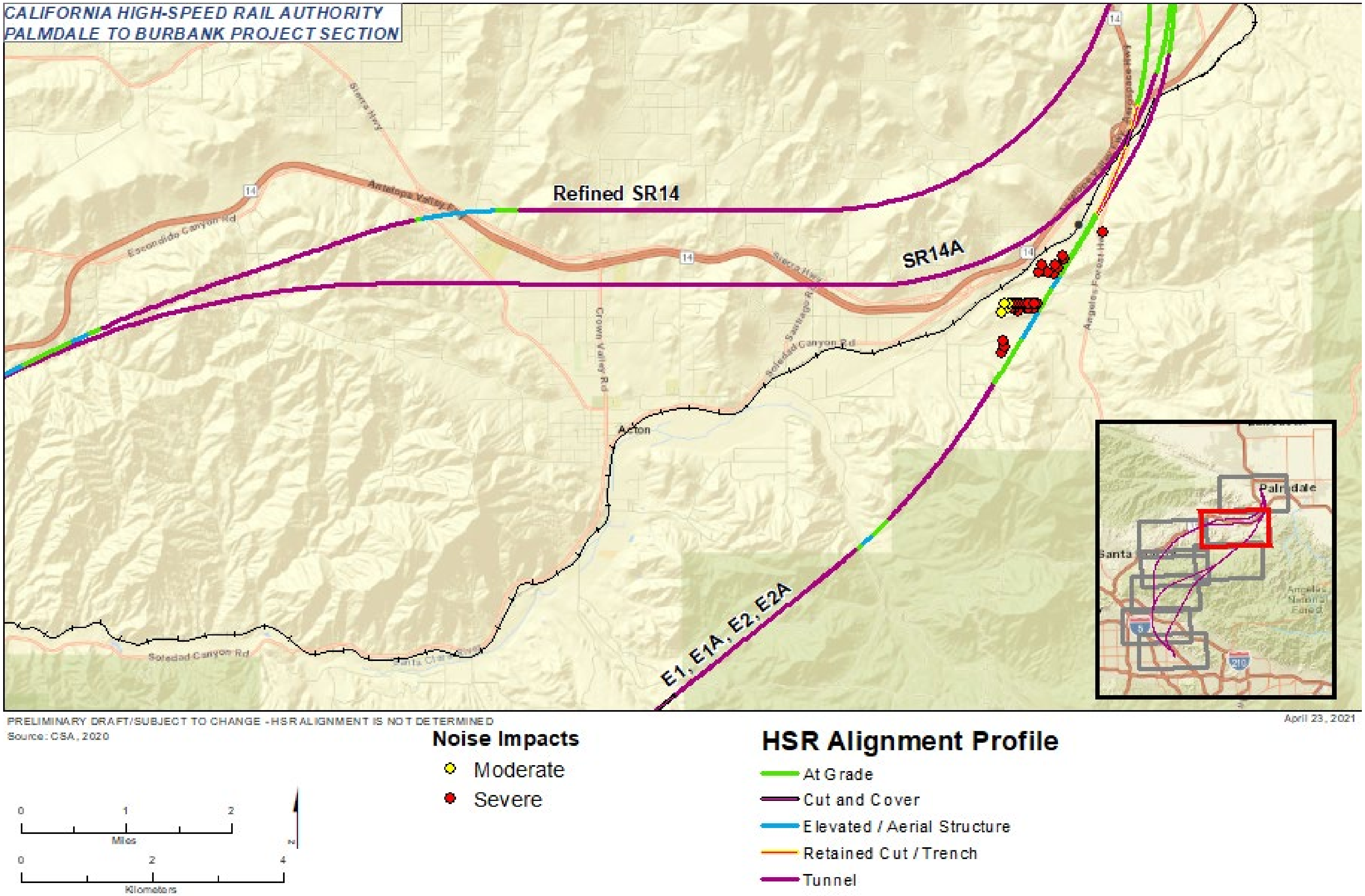


Figure 3.4-25 Noise Impact Locations for the E1 Build Alternative (Map 2 of 3)

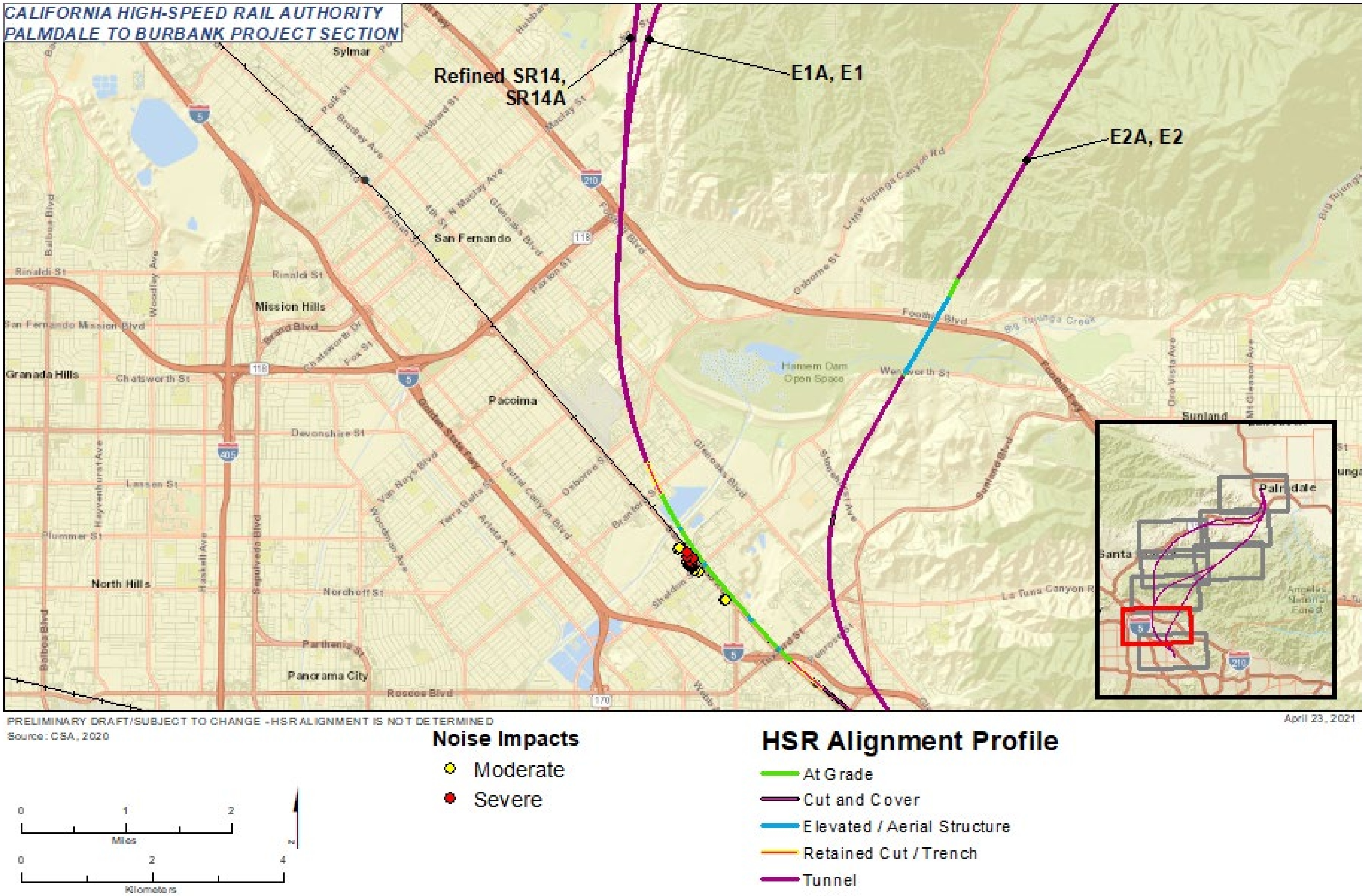


Figure 3.4-26 Noise Impact Locations for the E1 Build Alternative (Map 3 of 3)

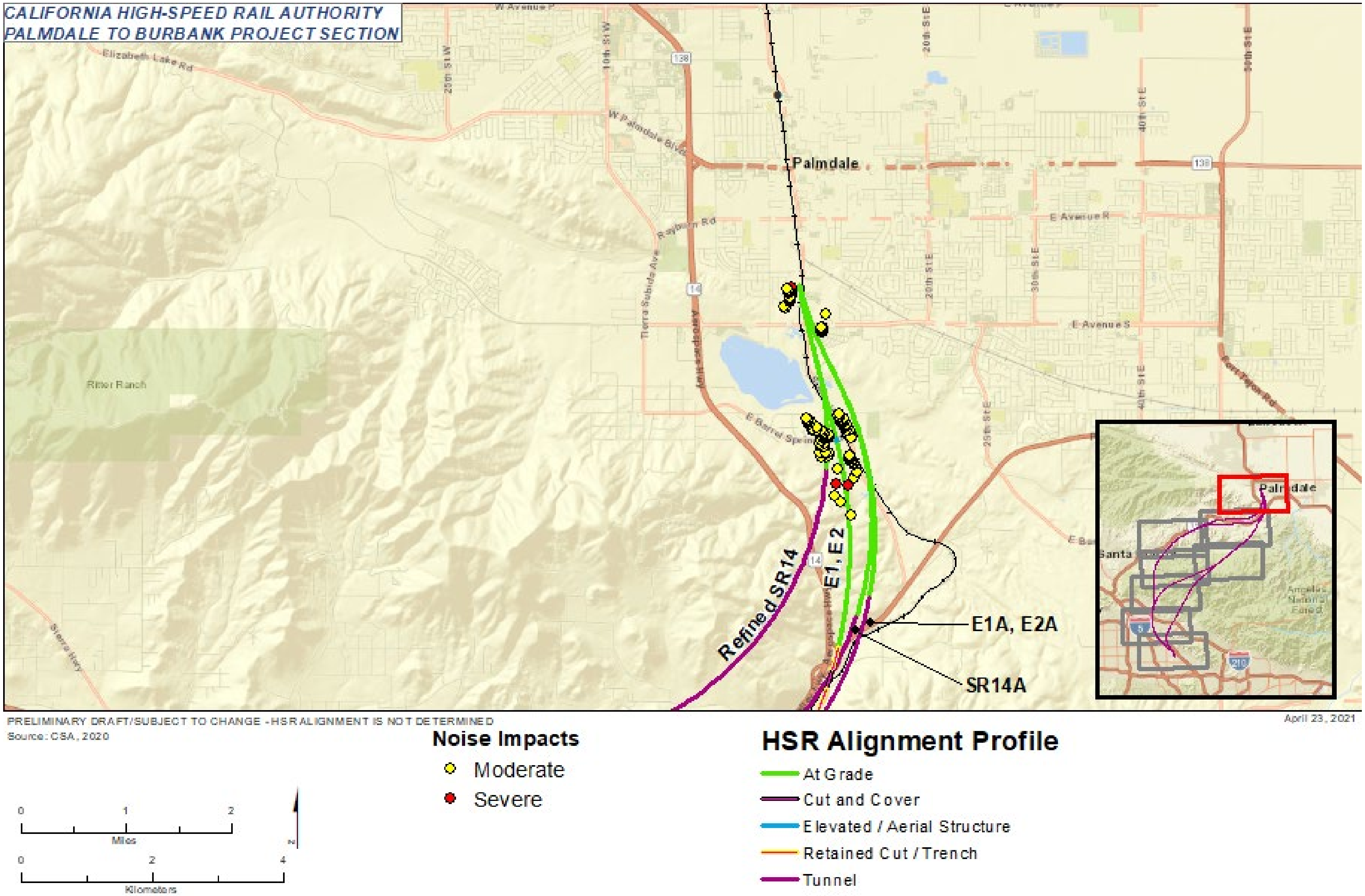


Figure 3.4-27 Noise Impact Locations for the E1A Build Alternative (Map 1 of 3)

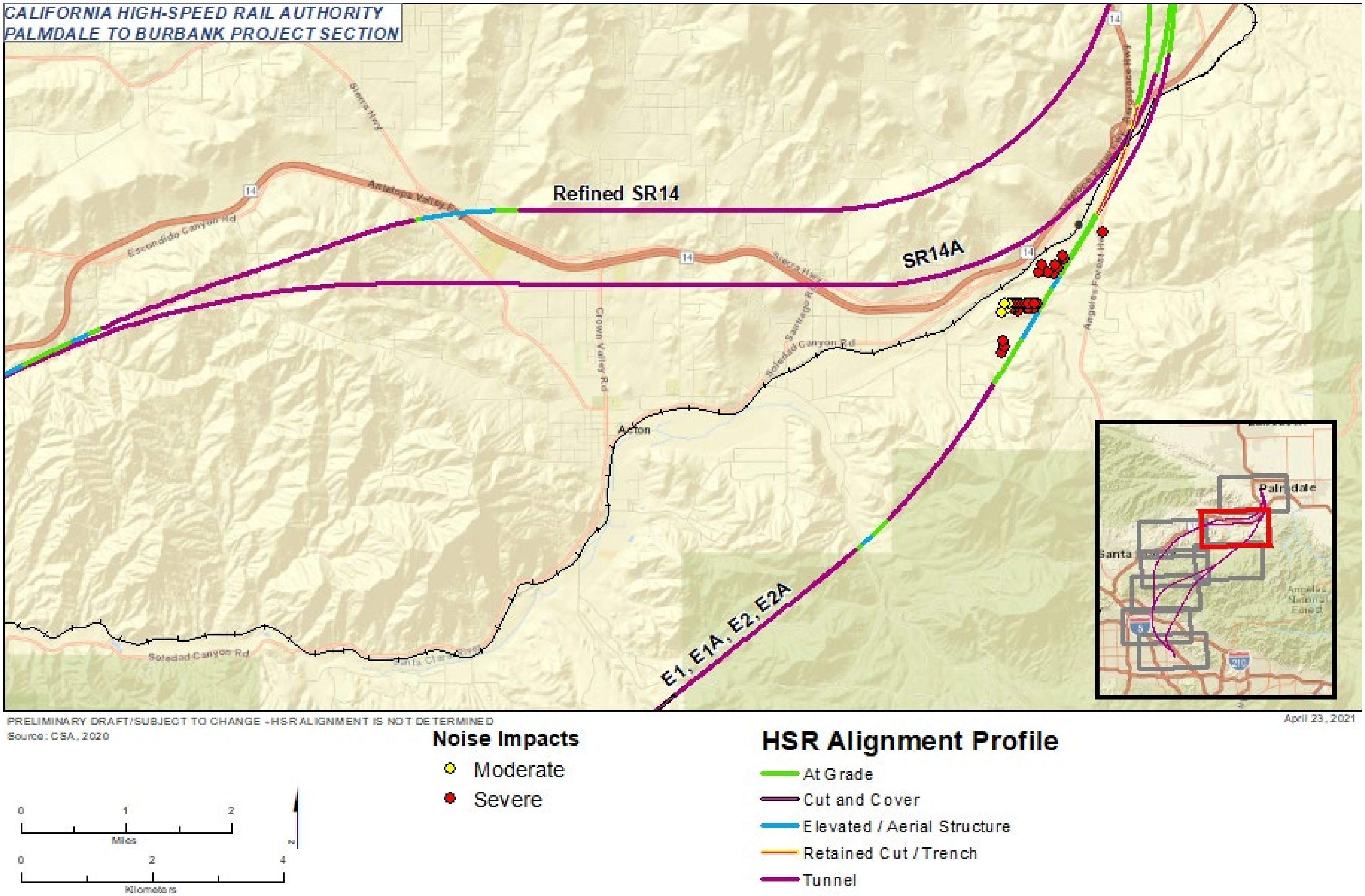


Figure 3.4-28 Noise Impact Locations for the E1A Build Alternative (Map 2 of 3)

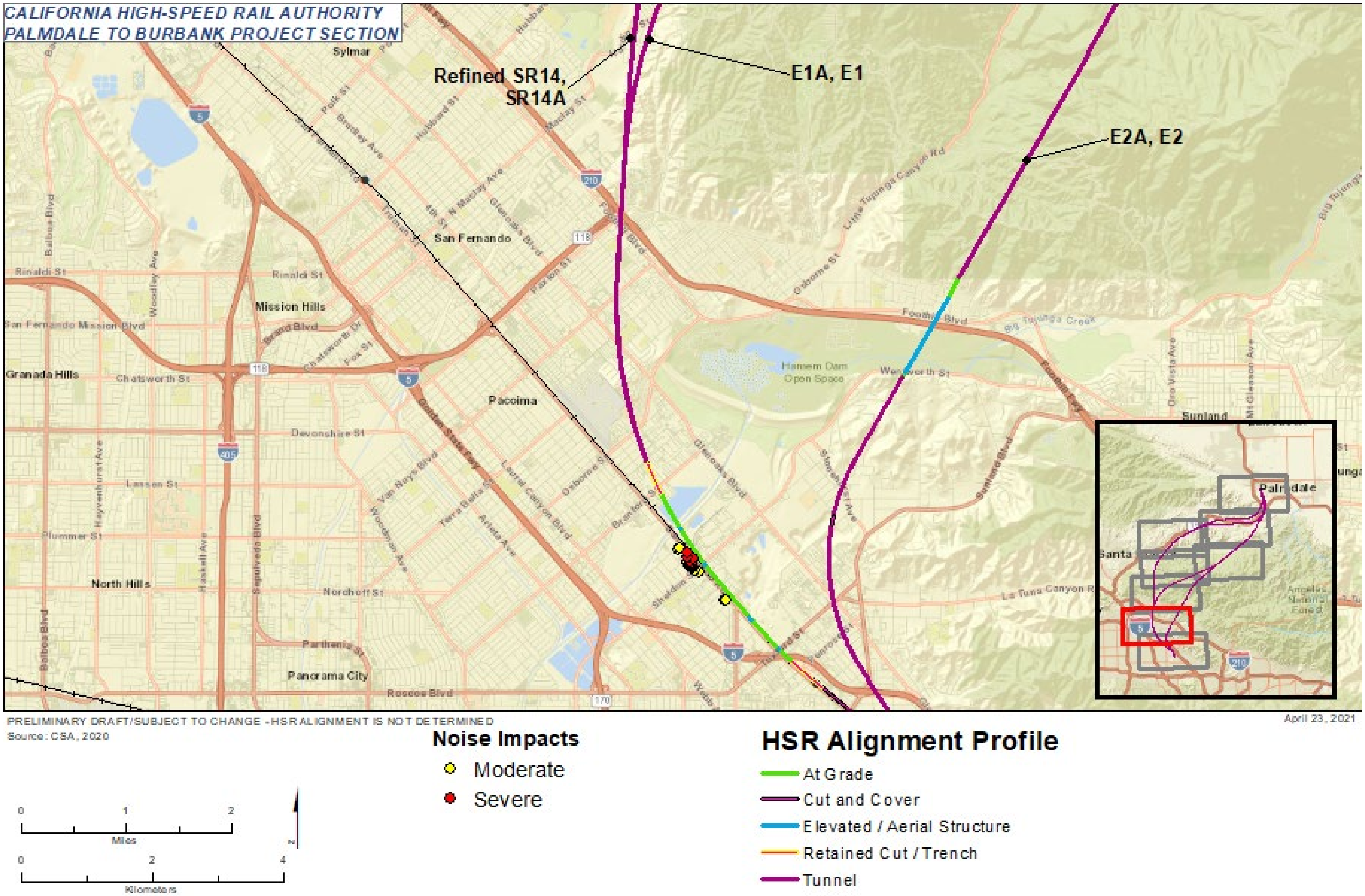


Figure 3.4-29 Noise Impact Locations for the E1A Build Alternative (Map 3 of 3)

E2 and E2A Build Alternative

Figure 3.4-30 through Figure 3.4-32 show the noise impact locations for the E2 Build Alternative. Figure 3.4-33 through Figure 3.4-35 show the noise impact locations for the E2A Build Alternative.

Central Subsection

The results of the impact assessment for California HSR System operational noise for the E2 Build Alternative and the E2A Build Alternative within the Central Subsection before mitigation are summarized in Table 3.4-33 for residential land uses. No noise impacts on institutional uses (e.g., schools, libraries, theaters, and churches) were identified for the E2 Build Alternative or the E2A Build Alternative within the Central Subsection.

Table 3.4-33 Operational Noise Impacts – Residential: E2 and E2A Build Alternatives, Central Subsection

Location	Side of Track	Closest Receiver(s) Distance to Near Track (feet) E2	Closest Receiver(s) Distance to Near Track (feet) E2A	Existing Noise Level (dBA) E2	Existing Noise Level (dBA) E2A	Project Noise Level (dBA) E2	Project Noise Level (dBA) E2A	Noise Impact Criteria (dBA) E2		Noise Impact Criteria (dBA) E2A		Number of Effects E2[1]		Number of Effects E2A[1]	
								Mod	Sev	Mod	Sev	Mod	Sev	Mod	Sev
Spruce Court to East Avenue S	NB	-	835	-	65	-	64	-	-	61	66	**-**	**-**	**1**	**0**
Spruce Court to East Avenue S	SB	412	444	65	65	68	67	61	66	61	66	**10**	**10**	**11**	**8**
East Avenue S to Soledad Siphon	NB	293	283	67	65	71	65	62	67	61	66	**65**	**37**	**9**	**0**
East Avenue S to Soledad Siphon	SB	258	371	51	67	71	68	54	60	62	67	**0**	**27**	**80**	**3**
Soledad Siphon to Pearblossom Highway	NB	556	-	51	-	66	-	54	60	-	-	**0**	**1**	**-**	**-**
Soledad Siphon to Pearblossom Highway	SB	325	1,135	51	51	69	58	54	60	54	60	**0**	**1**	**3**	**0**
Pearblossom Highway to Foreston Drive	NB	659	682	57	57	65	65	56	62	56	62	**0**	**1**	**0**	**1**
Pearblossom Highway to Foreston Drive	SB	209	254	57	57	72	73	56	62	56	62	**7**	**21**	**5**	**23**
Foreston Drive to Aliso Canyon Road	SB	470	470	57	57	67	67	56	62	56	62	**0**	**3**	**0**	**3**
BP and L Road to Wentworth Street	NB	256	256	57	57	75	75	56	62	56	62	**5**	**12**	**5**	**12**
BP and L Road to Wentworth Street	SB	187	187	57	57	75	75	56	62	56	62	**44**	**49**	**44**	**49**
Wentworth Street to McBroom Street	NB	431	431	54	54	61	61	55	61	55	61	**10**	**2**	**10**	**2**

Source: Authority, 2019
[1]The Number of Effects indicates locations where the noise level threshold is exceeded at noise measurement locations
Authority = California High-Speed Rail Authority; dBA = A-weighted decibel; Mod = moderate; NB = northbound; SB = southbound; Sev = severe

Within the ANF, including portions of the SGMNM, the E2 Build Alternative and E2A Build Alternative alignments would be in tunnel; therefore, operations would not produce perceptible noise effects aboveground. Operation of HSR trains adjacent to the ANF, including portions of the SGMNM, could generate noise on USFS lands; however, there are no designated recreational areas, formal campgrounds, or other sensitive receivers located within these areas.

Burbank Subsection

There would be no noise effects for the E2 Build Alternative or the E2A Build Alternative in the Burbank Subsection as there are few noise-sensitive receptors, and project noise levels would not exceed the threshold for sensitive receivers.

CEQA Conclusion

There are no noise-sensitive receivers for the E2 Build Alternative or the E2A Build Alternative in the Burbank Subsection. Operation of the E2 and E2A Build Alternatives in the Central Subsection would result in severe noise impacts at residential receivers. This exceedance of noise standards represents a significant impact under CEQA, and mitigation is required. Mitigation Measures N&V-MM#3, N&V-MM#4, N&V-MM#5, and N&V-MM#6 (discussed in Section 3.4.7) would reduce noise from California HSR System operation. These mitigation measures would reduce noise by reducing rail gaps and turnouts, by ensuring vehicles meet federal noise regulations to the extent technologically available, and by implementing noise barriers. Independent of the other noise mitigation measures, the noise barriers included in Mitigation Measure N&V-MM# 3, in most cases, would effectively reduce exterior noise below applicable thresholds. Section 3.4.7 includes an analysis of feasible noise barriers. For the E2 Build Alternative seven noise barriers were evaluated. Three of the noise barriers would eliminate all severe noise impacts at their respective locations. Three of the noise barriers would not reduce all severe noise impacts resulting residual severe noise impacts at their respective locations. One noise barrier was determined to not be reasonable.

For the E2A Build Alternative four noise barriers were evaluated. One would eliminate all severe noise impacts at its location. Two noise barriers would not reduce all severe noise impacts resulting in residual severe noise impacts at their locations, and one noise barrier was determined to not be reasonable.

Additionally, for both Build Alternatives, there are scattered and isolated residences that would experience severe noise impacts for which noise barriers would not meet the criteria discussed in Section 3.4.7. The E2 and E2A Build Alternatives each have 33 of these impacts. Because noise barriers are either not reasonable or do not eliminate all severe noise impacts, other noise-reducing measures discussed in Mitigation Measure N&V-MM#3, such as sounds insulation and noise easements, would be applied. While these measures would reduce impacts they may not completely reduce noise levels to below thresholds in all locations. The areas where noise barrier criteria is not met, combined with areas where there remain severe residuals after implementation of mitigation measures would result in a total of 69 and 54 severe effects for the E2 and E2A Build Alternatives, respectively. This represents a significant and unavoidable impact for the E2 Build Alternative and the E2A Build Alternative.

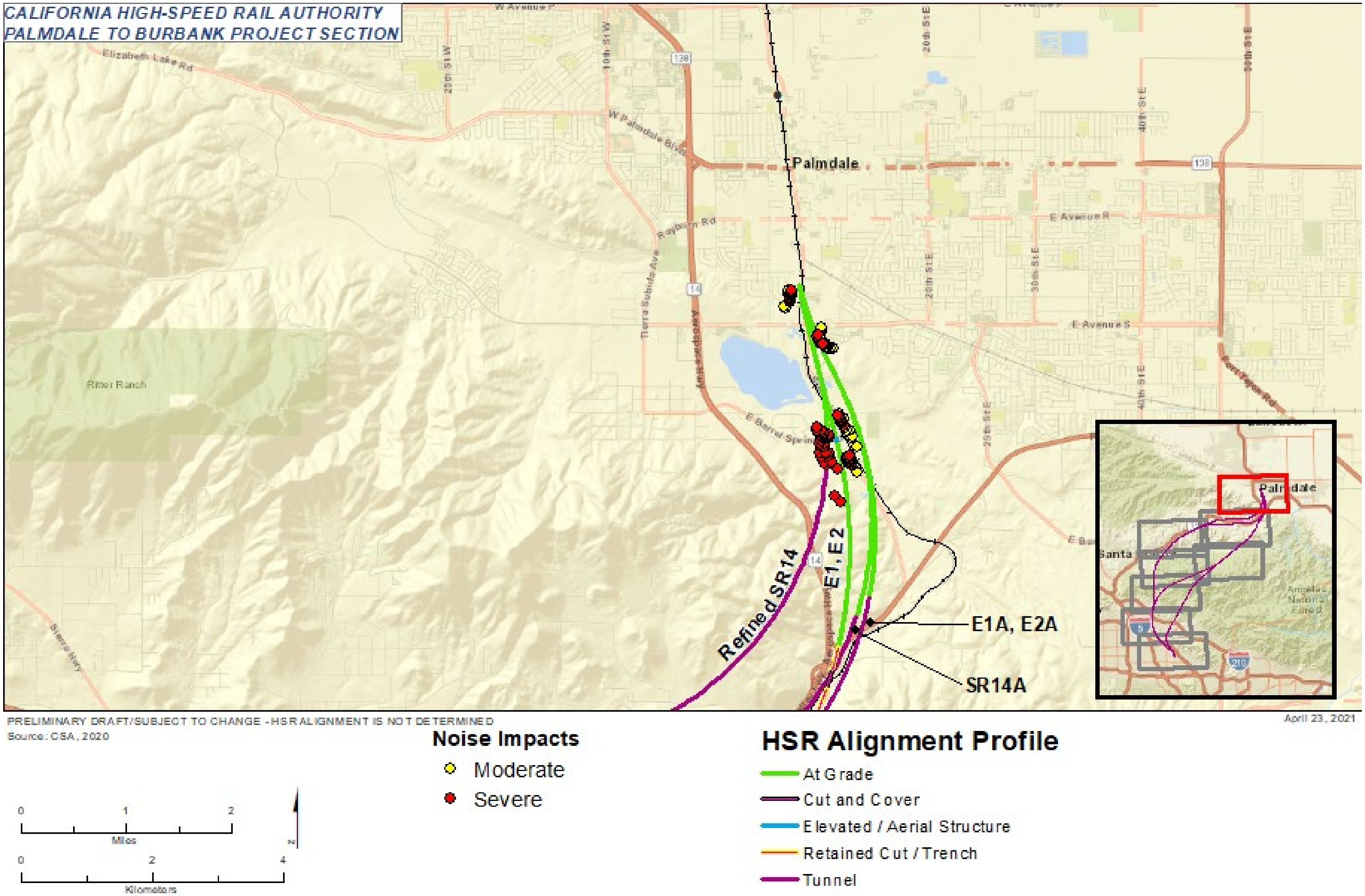


Figure 3.4-30 Noise Impact Locations for the E2 Build Alternative (Map 1 of 3)

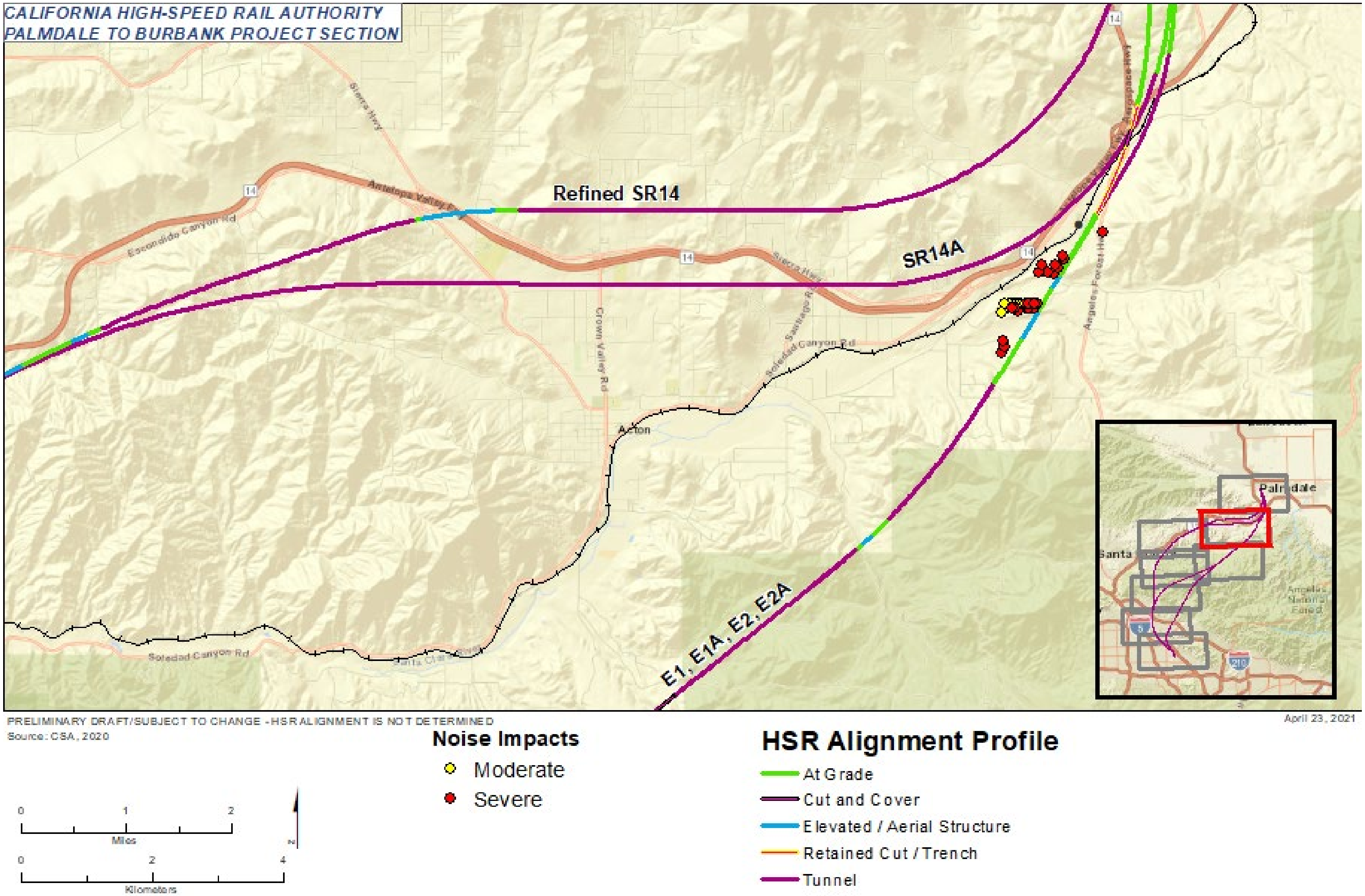


Figure 3.4-31 Noise Impact Locations for the E2 Build Alternative (Map 2 of 3)

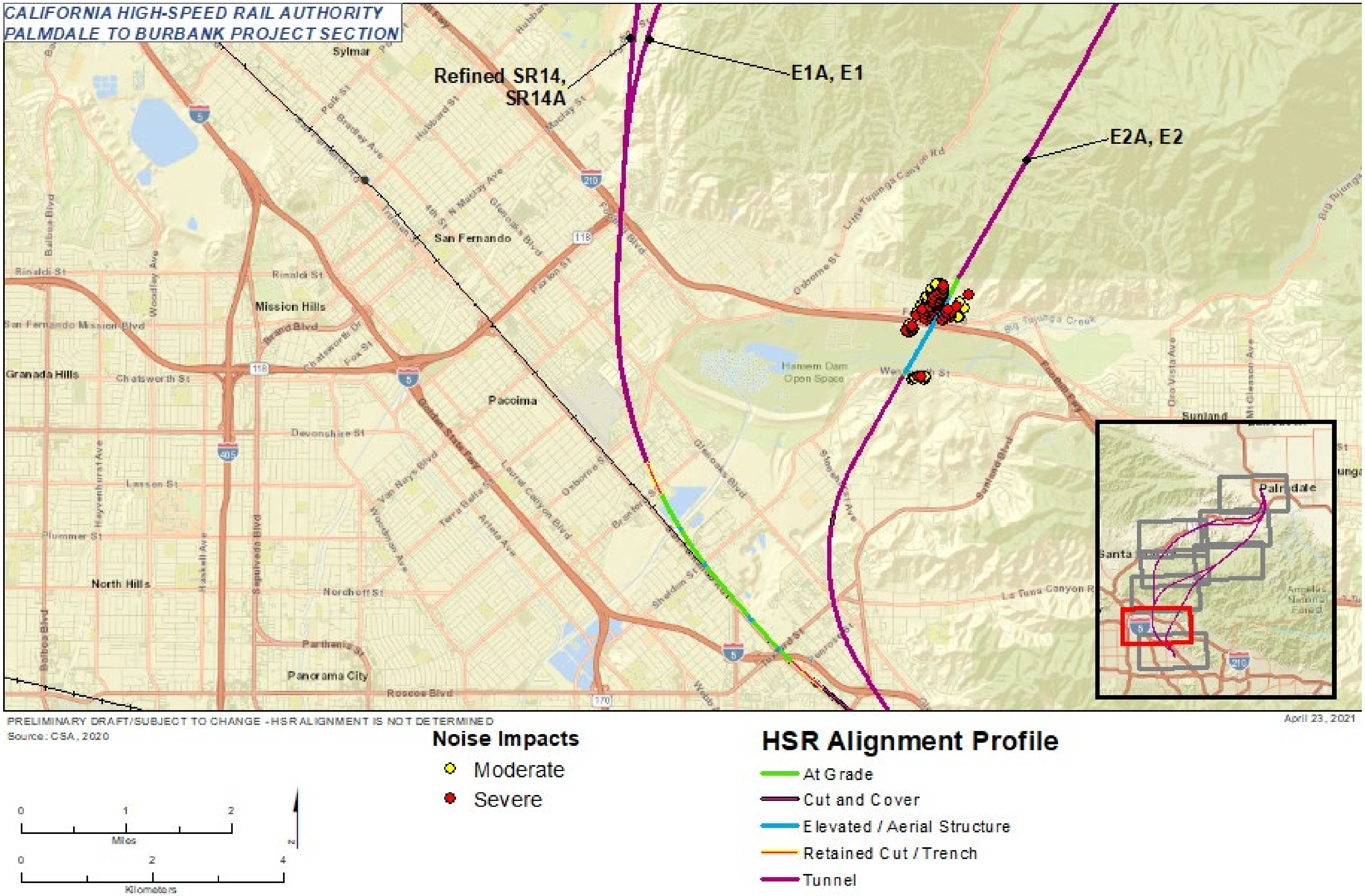


Figure 3.4-32 Noise Impact Locations for the E2 Build Alternative (Map 3 of 3)

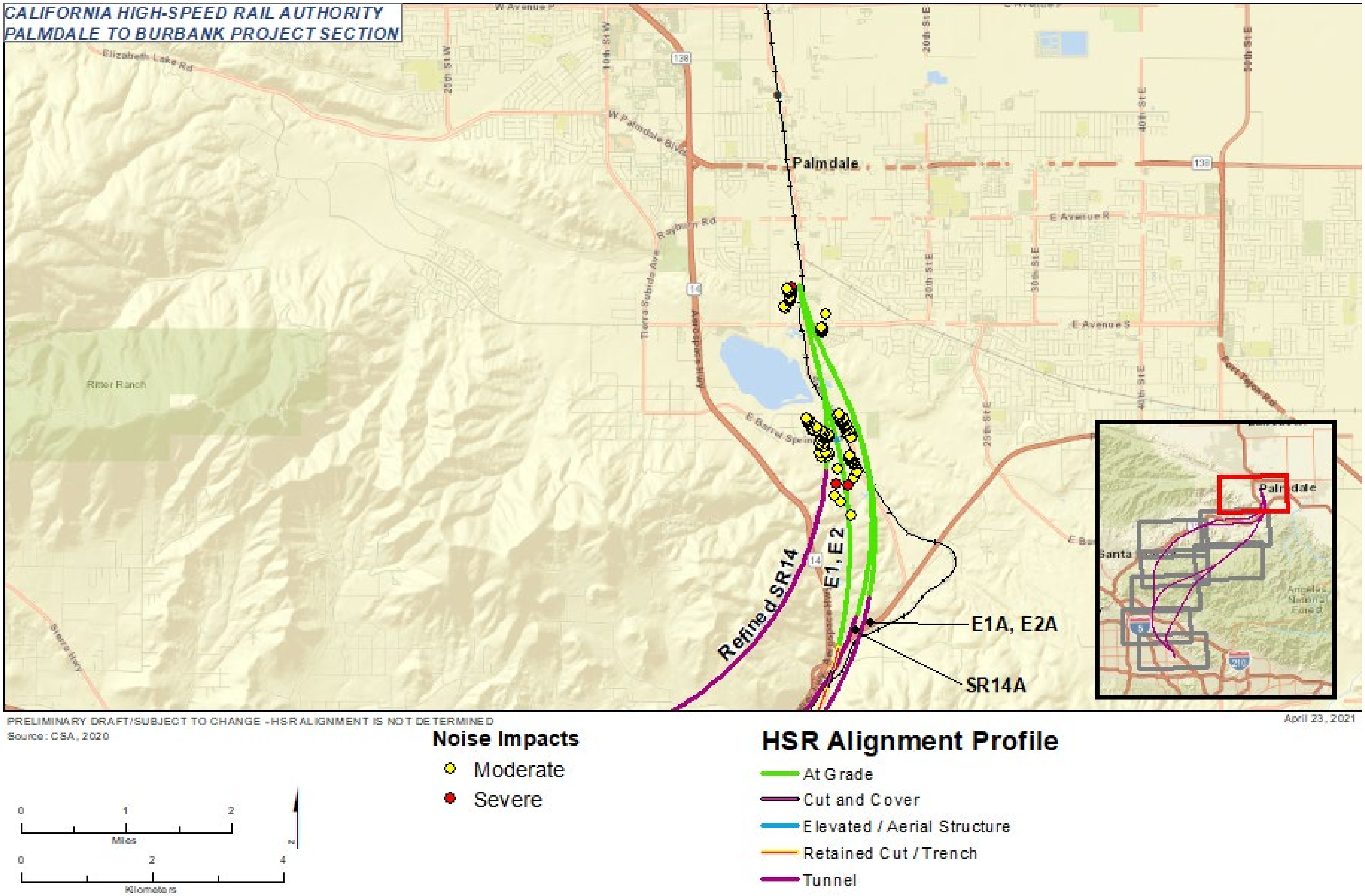


Figure 3.4-33 Noise Impact Locations for the E2A Build Alternative (Map 1 of 3)

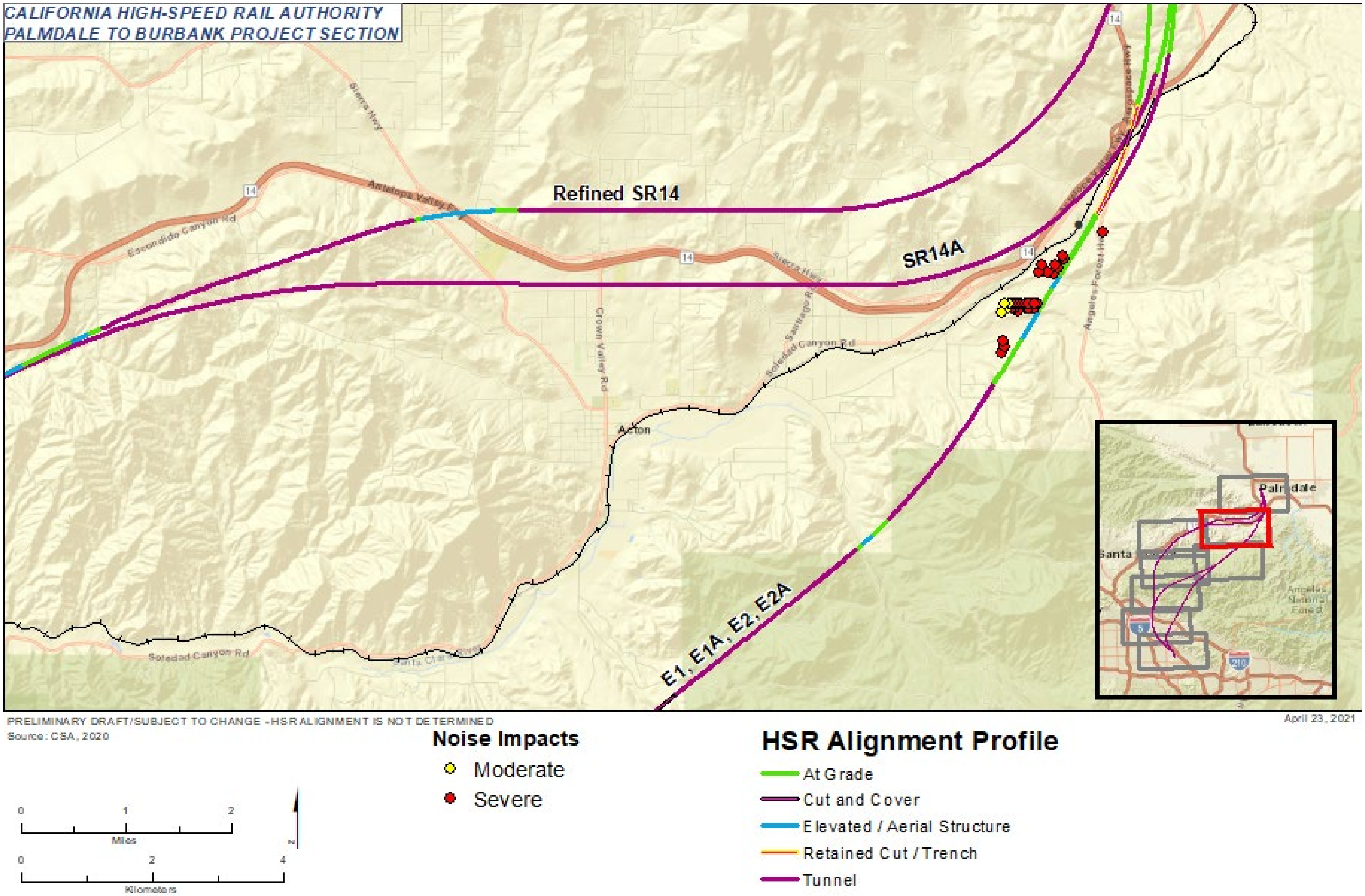


Figure 3.4-34 Noise Impact Locations for the E2A Build Alternative (Map 2 of 3)

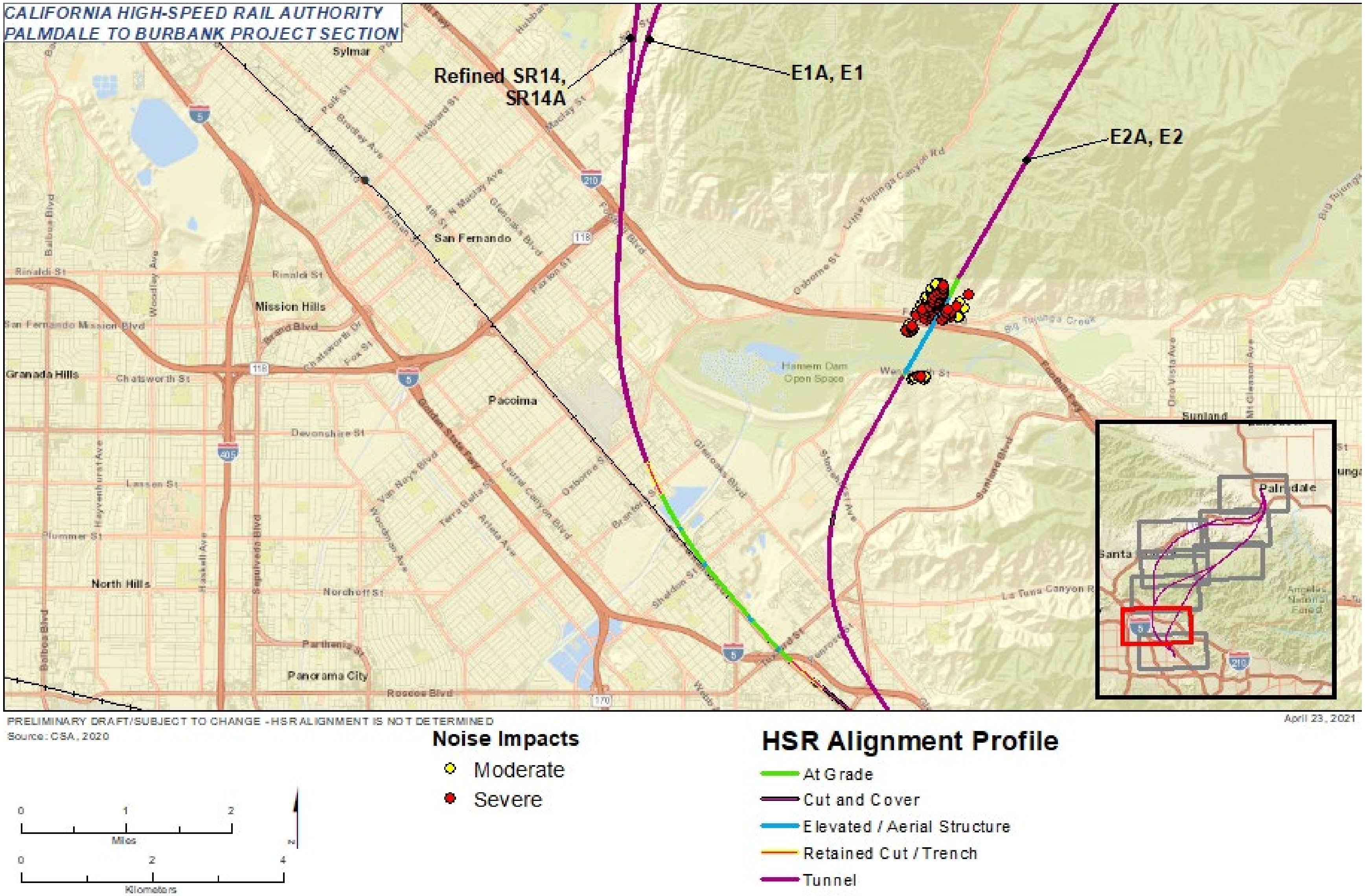


Figure 3.4-35 Noise Impact Locations for the E2A Build Alternative (Map 3 of 3)

Impact N&V#7: Noise and Vibration Impacts on Domestic Animals.

Domestic birds and mammals near the California HSR System corridor may be affected by train pass-bys if they are subjected to SEL values of 100 dBA or higher, as shown in Table 3.4-13. Generally, domestic animals such as dairy cows, horses, and other farm animals are of concern. Because of the frequency and speed of trains, noise created by train operations also has the potential to affect wildlife movement and use of habitat. See Section 3.7, Biological and Aquatic Resources, for analysis of noise and vibration impacts on wildlife. See section 3.14, Agricultural Farmland and Forestland, for analysis of construction noise and vibration impacts to domestic livestock.

The noise exposure limit of an SEL of 100 dBA for domestic animals would be limited to locations within 40 to 50 feet of the aboveground alignment centerline as shown in Figure 3.4-11, which is typically within the fenced right-of-way. Such fencing would preclude domestic animals from approaching the alignment at a proximity of 40 to 50 feet. Maintenance activities are expected to be dispersed over time and location and are not expected to be of an intensity or duration to result in substantial impacts on domestic animals.

Aerial structures associated with each of the six Build Alternatives would pass over public recreation areas that provide equestrian trails and/or equestrian facilities such as riding stables. These public recreation resources include:

- Pacific Crest Trail (Refined SR14 and SR14A Build Alternatives only, refer to Figure 3.15-7 in Section 3.15, Parks, Recreation, and Open Space)
- Vasquez Rocks Natural Area Park (Refined SR14 and SR14A Build Alternatives only, refer to Figure 3.15-7 in Section 3.15, Parks, Recreation, and Open Space)
- Hansen Dam Recreation Area (E2 and E2A Build Alternatives only, refer to Figure 3.15-15 in Section 3.15, Parks, Recreation, and Open Space)
- Stonehurst Park and Recreation Center (E2 and E2A Build Alternatives only, refer to Figure 3.15-15 in Section 3.15, Parks, Recreation, and Open Space)

At these public recreation resources, the Refined SR14, SR14A, E2, and E2A Build Alternative alignments would cross through areas likely to have horses present. Horses near these viaduct locations could experience startle effects from the noise. The E1 and E1A Build Alternative alignments would not pass by the public equestrian trails or facilities listed above.

The main source of operations-related vibration would be train passage. This vibration would take place throughout the project extent whenever trains pass. Domestic animals are not anticipated to be close enough to experience significant vibration effects. Further, the duration of vibration would be brief; a train would take approximately 2 seconds to pass any given point or 3 seconds if vibration impacts are assumed to extend up to 150 feet in front of and behind the train. At a maximum of 176 trains per day, there would be a potential exposure of about 9 minutes per day, or 0.6 percent of the time. Therefore, because of the distance from vibratory sources and the limited time of exposure, vibration from train passage is not anticipated to affect domestic animals.

CEQA Conclusion

There would be no startle effects on domestic animals for the E1 Build Alternative and the E1A Build Alternative. Therefore, CEQA does not require any mitigation for the E1 and E1A Build Alternatives. Based on FRA screening distances, as shown in Figure 3.4-11 and Table 3.4-13, California HSR System trains would cause startle noise impacts on domestic animals within 50 feet of the Refined SR14, SR14A, E2, and E2A Build Alternative alignments centerlines during operation. In particular, there is a reasonable likelihood that horses would be within 50 feet of California HSR System aerial structures along the Pacific Crest Trail and in Vasquez Rocks Natural Area Park, the Hansen Dam Recreation Area, and Stonehurst Park and Recreation Center. Noise impacts during California HSR System operation would periodically substantially increase ambient noise levels in the project vicinity above levels existing without the project. This represents a significant impact under CEQA, and mitigation is required.

Mitigation Measure N&V-MM#8 (discussed in Section 3.4.7, Mitigation Measures) would reduce startle effects by requiring active and passive warning signs to be posted along the Pacific Crest Trail and in Vasquez Rocks Natural Area Park, the Hansen Dam Recreation Area, and Stonehurst Park and Recreation Center. These signs will be posted to warn users of an upcoming train crossing and the approximate time for the crossing. Users accompanied by domestic animals will have appropriate warning in order to reduce startle effects on animals. With implementation of Mitigation Measure N&V-MM#8, noise impacts on domestic animals would be less than significant under CEQA after mitigation.

The vibration impact under CEQA would be less than significant for the Refined SR14, SR14A, E1, E1A, E2, and E2A Build Alternatives. While domestic animals may perceive ground vibrations caused by passing trains, such vibrations have low potential to affect domestic animals because they would not be close to the Build Alternative alignment and train pass-bys would be of short duration. Therefore, CEQA does not require any mitigation.

Impact N&V#8: Operational Train Vibration and Ground-Borne Noise Impacts.

The analysis below presents assessments of operational vibration and ground-borne noise impacts for each of the six Build Alternatives. Only areas of the Build Alternative alignments that contain sensitive receivers are discussed below because areas of the alignment where there are no sensitive receivers would not experience vibration or ground-borne noise impacts, as described in Section 3.4.5, Affected Environment.

In calculating future vibration and ground-borne noise levels, maximum train speeds were used that range from 150 to 220 mph, depending on the location along the Build Alternative alignments. Vibration impacts would result from the proximity of the receivers to the proposed track (or aerial structure) and the speeds of the trains.

The results of vibration analysis are summarized in Table 3.4-34. This table calculates affected sensitive receivers by Build Alternative and subsection. Ground-borne noise impacts are included in the vibration impact totals.

Table 3.4-34 Summary of Operational Train Vibration Impacts

Build Alternative	Subsection	Affected Vibration-Sensitive Receivers	
		Residential	Institutional
Refined SR14	Central	27	1
	Burbank	0	0
	Total	**27**	**1**
SR14A	Central	27	1
	Burbank	0	0
	Total	**27**	**1**
E1	Central	20	1
	Burbank	0	0
	Total	**20**	**1**

Build Alternative	Subsection	Affected Vibration-Sensitive Receivers	
		Residential	Institutional
E1A	Central	20	1
	Burbank	0	0
	Total	**20**	**1**
E2	Central	0	0
	Burbank	0	0
	Total	**0**	**0**
E2A	Central	0	0
	Burbank	0	0
	Total	**0**	**0**

Source: Authority, 2019
Authority = California High-Speed Rail Authority

Refined SR14 and SR14A Build Alternatives

Central Subsection

The assessment below includes both vibration and ground-borne noise impacts on residential and institutional uses. Impacts on residential land uses are listed in Table 3.4-35 and Table 3.4-36. Vibration and ground-borne noise impacts in this area would affect residences on both sides of the HSR alignment. Within the ANF, including portions of the SGMNM, the Refined SR14 and SR14A Build Alternative alignments would generally continue in tunnel; therefore, operations would not produce perceptible vibration and ground-borne noise impacts aboveground.

Table 3.4-35 Operational Vibration Impacts – Residential: Refined SR14 and SR14A Build Alternatives, Central Subsection

Location	Side of Track	VSA	Closest Receiver(s) Distance to Near Track (feet) Refined SR14	Closest Receiver(s) Distance to Near Track (feet) SR14A	Vibration Levels (VdB)[1]			Number of Effects Refined SR14	Number of Effects SR14A
					Project Levels Refined SR14	Project Levels SR14A	FRA Impact Criteria		
Spruce Court to East Avenue S	NB	3cba	-	835	-	51	72	**-**	**0**
Spruce Court to East Avenue S	SB	3cb	406	444	55	55	72	**0**	**0**
East Avenue S to Soledad Siphon	NB	4c	268	283	58	57	72	**0**	**0**
East Avenue S to Soledad Siphon	SB	5c	122	343	41	54	72	**0**	**0**
Soledad Siphon to Acton Canyon Road	NB	6c	256	179	60	62	72	**0**	**0**
Soledad Siphon to Acton Canyon Road	SB	7c	287	179	60	62	72	**0**	**0**
Acton Canyon Road to Hypotenuse Road	NB	8c	258	187	60	63	72	**0**	**0**
Acton Canyon Road to Hypotenuse Road	SB	9c	119	-	66	-	72	**0**	**-**
Hypotenuse Road to Clanfield Street	NB	10c	381	187	60	63	72	**0**	**0**
Hypotenuse Road to Clanfield Street	SB	11c	534	218	58	63	72	**0**	**0**
Clanfield Street to Big Springs Road	NB	12c	289	179	61	64	72	**0**	**0**
Clanfield Street to Big Springs Road	SB	13c	286	179	61	64	72	**0**	**0**
Big Springs Road to Agua Dulce Canyon Road	SB	14c	186	197	60	63	72	**0**	**0**
Agua Dulce Canyon Road to Soledad Canyon Road	NB	15c	46	-	71	-	72	**0-**	**-**
Soledad Canyon Road to Sand Canyon Road	NB	16c	374	478	54	52	72	**0**	**0**
Soledad Canyon Road to Sand Canyon Road	SB	17c	365	-	54	-	72	**0**	**-**
Gavina Avenue to Valley Vista Way	NB	18c	133	133	59	59	72	**0**	**0**

Location	Side of Track	VSA	Closest Receiver(s) Distance to Near Track (feet) Refined SR14	Closest Receiver(s) Distance to Near Track (feet) SR14A	Vibration Levels (VdB)[1]			Number of Effects Refined SR14	Number of Effects SR14A
					Project Levels Refined SR14	Project Levels SR14A	FRA Impact Criteria		
Gavina Avenue to Valley Vista Way	SB	19c	134	134	59	59	72	**0**	**0**
Foothill Freeway to Glenoaks Boulevard	NB	20c	171	171	69	69	72	**0**	**0**
Foothill Freeway to Glenoaks Boulevard	SB	21c	173	173	69	69	72	**0**	**0**
Glenoaks Boulevard to Osborne Street	NB	22c	183	183	69	69	72	**0**	**0**
Glenoaks Boulevard to Osborne Street	SB	23c	199	199	68	68	72	**0**	**0**
Osborne Street to Montague Street	NB	24c	80	80	74	74	72	**9**	**9**
Osborne Street to Montague Street	SB	25c	82	82	74	74	72	**4**	**4**
Truesdale Street to Wicks Street	SB	26c	293	293	62	62	72	**0**	**0**
Wicks Street to Lankershim Boulevard	SB	27c	330	330	62	62	72	**0**	**0**
Goss Street to Olinda Street	SB	28ca	256	256	62	62	72	**0**	**0**
Olinda St to Sunland Boulevard	NB	22ab	293	293	61	61	72	**0**	**0**
Olinda St to Sunland Boulevard	SB	22ab	247	247	62	62	72	**0**	**0**

Location	Side of Track	VSA	Closest Receiver(s) Distance to Near Track (feet) Refined SR14	Closest Receiver(s) Distance to Near Track (feet) SR14A	Vibration Levels (VdB)[1]			Number of Effects Refined SR14	Number of Effects SR14A
					Project Levels Refined SR14	Project Levels SR14A	FRA Impact Criteria		
Sunland Boulevard to Wheatland Avenue	NB	24a	274	274	52	52	72	**0**	**0**
Sunland Boulevard to Wheatland Avenue	SB	24a	184	184	53	53	72	**0**	**0**
Wheatland Avenue to Lockheed Drive	NB	25a	90	90	59	59	72	**0**	**0**

Source: Authority, 2019
[1] Maximum one-third-octave band vibration velocity level over the frequency range between 8 Hz and 80 Hz
Authority = California High-Speed Rail Authority; FRA = Federal Railroad Administration; Hz = hertz; NB = northbound; SB = southbound; VdB = vibration velocity level; VSA = vibration-sensitive area

Table 3.4-36 Ground-Borne Noise Impacts – Residential: Refined SR14 and SR14A Build Alternatives, Central Subsection

Location	Side of Track	Closest Receiver(s) Distance to Near Track (feet) Refined SR14	Closest Receiver(s) Distance to Near Track (feet) SR14A	Ground-Borne Noise Levels (dBA)			Number of Effects Refined SR14	Number of Effects SR14A
				Project Levels Refined SR14	Project Levels SR14A	FRA Impact Criteria		
Spruce Court to East Avenue S	NB	-	835	-	-13	35	**-**	**0**
Spruce Court to East Avenue S	SB	406	444	<0	-7	35	**0**	**0**
East Avenue S to Soledad Siphon	NB	268	283	15	1	35	**0**	**0**
East Avenue S to Soledad Siphon	SB	122	343	15	-5	35	**0**	**0**
Soledad Siphon to Acton Canyon Road	NB	256	179	8	14	35	**0**	**0**
Soledad Siphon to Acton Canyon Road	SB	287	179	6	14	35	**0**	**0**
Acton Canyon Road to Hypotenuse Road	NB	258	187	8	15	35	**0**	**0**
Acton Canyon Road to Hypotenuse Road	SB	119	-	23	-	35	**0**	**-**
Hypotenuse Road to Clanfield Street	NB	381	187	3	15	35	**0**	**0**

Location	Side of Track	Closest Receiver(s) Distance to Near Track (feet) Refined SR14	Closest Receiver(s) Distance to Near Track (feet) SR14A	Ground-Borne Noise Levels (dBA)			Number of Effects Refined SR14	Number of Effects SR14A
				Project Levels Refined SR14	Project Levels SR14A	FRA Impact Criteria		
Hypotenuse Road to Clanfield Street	SB	534	218	0	12	35	**0**	**0**
Clanfield Street to Big Springs Road	NB	289	179	7	16	35	**0**	**0**
Clanfield Street to Big Springs Road	SB	286	179	8	16	35	**0**	**0**
Big Springs Road to Agua Dulce Canyon Road	SB	-	197	-	14	35	**-**	**0**
Soledad Canyon Road to Sand Canyon Road	SB	365	478	<0	-5	35	**0**	**0**
Gavina Avenue to Valley Vista Way	NB	133	133	26	26	35	**0**	**0**
Gavina Avenue to Valley Vista Way	SB	134	134	25	25	35	**0**	**0**
Foothill Freeway to Glenoaks Boulevard	NB	171	171	32	32	35	**0**	**0**
Foothill Freeway to Glenoaks Boulevard	SB	173	173	32	32	35	**0**	**0**
Glenoaks Boulevard to Osborne Street	NB	183	183	31	31	35	**0**	**0**
Glenoaks Boulevard to Osborne Street	SB	199	199	30	30	35	**0**	**0**
Osborne Street to Montague Street	NB	80	80	39	39	35	**9**	**9**
Osborne Street to Montague Street	SB	82	82	39	39	35	**5**	**5**
Wicks Street to Lankershim Boulevard	SB	330	330	26	26	35	**0**	**0**
Goss Street to Olinda Street	SB	256	256	25	25	35	**0**	**0**
Olinda St to Sunland Boulevard	NB	293	293	25	25	35	**0**	**0**
Olinda St to Sunland Boulevard	SB	247	247	26	26	35	**0**	**0**
Sunland Boulevard to Wheatland Avenue	NB	274	274	16	16	35	**0**	**0**
Sunland Boulevard to Wheatland Avenue	SB	184	184	20	20	35	**0**	**0**
Wheatland Avenue to Lockheed Drive	NB	90	90	26	26	35	**0**	**0**

Source: Authority, 2019
Authority = California High-Speed Rail Authority; FRA = Federal Railroad Administration; NB = northbound; SB = southbound

Impacts on institutional land uses are listed in Table 3.4-37 and Table 3.4-38. Impacts on institutional land uses would be below the vibration and ground-borne noise impact criteria thresholds.

Table 3.4-37 Operational Vibration Impacts – Institutional: Refined SR14 and SR14A Build Alternatives, Central Subsection

Location	Name	Side of Track	VSA	Distance to Near Track (feet)	Vibration Levels (VdB)[1]		Number of Effects
					Project Levels	FRA Impact Criteria	
Foothill Freeway (I-210) to Glenoaks Boulevard	Hillery T. Broadous Elementary School	SB	21c	180	68	75	**0**
Foothill Freeway to Glenoaks Boulevard	Hillery Broadous Early Educational Center	SB	21c	183	68	75	**0**
Foothill Freeway to Glenoaks Boulevard	Maclay Middle School	SB	21c	295	67	75	**0**
Sunland Boulevard to Wheatland Ave	Iglesia De Cristo Ministerios	NB	23a	84	66	75	**0**
Sunland Boulevard to Wheatland Ave	Roscoe Elementary School	SB	24a	206	62	75	**0**
Wheatland Avenue to Lockheed Drive	Burbank Islamic Center	NB	25a	66	63	75	**0**
Wheatland Avenue to Lockheed Drive	The Greenery Studio	NB	25a	73	62	65	**0**

Source: Authority, 2019
[1] Maximum one-third-octave band vibration velocity level over the frequency range between 8 Hz and 80 Hz.
Institutional operational vibration impacts are identical for the Refined SR14 and SR14A Build Alternatives.
Authority = California High-Speed Rail Authority; FRA = Federal Railroad Administration; Hz = hertz; NB = northbound; SB = southbound; VdB = vibration velocity level; VSA = vibration-sensitive area

Table 3.4-38 Ground-Borne Noise Impacts – Institutional: Refined SR14 and SR14A Build Alternatives, Central Subsection

Location	Name	Side of Track	Distance to Near Track (feet)	Ground-Borne Noise Levels (dBA)		Number of Effects
				Project Levels	FRA Impact Criteria	
Foothill Freeway (I-210) to Glenoaks Boulevard	Hillery T. Broadous Elementary School	SB	180	31	40	**0**
Foothill Freeway to Glenoaks Boulevard	Hillery Broadous Early Educational Center	SB	183	31	40	**0**

Location	Name	Side of Track	Distance to Near Track (feet)	Ground-Borne Noise Levels (dBA)		Number of Effects
				Project Levels	FRA Impact Criteria	
Foothill Freeway to Glenoaks Boulevard	Maclay Middle School	SB	295	29	40	**0**
Sunland Boulevard to Wheatland Avenue	Iglesia De Cristo Ministerios	NB	84	30	40	**0**
Sunland Boulevard to Wheatland Avenue	Roscoe Elementary School	SB	206	29	40	**0**
Wheatland Avenue to Lockheed Drive	Burbank Islamic Center	NB	66	29	40	**0**
Wheatland Avenue to Lockheed Drive	The Greenery Studio	NB	73	28	25	**1**

Source: Authority, 2019
Institutional ground-borne noise impacts are identical for the Refined SR14 and SR14A Build Alternatives
Authority = California High-Speed Rail Authority; dBA = A-weighted decibel; FRA = Federal Railroad Administration; NB = northbound; SB = southbound

Burbank Subsection

There would be no vibration effects for the Refined SR14 Build Alternative and the SR14A Build Alternative within the Burbank Subsection as there are few noise-sensitive receptors, and project noise levels would not exceed the threshold for sensitive receivers.

CEQA Conclusion

Operation of the Refined SR14 Build Alternative and the SR14A Build Alternative would not encounter vibration-sensitive receivers in the Burbank Subsection. Therefore, CEQA does not require any mitigation.

Operation of the Refined SR14 and SR14A Build Alternatives in the Central Subsection would exceed vibration and ground-borne impact criteria for institutional uses and residential receivers. This represents a significant impact under CEQA, and mitigation is required. The FRA-recommended impact threshold for each impact location is described in Table 3.4-35 through Table 3.4-38. To avoid impact, it is estimated that mitigation will need to be designed to reduce ground-borne vibration levels by at least two dB and reduce ground-borne noise levels by at least four dB. Mitigation Measure N&V-MM#7 (discussed in Section 3.4.7, Mitigation Measures) will require development of site-specific vibration reduction measures, including stiffening floors in vibration-sensitive buildings, creating buffer zones, and modifying HSR vehicles. This measure is anticipated to effectively reduce vibration and ground-borne noise levels below threshold levels. With implementation of Mitigation Measure N&V-MM#7, this impact would be less than significant under CEQA after mitigation.

E1 and E1A Build Alternatives

Central Subsection

The assessment below includes both vibration and ground-borne noise impacts for residential and institutional uses. Impacts on residential land uses are listed in Table 3.4-39 and Table 3.4-40. The vibration and ground-borne noise impacts in this area would affect residences on both sides of the HSR alignment. Within the ANF, including portions of the SGMNM, the E1 Build Alternative and the E1A Build Alternative alignments would be in tunnel; therefore, operations would not produce perceptible vibration and ground-borne noise impacts aboveground. Impacts on institutional land uses are listed in Table 3.4-41 and Table 3.4-42.

Table 3.4-39 Operational Vibration Impacts – Residential: E1 and E1A Build Alternatives, Central Subsection

Location	Side of Track	VSA	Closest Receiver(s) Distance to Near Track (feet) E1	Closest Receiver(s) Distance to Near Track (feet) E1A	Vibration Levels (VdB)[1]			Number of Effects E1	Number of Effects E1A
					Project Levels E1	Project Levels E1A	FRA Impact Criteria		
Spruce Court to East Avenue S	NB	3aba	-	835	-	51	72	**-**	**0**
Spruce Court to East Avenue S	SB	3ab	413	444	55	54	72	**0**	**0**
East Avenue S to Soledad Siphon	NB	4a	293	283	57	57	72	**0**	**0**
East Avenue S to Soledad Siphon	SB	5a	258	371	42	55	72	**0**	**0**
Soledad Siphon to Pearblossom Highway	NB	6a	582	-	42	-	72	**0**	**-**
Soledad Siphon to Pearblossom Highway	SB	7a	331	1,135	42	50	72	**0**	**0**
Pearblossom Highway to Foreston Drive	NB	8a	660	189	57	60	72	**0**	**0**
Pearblossom Highway to Foreston Drive	SB	9a	210	175	61	62	72	**0**	**0**
Foreston Drive to Aliso Canyon Road	NB	10a	235	235	62	62	72	**0**	**0**
Foreston Drive to Aliso Canyon Road	SB	11a	192	192	63	63	72	**0**	**0**
Via Santa Barbara to Valley Vista Way	NB	12a	151	151	58	58	72	**0**	**0**
Via Santa Barbara to Valley Vista Way	SB	13a	123	123	57	57	72	**0**	**0**
Foothill Freeway to Glenoaks Boulevard	NB	14a	162	162	69	69	72	**0**	**0**
Foothill Freeway to Glenoaks Boulevard	SB	15a	164	164	68	68	72	**0**	**0**
Glenoaks Boulevard to Osborne Street	NB	16a	195	195	69	69	72	**0**	**0**
Glenoaks Boulevard to Osborne Street	SB	17a	197	197	67	67	72	**0**	**0**
Osborne Street to Montague Street	NB	18a	78	78	74	74	72	**9**	**9**
Osborne Street to Montague Street	SB	19a	81	81	73	73	72	**1**	**1**
Truesdale Street to Wicks Street	SB	20a	293	293	62	62	72	**0**	**0**
Wicks Street to Lankershim Boulevard	SB	21a	330	330	62	62	72	**0**	**0**
Goss Street to Olinda Street	SB	22aa	256	256	61	61	72	**0**	**0**

Location	Side of Track	VSA	Closest Receiver(s) Distance to Near Track (feet) E1	Closest Receiver(s) Distance to Near Track (feet) E1A	Vibration Levels (VdB)[1]			Number of Effects E1	Number of Effects E1A
					Project Levels E1	Project Levels E1A	FRA Impact Criteria		
Olinda Street to Sunland Boulevard	NB	22ab	293	293	61	61	72	**0**	**0**
Olinda Street to Sunland Boulevard	SB	22ab	247	247	62	62	72	**0**	**0**
Sunland Boulevard to Wheatland Avenue	NB	24a	274	274	52	52	72	**0**	**0**
Sunland Boulevard to Wheatland Avenue	SB	24a	184	184	53	53	72	**0**	**0**
Wheatland Avenue to Lockheed Drive	NB	25a	90	90	59	59	72	**0**	**0**

Source: Authority, 2019
[1] Maximum one-third-octave band vibration velocity level over the frequency range between 8 Hz and 80 Hz
Authority = California High-Speed Rail Authority; FRA = Federal Railroad Administration; Hz = hertz; NB = northbound; SB = southbound; VdB = vibration velocity level; VSA = vibration-sensitive area

Table 3.4-40 Ground-Borne Noise Impacts – Residential: E1 and E1A Build Alternatives, Central Subsection

Location	Side of Track	Closest Receiver(s) Distance to Near Track (feet E1)	Closest Receiver(s) Distance to Near Track (feet E1A)	Ground-Borne Noise Levels (dBA)			Number of Effects E1	Number of Effects E1A
				Project Levels E1	Project Levels E1A	FRA Impact Criteria		
Spruce Court to East Avenue S	NB	-	835	-	-13	35	**-**	**0**
Spruce Court to East Avenue S	SB	413	444	<0	-7	35	**0**	**0**
East Avenue S to Soledad Siphon	NB	-	283	-	1	35	**-**	**0**
East Avenue S to Soledad Siphon	SB	-	371	-	-5	35	**-**	**0**
Soledad Siphon to Pearblossom Highway	NB	582-	-	17	-	35	**0**	**-**
Soledad Siphon to Pearblossom Highway	SB	331	1,135	17	-15	35	**0**	**0**
Pearblossom Highway to Foreston Drive	NB	660	189	<0	11	35	**0**	**0**
Pearblossom Highway to Foreston Drive	SB	210	175	8	10	35	**0**	**0**
Foreston Drive to Aliso Canyon Road	NB	235	235	11	11	35	**0**	**0**
Foreston Drive to Aliso Canyon Road	SB	192	192	12	12	35	**0**	**0**

Location	Side of Track	Closest Receiver(s) Distance to Near Track (feet E1)	Closest Receiver(s) Distance to Near Track (feet E1A)	Ground-Borne Noise Levels (dBA)			Number of Effects E1	Number of Effects E1A
				Project Levels E1	Project Levels E1A	FRA Impact Criteria		
Via Santa Barbara to Valley Vista Way	NB	151	151	23	23	35	**0**	**0**
Via Santa Barbara to Valley Vista Way	SB	123	123	22	22	35	**0**	**0**
Foothill Freeway to Glenoaks Boulevard	NB	162	162	32	32	35	**0**	**0**
Foothill Freeway to Glenoaks Boulevard	SB	164	164	31	31	35	**0**	**0**
Glenoaks Boulevard to Osborne Street	NB	195	195	30	30	35	**0**	**0**
Glenoaks Boulevard to Osborne Street	SB	197	197	29	29	35	**0**	**0**
Osborne Street to Montague Street	NB	78	78	39	39	35	**9**	**9**
Osborne Street to Montague Street	SB	81	81	38	38	35	**1**	**1**
Wicks Street to Lankershim Boulevard	SB	330	330	26	26	35	**0**	**0**
Goss Street to Olinda Street	SB	256	256	25	25	35	**0**	**0**
Olinda Street to Sunland Boulevard	NB	293	293	25	25	35	**0**	**0**
Olinda Street to Sunland Boulevard	SB	247	247	26	26	35	**0**	**0**
Sunland Boulevard to Wheatland Avenue	NB	274	274	16	16	35	**0**	**0**
Sunland Boulevard to Wheatland Avenue	SB	184	184	20	20	35	**0**	**0**
Wheatland Avenue to Lockheed Drive	NB	90	90	26	26	35	**0**	**0**

Source: Authority, 2019
Authority = California High-Speed Rail Authority; FRA = Federal Railroad Administration; NB = northbound; SB = southbound, < = less than

Table 3.4-41 Operational Vibration Impacts – Institutional: E1 and E1A Build Alternatives, Central Subsection

Location	Name	Side of Track	VSA	Distance to Near Track (feet)	Vibration Levels (VdB)[1]		Number of Effects
					Project Levels	FRA Impact Criteria	
Foothill Freeway (I-210) to Glenoaks Boulevard	Hillery T. Broadous Elementary School	SB	15a	164	68	75	**0**
Foothill Freeway to Glenoaks Boulevard	Hillery Broadous Early Educational Center	SB	15a	169	68	75	**0**
Foothill Freeway to Glenoaks Boulevard	Maclay Middle School	SB	15a	292	67	75	**0**
Sunland Boulevard to Wheatland Avenue	Iglesia De Cristo Ministerios	NB	23a	84	66	75	**0**
Sunland Boulevard to Wheatland Avenue	Roscoe Elementary School	SB	24a	206	52	75	**0**
Wheatland Avenue to Lockheed Drive	Burbank Islamic Center	NB	25a	66	63	75	**0**
Wheatland Avenue to Lockheed Drive	The Greenery Studio	NB	25a	73	62	65	**0**

Source: Authority, 2019
1 Maximum one-third-octave band vibration velocity level over the frequency range between 8 Hz and 80 Hz.
Institutional operational vibration impacts would be identical for the E1 and E1A Build Alternatives.
Authority = California High-Speed Rail Authority; FRA = Federal Railroad Administration; Hz = hertz; NB = northbound; SB = southbound; VdB = vibration velocity level; VSA = vibration-sensitive area

Table 3.4-42 Ground-Borne Noise Impacts – Institutional: E1 and E1A Build Alternatives, Central Subsection

Location	Name	Side of Track	Distance to Near Track (feet)	Ground-Borne Noise Levels (dBA)		Number of Effects
				Project Levels	FRA Impact Criteria	
Foothill Freeway (I-210) to Glenoaks Boulevard	Hillery T. Broadous Elementary School	SB	164	31	40	**0**
Foothill Freeway to Glenoaks Boulevard	Hillery Broadous Early Educational Center	SB	169	30	40	**0**
Foothill Freeway to Glenoaks Boulevard	Maclay Middle School	SB	292	29	40	**0**
Sunland Boulevard to Wheatland Avenue	Iglesia De Cristo Ministerios	NB	84	30	40	**0**
Sunland Boulevard to Wheatland Avenue	Roscoe Elementary School	SB	206	18	40	**0**

Location	Name	Side of Track	Distance to Near Track (feet)	Ground-Borne Noise Levels (dBA)		Number of Effects
				Project Levels	FRA Impact Criteria	
Wheatland Avenue to Lockheed Drive	Burbank Islamic Center	NB	66	29	40	**0**
Wheatland Avenue to Lockheed Drive	The Greenery Studio	NB	73	28	25	**1**

Source: Authority, 2019
Institutional Ground-Borne Noise Impacts would be identical for the E1 and E1A Build Alternatives
Authority = California High-Speed Rail Authority; dBA = A-weighted decibel; FRA = Federal Railroad Administration; NB = northbound; SB = southbound

Burbank Subsection

There would be no vibration effects for the E1 Build Alternative and the E1A Build Alternative within the Burbank Subsection as there are few noise-sensitive receptors, and project noise levels would not exceed the threshold for sensitive receivers.

CEQA Conclusion

There are no vibration-sensitive receivers for the E1 or E1A Build Alternatives within the Burbank Subsection. Therefore, CEQA does not require any mitigation.

Operation of the E1 and E1A Build Alternatives in the Central Subsection would exceed vibration and ground-borne impact criteria at residential receivers and ground-borne noise impact criteria at institutional uses. This represents a significant impact under CEQA, and mitigation is required. The FRA-recommended impact threshold for each impact location is described in Table 3.4-39 through Table 3.4-42. To avoid impacts, it is estimated that mitigation will need to be designed to reduce ground-borne vibration levels by at least two dB and reduce ground-borne noise levels by at least four dB. Mitigation Measure N&V-MM#7 (discussed in Section 3.4.7) will require development of site-specific vibration-reduction measures, including stiffening floors in vibration-sensitive buildings, creating buffer zones, and modifying vehicles. This measure is anticipated to effectively reduce vibration and ground-borne noise levels below threshold levels. With implementation of Mitigation Measure N&V-MM#7, this impact would be less than significant under CEQA for the E1 Build Alternative and the E1A Build Alternative after mitigation.

E2 and E2A Build Alternatives

Central Subsection

The assessment below includes both vibration and ground-borne noise impacts for residential and institutional uses. Impacts on residential land uses are listed in Table 3.4-43 and Table 3.4-44. Impacts on institutional land uses are listed in Table 3.4-45 and Table 3.4-46. Ground-borne noise impacts on residential land uses would be below the ground-borne noise impact criteria thresholds, and vibration impacts on residential and institutional land uses would be below the vibration impact criteria thresholds. Within the ANF, including portions of the SGMNM, the E2 Build Alternative and the E2A Build Alternative alignments would generally continue in tunnel; therefore, operations would not produce perceptible vibration and ground-borne noise impacts aboveground.

Table 3.4-43 Operational Vibration Impacts – Residential: E2 and E2A Build Alternatives, Central Subsection

Location	Side of Track	VSA	Closest Receiver(s) Distance to Near Track (feet) E2	Closest Receiver(s) Distance to Near Track (feet) E2A	Vibration Levels (VdB)[1]			Number of Effects E2	Number of Effects E2A
					Project Levels E2	Project Levels E2A	FRA Impact Criteria		
Spruce Court to East Avenue S	NB	3bba	-	835	-	51	72	**-**	**0**
Spruce Court to East Avenue S	SB	3bb	412	444	55	54	72	**0**	**0**
East Avenue S to Soledad Siphon	NB	4b	293	283	57	57	72	**0**	**0**
East Avenue S to Soledad Siphon	SB	5b	258	371	32	55	72	**0**	**0**
Soledad Siphon to Pearblossom Highway	NB	6b	582	-	42	-	72	**0**	**0**
Soledad Siphon to Pearblossom Highway	SB	7b	331	1,135	42	50	72	**0**	**0**
Pearblossom Highway to Foreston Drive	NB	8b	660	189	57	60	72	**0**	**0**
Pearblossom Highway to Foreston Drive	SB	9b	210	175	63	62	72	**0**	**0**
Foreston Drive to Aliso Canyon Road	NB	10b	235	235	62	62	72	**0**	**0**
Foreston Drive to Aliso Canyon Road	SB	11b	192	192	63	63	72	**0**	**0**
Forest Route 3N29 to BP and L Road	SB	12b	403	403	64	64	72	**0**	**0**
BP and L Road to Wentworth Street	NB	13b	256	256	63	63	72	**0**	**0**
BP and L Road to Wentworth Street	SB	14b	187	187	63	63	72	**0**	**0**
Wentworth Street to McBroom Street	NB	15b	169	169	62	62	72	**0**	**0**
McBroom Street to Wicks Street	NB	16b	73	73	70	70	72	**0**	**0**
McBroom Street to Wicks Street	SB	17b	70	70	71	71	72	**0**	**0**
Wicks Street to Peoria Street	NB	18b	79	79	70	70	72	**0**	**0**

Location	Side of Track	VSA	Closest Receiver(s) Distance to Near Track (feet) E2	Closest Receiver(s) Distance to Near Track (feet) E2A	Vibration Levels (VdB)[1]			Number of Effects E2	Number of Effects E2A
					Project Levels E2	Project Levels E2A	FRA Impact Criteria		
Wicks Street to Peoria Street	SB	19b	74	74	70	70	72	**0**	**0**
Fleetwood Street to Olinda Street	NB	20b	147	147	67	67	72	**0**	**0**
Fleetwood Street to Olinda Street	SB	21b	147	147	67	67	72	**0**	**0**
Olinda Street to Golden State Freeway	NB	22b	165	165	65	65	72	**0**	**0**
Olinda Street to Golden State Freeway	SB	23b	166	166	65	65	72	**0**	**0**
Golden State Freeway to Lanark Street	NB	24b	187	187	63	63	72	**0**	**0**
Golden State Freeway to Lanark Street	SB	25b	186	186	63	63	72	**0**	**0**
Lanark Street to Lockheed Drive	NB	26b	186	186	62	62	72	**0**	**0**
Lanark Street to Lockheed Drive	SB	27b	195	195	62	62	72	**0**	**0**

Source: Authority, 2019
[1] Maximum one-third-octave band vibration velocity level over the frequency range between 8 Hz and 80 Hz.
Authority = California High-Speed Rail Authority; FRA = Federal Railroad Administration; NB = northbound; SB = southbound; VdB = vibration velocity level; VSA = vibration-sensitive area

Table 3.4-44 Ground-Borne Noise Impacts – Residential: E2 and E2A Build Alternatives, Central Subsection

Location	Side of Track	Closest Receiver(s) Distance to Near Track (feet) E2	Closest Receiver(s) Distance to Near Track (feet) E2A	Ground-Borne Noise Levels (dBA)			Number of Effects E2	Number of Effects E2A
				Project Levels E2	Project Levels E2A	FRA Impact Criteria		
Spruce Court to East Avenue S	NB	-	835	-	-13	35	**-**	**0**
Spruce Court to East Avenue S	SB	412	444	<0	-7	35	**0**	**0**

Location	Side of Track	Closest Receiver(s) Distance to Near Track (feet) E2	Closest Receiver(s) Distance to Near Track (feet) E2A	Ground-Borne Noise Levels (dBA)			Number of Effects E2	Number of Effects E2A
				Project Levels E2	Project Levels E2A	FRA Impact Criteria		
East Avenue S to Soledad Siphon	NB	-	283	-	1	35	**-**	**0**
East Avenue S to Soledad Siphon	SB	-	371	-	-5	35	**-**	**0**
Soledad Siphon to Pearblossom Highway	NB	582	-	17	-	35	**0**	**-**
Soledad Siphon to Pearblossom Highway	SB	331	1,135	17	-15	35	**0**	**0**
Pearblossom Highway to Foreston Drive	NB	660	189	<0	11	35	**0**	**0**
Pearblossom Highway to Foreston Drive	SB	210	175	13	10	35	**0**	**0**
Foreston Drive to Aliso Canyon Road	NB	235	235	11	11	35	**0**	**0**
Foreston Drive to Aliso Canyon Road	SB	192	192	14	14	35	**0**	**0**
Forest Route 3N29 to BP and L Road	SB	403	403	16	16	35	**0**	**0**
BP and L Road to Wentworth Street	NB	256	256	8	8	35	**0**	**0**
BP and L Road to Wentworth Street	SB	187	187	14	14	35	**0**	**0**
Wentworth Street to McBroom Street	NB	169	169	23	23	35	**0**	**0**
McBroom Street to Wicks Street	NB	73	73	33	33	35	**0**	**0**
McBroom Street to Wicks Street	SB	70	70	34	34	35	**0**	**0**
Wicks Street to Peoria Street	NB	79	79	32	32	35	**0**	**0**
Wicks Street to Peoria Street	SB	74	74	33	33	35	**0**	**0**
Fleetwood Street to Olinda Street	NB	147	147	33	33	35	**0**	**0**
Fleetwood Street to Olinda Street	SB	147	147	33	33	35	**0**	**0**

Location	Side of Track	Closest Receiver(s) Distance to Near Track (feet) E2	Closest Receiver(s) Distance to Near Track (feet) E2A	Ground-Borne Noise Levels (dBA)			Number of Effects E2	Number of Effects E2A
				Project Levels E2	Project Levels E2A	FRA Impact Criteria		
Olinda Street to Golden State Freeway	NB	165	165	31	31	35	**0**	**0**
Olinda Street to Golden State Freeway	SB	166	166	31	31	35	**0**	**0**
Golden State Freeway to Lanark Street	NB	187	187	30	30	35	**0**	**0**
Golden State Freeway to Lanark Street	SB	186	186	30	30	35	**0**	**0**
Lanark Street to Lockheed Drive	NB	186	186	29	29	35	**0**	**0**
Lanark Street to Lockheed Drive	SB	195	195	29	29	35	**0**	**0**

Source: Authority, 2019

Authority = California High-Speed Rail Authority; dBA = A-weighted decibel; FRA = Federal Railroad Administration; NB = northbound; SB = southbound

Table 3.4-45 Operational Vibration Impacts – Institutional: E2 and E2A Build Alternatives, Central Subsection

Location	Name	Side of Track	VSA	Distance to Near Track (feet)	Vibration Levels (VdB)[1]		Number of Effects
					Project Levels	FRA Impact Criteria	
Wicks Street to Peoria Street	Stonehurst Avenue Elementary School	NB	18b	92	68	75	**0**
Lanark Street to Lockheed Drive	The Greenery Studio	SB	26b	280	49	75	**0**

Source: Authority, 2019
[1] Maximum one-third-octave band vibration velocity level over the frequency range between 8 Hz and 80 Hz.
Institutional operational vibration impacts are identical for the E2 and E2A Build Alternatives,
Authority = California High-Speed Rail Authority; FRA = Federal Railroad Administration; Hz = hertz; NB = northbound; SB = southbound; VdB = vibration velocity level; VSA = vibration-sensitive area

Table 3.4-46 Ground-Borne Noise Impacts – Institutional: E2 and E2A Build Alternatives, Central Subsection

Location	Name	Side of Track	Distance to Near Track (feet)	Ground-Borne Noise Levels (dBA)		Number of Effects
				Project Levels	FRA Impact Criteria	
Wicks Street to Peoria Street	Stonehurst Avenue Elementary School	NB	92	30	40	**0**
Lanark Street to Lockheed Drive	The Greenery Studio	SB	280	17	25	**0**

Source: Authority, 2019
Institutional ground-borne noise impacts are identical for the E2 and E2A Build Alternatives.
Authority = California High-Speed Rail Authority; dBA = A-weighted decibel; FRA = Federal Railroad Administration; NB = northbound; SB = southbound

Burbank Subsection

There would be no vibration effects for the E2 Build Alternative and the E2A Build Alternative within the Burbank Subsection as there are few noise-sensitive receptors, and project noise levels would not exceed the threshold for sensitive receivers.

CEQA Conclusion

There are no vibration-sensitive receivers for the E2 Build Alternative or the E2A Build Alternative in the Burbank Subsection. Operation of the E2 and E2A Build Alternatives in the Central Subsection would not exceed vibration impact criteria and would not generate excessive ground-borne vibration or ground-borne noise levels. This impact would be less than significant under CEQA for the E2 Build Alternative and the E2A Build Alternative. Therefore, CEQA does not require any mitigation.

Impact N&V#9: Noise and Vibration from High-Speed Rail Stationary Facilities.

Burbank Airport Station

<u>Noise Impacts</u>
Based on the FTA noise impact screening distance of 250 feet, noise impacts are not anticipated from operations at the Burbank Airport Station because there are no sensitive receivers within screening distance of the station.

CEQA Conclusion

Operations at the Burbank Airport Station would not exceed noise impact criteria and would not permanently or periodically substantially increase ambient noise levels in the project vicinity above levels existing without the project. Thus, there would be no impact for the Refined SR14, SR14A, E1, E1A, E2, and E2A Build Alternatives, and CEQA does not require any mitigation.

<u>Vibration Impacts</u>
Vibration impacts are not anticipated from operations in the vicinity of the Burbank Airport Station as there are no vibration-sensitive receivers in the Burbank Subsection.

CEQA Conclusion

Operations at the Burbank Airport Station would not exceed vibration impact criteria and would not generate excessive ground-borne vibration or ground-borne noise levels. Thus, no impact would occur for the Refined SR14, SR14A, E1, E1A, E2, and E2A Build Alternatives, and CEQA does not require any mitigation.

Adits

<u>Noise Impacts</u>
Long-term operational noise impacts from ventilation equipment associated with adits would be limited to noise-sensitive receivers within 200 feet (the FTA screening distance for ventilation structures) of the proposed adits. There are two adit locations where noise-sensitive receivers are located within this screening distance:

- E1-W2b/SR14-W2—The nearest noise-sensitive receiver is 30 feet from the edge of the adit footprint and 500 feet from the center of the adit footprint.
- E2-W2—The nearest noise-sensitive receiver is 60 feet from the edge of the adit footprint and 530 feet from the center of the adit footprint.

Noise generated by ventilation equipment associated with adits would result in a permanent increase in noise compared to the existing noise environment at sensitive receivers. Noise generated by the ventilation equipment is conservatively assumed to be potentially significant.

Within the ANF, adit options would be located within an in-holding (private property not for recreational use) near existing roadways within the ANF. Portions of the ANF would experience perceptible vibration during construction activities at the adit locations within the ANF. However, there are no designated recreational areas, formal campgrounds, or other sensitive receivers, located near the adits. Therefore, no long-term operational noise impacts associated with adits within the ANF would occur.

CEQA Conclusion

Noise impacts from ventilation equipment associated with adits would permanently, substantially increase ambient noise levels in the project vicinity above levels existing without the project. This possible exceedance of noise standards is conservatively assumed to be a potentially significant impact under CEQA and, therefore, mitigation would be required. Mitigation Measures N&V-MM#3 and N&V-MM#6 (discussed in Section 3.4.7) would reduce noise from the adit during HSR operation. These mitigation measures would reduce noise through the creation of noise barriers and by ensuring that noise mitigation is reassessed during final project design. Independent of the other noise mitigation measures, the noise barriers included in Mitigation Measure N&V-MM# 3 would likely reduce exterior noise below applicable thresholds. In the event that noise barriers are not feasible, ventilation equipment noise control treatments could also be included in the design to reduce exterior noise levels below applicable thresholds, resulting in a less than significant impact for the Refined SR14, SR14A, E1, E1A, E2, and E2A Build Alternatives.

<u>Vibration Impacts</u>
Long-term operation of the proposed adits and windows would not generate noticeable vibration. Therefore, no long-term operational vibration impacts would occur.

CEQA Conclusion

Operations associated with the adits would not exceed vibration impact criteria and would not generate excessive ground-borne vibration or ground-borne noise levels. No impact would occur for the Refined SR14, SR14A, E1, E1A, E2, and E2A Build Alternatives. Therefore, CEQA does not require any mitigation.

Substation

Substations transform high-voltage electricity supplied by public utilities to the voltage necessary for operating the trains. Substations would be located next to the Build Alternative alignment, approximately every 30 miles along the alignment. Each substation site would be about 35,200 square feet (generally 220 feet by 160 feet) in size. In total, the preliminary engineering plans show 14 potential substations along the Build Alternative alignments.

<u>Noise Impacts</u>
Long-term operational noise impacts from the proposed substations were evaluated using a screening distance of 250 feet from the center of the substations from the FTA guidance (FTA 2018). Based on this distance, there are no sensitive receivers in the project vicinity and as such, there would be no long-term operational noise impacts from substations for all six Build Alternatives.

CEQA Conclusion

Operations at the substations would not permanently, substantially increase ambient noise levels in the project vicinity above existing levels for residential receivers. Therefore, no impacts would occur under CEQA for the Refined SR14, SR14A, E1, E1A, E2, and E2A Build Alternatives. Therefore, CEQA does not require any mitigation.

<u>Vibration Impacts</u>
Long-term operation of the substations would not generate noticeable vibration. Therefore, no long-term operational vibration impacts would occur for the Refined SR14, SR14A, E1, E1A, E2, and E2A Build Alternatives. Therefore, CEQA does not require any mitigation.

CEQA Conclusion

Operations at the substations would not exceed vibration impact criteria and would not generate excessive ground-borne vibration or ground-borne noise levels. Therefore, no impact under CEQA would occur for all six Build Alternatives, and no mitigation is required.

Electric Power Utility Improvements

<u>Noise Impacts</u>
Noise impacts from operation of electrical utilities are not anticipated because no noise would be generated by electrical utility operation.

CEQA Conclusion

Operation of electrical utilities would not exceed noise impact criteria and would not permanently or periodically substantially increase ambient noise levels in the project vicinity above levels existing without the project. No impact would occur for the Refined SR14, SR14A, E1, E1A, E2, and E2A Build Alternatives. Therefore, CEQA does not require any mitigation.

<u>Vibration Impacts</u>
Vibration impacts from operation of electrical utilities are not anticipated because no vibration would be generated by electrical utility operation.

CEQA Conclusion

Operation of electrical utilities would not exceed vibration impact criteria and would not generate excessive ground-borne vibration or ground-borne noise levels. No impact would occur for the Refined SR14, SR14A, E1, E1A, E2, and E2A Build Alternatives. Therefore, CEQA does not require any mitigation.

3.4.7 Mitigation Measures

The mitigation measures listed in Table 3.4-47 would apply to all six Build Alternatives. Each mitigation measure is described in further detail below Table 3.4-47.

Table 3.4-47 Noise and Vibration Mitigation Measures

Mitigation Measures	Central Subsection						Burbank Subsection					
	Refined SR14	SR14A	E1	E1A	E2	E2A	Refined SR14	SR14A	E1	E1A	E2	E2A
Construction[1]												
N&V-MM#1 Construction Noise Mitigation Measures	X	X	X	X	X	X	X	X	X	X	X	X
N&V-MM#2 Construction Vibration Mitigation Measures	X	X	X	X	X	X	X	X	X	X	X	X
Operation[2]												
N&V-MM#3 Implement Proposed California High-Speed Rail Project Noise Mitigation Guidelines	X	X	X	X	X	X	N/A	N/A	N/A	N/A	N/A	N/A
N&V-MM#4 Vehicle Noise Specification	X	X	X	X	X	X	N/A	N/A	N/A	N/A	N/A	N/A
N&V-MM#5 Special Track Work at Crossovers and Turnouts	X	X	X	X	X	X	N/A	N/A	N/A	N/A	N/A	N/A

Mitigation Measures	Central Subsection						Burbank Subsection					
	Refined SR14	SR14A	E1	E1A	E2	E2A	Refined SR14	SR14A	E1	E1A	E2	E2A
N&V-MM#6 Additional Noise Analysis Following Final Design	X	X	X	X	X	X	N/A	N/A	N/A	N/A	N/A	N/A
N&V-MM#7 Implement Operation Vibration Mitigation Measures	X	X	X	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N&V-MM#8 Startle Effect Warning Signage	X	N/A	N/A	N/A	X	X	N/A	N/A	N/A	N/A	N/A	N/A

[1] Construction-period mitigation measures would apply to all Build Alternatives and subsections during construction.
[2] There are no operational mitigation measures required for the Burbank Subsection, which does not contain noise-sensitive or vibration-sensitive receivers.
N/A = not applicable

N&V-MM#1: Construction Noise Mitigation Measures

Prior to construction (any ground-disturbing activities), the contractor will prepare a noise-monitoring program for Authority approval. The noise-monitoring program will describe how, during construction, the contractor will monitor construction noise to verify compliance with the noise limits (8-hour L_{eq} dBA noise limits are 80 dBA during the day and 70 dBA at night for residential land use; 85 dBA both day and night for commercial land use; and 90 dBA both day and night for industrial land use) where a noise-sensitive receptor is present. The contractor would be given the flexibility to meet FRA construction noise limits in the most efficient and cost-effective manner. This can be done by either prohibiting certain noise-generating activities during nighttime hours or providing additional noise control measures to meet the noise limits. In addition, the noise-monitoring program will describe the actions required of the contractor to meet required noise limits. These actions will include the following nighttime and daytime noise control mitigation measures, as necessary:

- Install a temporary construction-site noise barrier near a noise source.
- Avoid nighttime construction in residential neighborhoods.
- Locate stationary construction equipment as far as possible from noise-sensitive sites.
- Re-route construction truck traffic along roadways that will cause the least disturbance to residents.
- During nighttime work, use smart back-up alarms, which automatically adjust the alarm levels based on background noise levels, or switch off back-up alarms and replace with spotters.
- Use low-noise emission equipment.
- Implement noise-deadening measures for truck loading and operations.
- Monitor and maintain equipment to meet noise limits.
- Line or cover storage bins, conveyors, and chutes with sound-deadening material.
- Use acoustic enclosures, shields, or shrouds for equipment and facilities.
- Use high-grade engine exhaust silencers and engine-casing sound insulation.
- Prohibit aboveground jackhammering and impact pile driving during nighttime hours.
- Minimize the use of generators to power equipment.
- Limit use of public address systems.
- Grade surface irregularities on construction sites.
- Use moveable noise barriers at the source of the construction activity.
- Limit or avoid certain noisy activities during nighttime hours.
- To mitigate noise related to pile driving, use an auger rather than a pile driver. If pile driving is necessary, limit the time of day that the activity can occur.

The Authority will establish and maintain (until construction is completed) a toll-free hotline for construction-related activities. The Authority will arrange for all incoming hotline messages to be logged (with summaries of the contents of each message) and for a designated representative of the Authority to respond to hotline messages within 24 hours (excluding weekends and holidays). The Authority will make a reasonable good-faith effort to address all concerns and answer all questions and shall include on the log its responses to all callers. The Authority shall make a log of the incoming messages including the Authority's responsive actions publicly available on its website.

The contractor will provide the Authority with an annual report by January 31 of the following year documenting how it implemented the noise-monitoring program.

N&V-MM#2: Construction Vibration Mitigation Measures

Prior to construction involving impact pile driving within 50 feet of any building, the contractor shall provide the Authority with a vibration technical memorandum documenting how project pile-driving criteria will be met. Upon approval of the technical memorandum by the Authority, and, where a noise-sensitive receptor is present, the contractor shall comply with the vibration reduction methods described in that memorandum. Potential construction vibration building damage is only anticipated from impact pile driving at very close distances to buildings. If pile driving occurs more than 25 to 50 feet from buildings, or if alternative methods such as push piling or auger piling are used, damage from construction vibration is not expected to occur. When a construction scenario has been established, pre-construction surveys will be conducted by the contractor at locations within 50 feet of pile driving to document the existing condition of buildings in case damage is reported during or after construction. The contractor will arrange for the repair of damaged buildings or will pay compensation to the property owner.

N&V-MM#3: Implement California High-Speed Rail Project Noise Mitigation Guidelines

Various options exist to address the severe noise effects from California HSR System operations. The Authority has developed Noise Mitigation Guidelines (Appendix 2-E) for the statewide California HSR System that set forth three categories of mitigation measures to reduce or offset severe noise impacts from HSR operations: noise barriers, sound insulation, and noise easements. The guidelines also set forth an implementation approach that considers multiple factors for determining the reasonableness of noise barriers as mitigation for severe noise impacts, including structural and seismic safety, cost, number of affected receptors, and effectiveness. Noise barrier mitigation would be designed to reduce the exterior noise levels from HSR operations from severe to moderate, according to the provisions of the FRA guidance (FRA 2012) and Figure 3.4-12.

Noise Barriers

Prior to operation of the California HSR System, the Authority shall prepare an HSR operation noise impact report. Based on the recommendations in the approved noise impact report, the Authority will install noise barriers where they can achieve between 5 and 15 dB of exterior noise reduction, depending on their height and location relative to the tracks. The primary requirements for an effective noise barrier are that the barrier must (1) be high enough and long enough to break the line-of-sight between the sound source and the receiver, (2) be of an impervious material with a minimum surface density of 4 pounds per square foot, and (3) not have any gaps or holes between the panels or at the bottom. Because many materials meet these requirements, aesthetics, durability, cost, and maintenance considerations usually determine the selection of materials for noise barriers. Depending on the situation, noise barriers can become visually intrusive. Typically, the noise barrier style is selected with input from the local jurisdiction to reduce the visual effects of barriers on adjacent lands uses (refer to Aesthetic Options for Non-Station Structures, 2017). For example, noise barriers could be solid or transparent, and made of various colors, materials, and surface treatments.

Pursuant to the Noise Mitigation Guidelines, recommended noise barriers must meet the following criteria to be considered a reasonable and feasible mitigation measure:

- Achieve a minimum of five dB of noise reduction, which is then defined as a benefited receptor.
- The minimum number of affected sites should be at least 10.
- The length should be at least 800 feet.
- Must be cost-effective.
- The community should approve of implementation of the recommended noise barriers (75 percent of all affected parties).

The maximum noise barrier height would be 14 feet for at-grade sections. Berm and berm/wall combinations are the preferred types of noise barriers where space and other environmental constraints permit. On aerial structures, the maximum noise barrier height would also be 14 feet, but barrier material would be limited by engineering weight restrictions for barriers on the structure. All noise barriers would be designed to be as low as possible to achieve a substantial noise reduction.

Several sound barriers were determined to be feasible and effective using the criteria described above. The noise barriers will have a setback of approximately 12 feet from the proposed track centerline, and thus would not expand the project boundary. The noise barriers will provide between 5 dB and 15 dB of exterior noise reduction to a minimum of 10 affected sites with a minimum barrier length of 800 feet. The noise barriers would also need to be considered financially reasonable. A financially reasonable noise barrier is defined as a noise barrier determined not to exceed a construction cost of $95,000 per benefitted receiver. Each potentially feasible noise barrier is described and evaluated for reasonableness in Table 3.4-48. Noise barriers identified as feasible and reasonable were modeled to demonstrate quantified reduction of associated noise impacts to a less than significant level.

As shown in Table 3.4-48, the Refined SR14 Build Alternative includes two proposed noise barriers, one of which eliminates all severe noise impacts while the other does not (two residual severe noise impacts would remain). For the SR14A Build Alternative in the Central Subsection one noise barrier is proposed which would eliminate all severe noise impacts at that location.

For the E1 Build Alternative five noise barriers were evaluated. Three of the five proposed noise barriers, would eliminate all severe noise impacts at their respective locations within the Central Subsection. One barrier was determined to not be reasonable, and one would not reduce all impacts (15 residual severe noise impacts would remain).

For the E1A Build Alternative two noise barriers were evaluated. One would eliminate all severe noise impacts at its location while the other was determined to not be reasonable.

For the E2 Build Alternative seven noise barriers were evaluated. Three of the noise barriers would eliminate all severe noise impacts at their respective locations. Three of the noise barriers would not reduce all severe noise impacts resulting residual severe noise impacts at their respective locations. One noise barrier was determined to not be reasonable.

For the E2A Build Alternative four noise barriers were evaluated. One would eliminate all severe noise impacts at its location. Two noise barriers would not reduce all severe noise impacts resulting in residual severe noise impacts at their locations. And one noise barrier was determined to not be reasonable.

Figure 3.4-36 through Figure 3.4-39 depict the location of the noise barriers evaluated.

There are no operations mitigation measures required for the Burbank Subsection, which does not contain noise-sensitive or vibration-sensitive receivers. Thus, no noise barriers are needed in the Burbank Subsection.

Install Building Sound Insulation

If noise barriers are not proposed for receptors with severe impacts, receptors do not approve of proposed noise barriers, or if proposed noise barriers do not reduce exterior sound levels to below a severe impact level, the Authority will consider building sound insulation as a potential additional mitigation measure on a case-by-case basis. Sound insulation of residences and institutional buildings to improve outdoor-to-indoor noise reduction is a mitigation measure that can be considered when the use of noise barriers is not feasible in providing a reasonable level (five to seven dBA) of noise reduction. Although this approach has no effect on noise in exterior areas, it may be the best choice for sites where noise barriers are not feasible or desirable and for buildings where indoor sensitivity is of most concern. Substantial improvements in building sound insulation (on the order of 5 to 10 dBA) can often be achieved by adding an extra layer of glazing to windows, by sealing holes in exterior surfaces that act as sound leaks, and by providing forced ventilation and air conditioning so that windows do not need to be opened.

Noise Easements

If a substantial noise reduction cannot be completed through installation of noise barriers or building sound insulation, the Authority will consider acquiring a noise easement on properties with a severe impact on a case-by-case basis. An agreement between the Authority and the property owner can be established wherein the property owner releases the right to petition the Authority regarding the noise level and subsequent disruptions. This would take the form of a permanent easement that would encompass the property boundaries to the right-of-way of the rail line. The Authority would consider this mitigation measure only in isolated cases where other mitigation is ineffective or infeasible.

Table 3.4-48 Proposed Noise Barrier Details and Reasonableness

Noise Barrier[1]	Side of Track	Type of Barrier	Length (feet)	Height[2] (feet)	Surface Area (square feet)	Total Cost	Number of BRs	Cost per BR	Cost in Excess of $95,000 per BR?	Barrier Reasonable?	Residual Severe Noise Impacts
Central Subsection (Refined SR14 Build Alternative)											
North of East Avenue R8 to south of Bayberry Street	SB	At grade	2,180	14	30,250	$2,136,400	55	$38,844	No	Yes[3]	0
North of East Barrel Springs Road to Sierra Hills Lane	SB	At grade	2,685	14	37,950	$2,631,300	30	$87,710	No	Yes[3]	2
Central Subsection (SR14A Build Alternative)											
North of East Avenue R8 to south of Bayberry Street	SB	At grade	2,180	14	30,250	$2,136,400	55	$38,844	No	Yes[3]	0
Central Subsection (E1 Build Alternative)											
North of East Avenue R8 to south of Bayberry Street	SB	At grade	2,180	14	30,250	$2,136,400	55	$38,844	No	Yes[3]	0
North of East Barrel Springs Road to Harold 1st Street	NB	At grade	1,170	14	16,380	$1,146,600	20	$57,330	No	Yes[3]	0
South of East Barrel Springs Road to south of Sierra Hills Lane	SB	At grade	2,890	14	40,460	$2,832,200	35	$80,920	No	Yes[3]	15
North of Carob Court to south of Sierra Hills Lane	NB	At grade	1,220	14	17,080	$1,195,600	47	$25,438	No	Yes[3]	0

Noise Barrier[1]	Side of Track	Type of Barrier	Length (feet)	Height[2] (feet)	Surface Area (square feet)	Total Cost	Number of BRs	Cost per BR	Cost in Excess of $95,000 per BR?	Barrier Reasonable?	Residual Severe Noise Impacts
North of Foreston Drive to south of Foreston Drive	SB	At grade	1,265	14	17,710	$1,239,700	10	$123,970	Yes	No	N/A
Central Subsection (E1A Build Alternative)											
North of East Avenue R8 to South of Bayberry Street	SB	At grade	2,180	14	30,250	$2,136,400	55	$38,844	No	Yes[3]	0
North of Foreston Drive to south of Foreston Drive	SB	At grade	1,265	14	17,710	$1,239,700	10	$123,970	Yes	No	N/A
Central Subsection (E2 Build Alternative)											
North of East Avenue R8 to south of Bayberry Street	SB	At grade	2,180	14	30,250	$2,136,400	55	$38,844	No	Yes[3]	0
North of East Barrel Springs Road to Harold 1st Street	NB	At grade	1,170	14	16,380	$1,146,600	20	$57,330	No	Yes[3]	0
South of East Barrel Springs Road to south of Sierra Hills Lane	SB	At grade	2,890	14	40,460	$2,832,200	35	$80,920	No	Yes[3]	15
North of Carob Court to south of Sierra Hills Lane	NB	At grade	1,220	14	17,080	$1,195,600	47	$25,438	No	Yes[3]	0
North of Foreston Drive to south of Foreston Drive	SB	At grade	1,265	14	17,710	$1,239,700	10	$123,970	Yes	No	N/A

Noise Barrier[1]	Side of Track	Type of Barrier	Length (feet)	Height[2] (feet)	Surface Area (square feet)	Total Cost	Number of BRs	Cost per BR	Cost in Excess of $95,000 per BR?	Barrier Reasonable?	Residual Severe Noise Impacts
BP and L Road to north of Wentworth Street	SB	Viaduct	4,570	8	36,560	$2,376,400	96	$24,754	No	Yes[3]	14
BP and L Road to south of Interstate 210	NB	Viaduct	2,735	8	21,880	$1,422,200	17	$83,659	No	Yes[3]	7
Central Subsection (E2A Build Alternative)											
North of East Avenue R8 to South of Bayberry Street	SB	At grade	2,180	14	30,250	$2,136,400	55	$38,844	No	Yes[3]	0
North of Foreston Drive to South of Foreston Drive	SB	At grade	1,265	14	17,710	$1,239,700	10	$123,970	Yes	No	N/A
BP and L Road to North of Wentworth Street	SB	Viaduct	4,570	8	36,560	$2,376,400	96	$24,754	No	Yes[3]	14
BP and L Road to South of Interstate 210	NB	Viaduct	2,735	8	21,880	$1,422,200	17	$83,659	No	Yes[3]	7

[1] All impervious noise barriers have a setback of approximately 12 feet from the proposed near track centerline
[2] Height is measured in feet above top of the rail.
[3] Pending 75 percent community approval of implementation of the recommended noise barrier
BR = benefited receiver; NB = northbound; SB = southbound

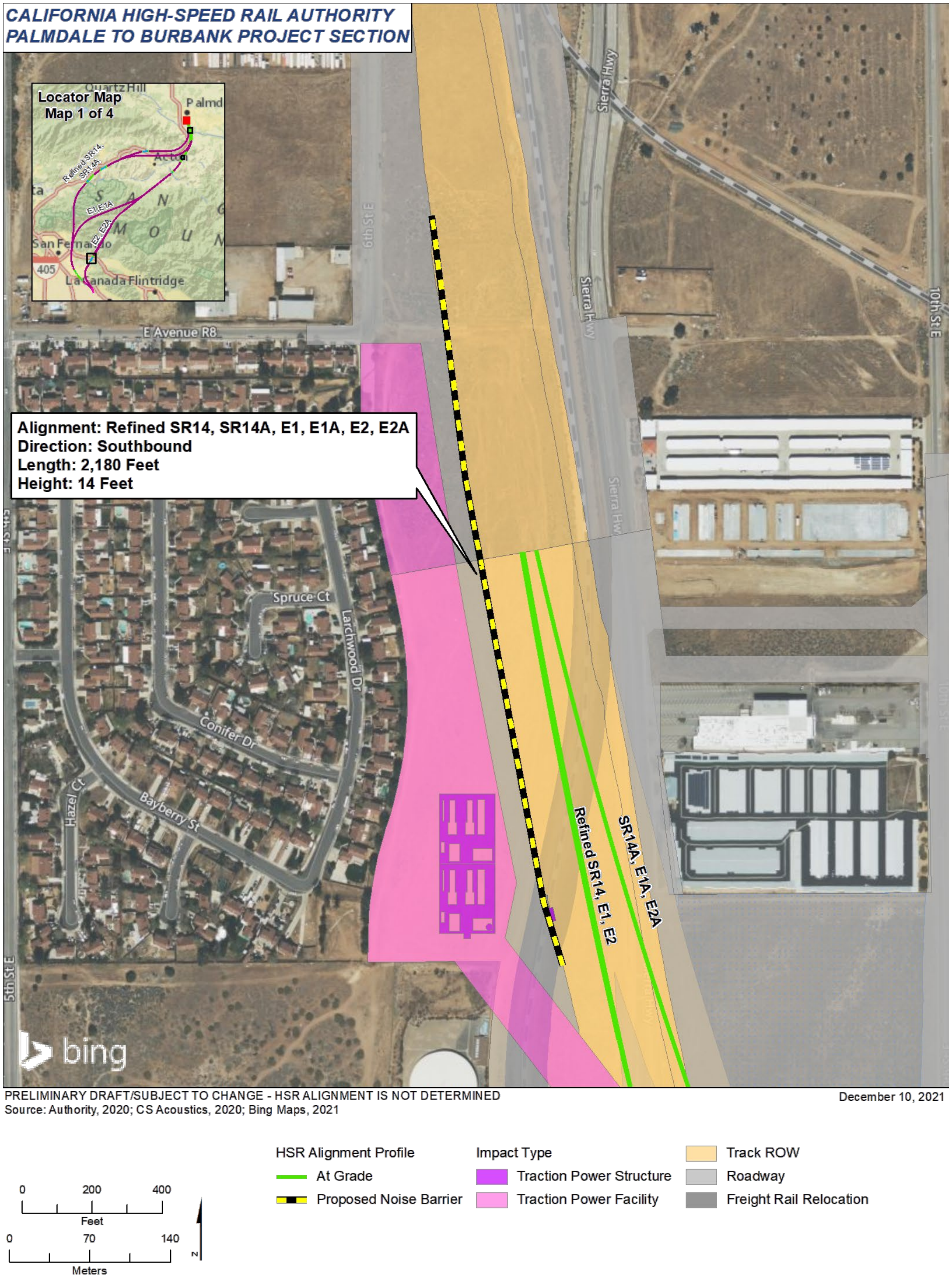


Figure 3.4-36 Placement of Proposed Noise Barriers (Map 1 of 4)

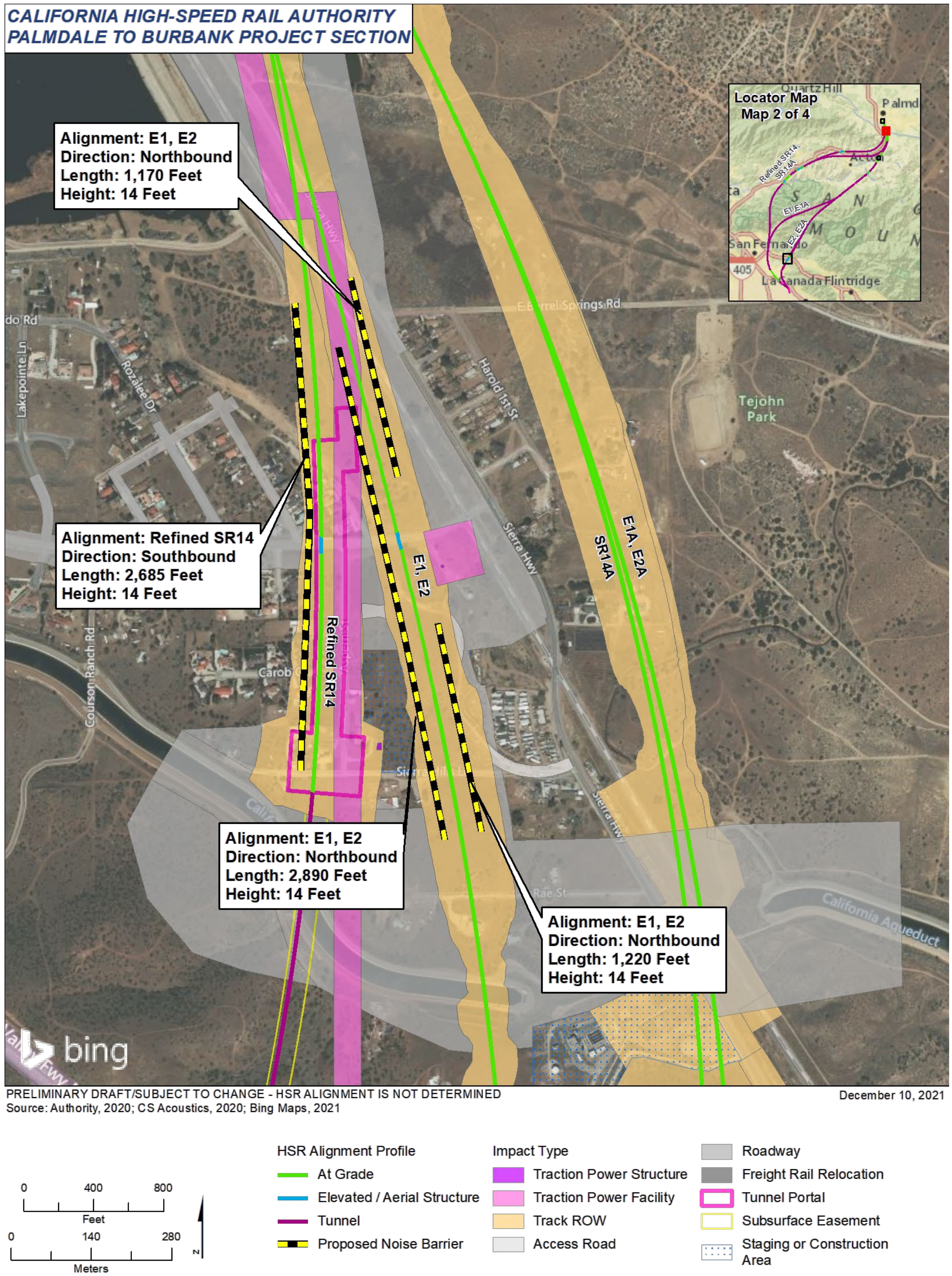


Figure 3.4-37 Placement of Proposed Noise Barriers (Map 2 of 4)

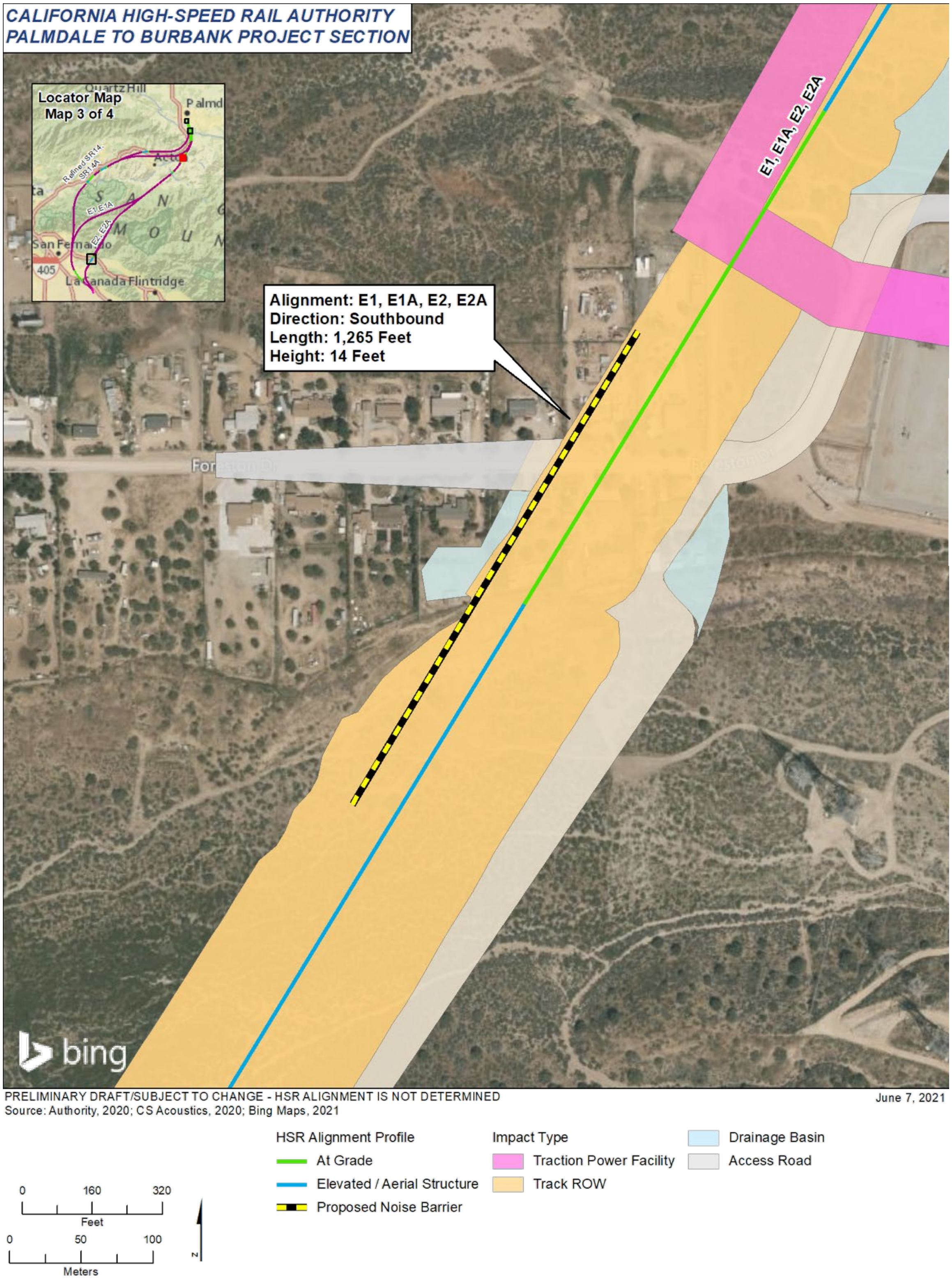


Figure 3.4-38 Placement of Proposed Noise Barriers (Map 3 of 4)

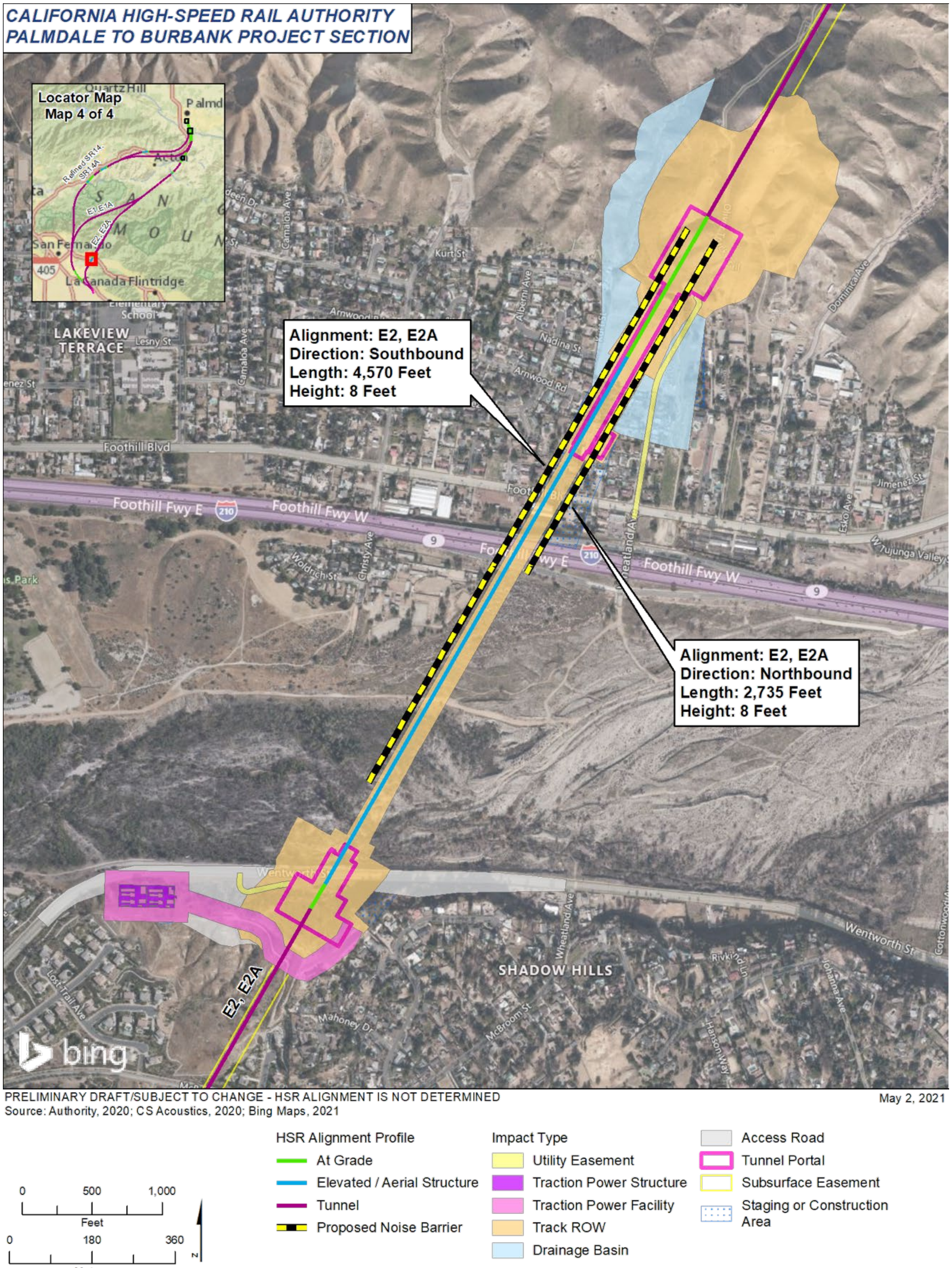


Figure 3.4-39 Placement of Proposed Noise Barriers (Map 4 of 4)

N&V-MM#4: Vehicle Noise Specification

During HSR vehicle technology procurement, the Authority will require bidders to meet the federal regulations (40 C.F.R. Part 201.12/13) at the time of procurement for locomotives (currently a 90 dBA level standard) operating at speeds of greater than 45 mph.

N&V-MM#5: Special Track Work at Crossovers and Turnouts

Prior to construction, the contractor will provide the Authority with an HSR operation noise technical report for review and approval. The report will address the minimization/elimination of rail gaps at turnouts. Because the impacts of HSR wheels over rail gaps at turnouts increases HSR noise by approximately 6 dB over typical operations, turnouts can be a major source of noise impact. If the turnouts cannot be moved from sensitive areas, the noise technical report will recommend the use of special types of track work that would eliminate the gap. The Authority will require the project design to follow the recommendations in the approved noise impact report.

N&V-MM#6: Additional Noise Analysis Following Final Design

Prior to construction, the contactor will provide the Authority with an HSR operational noise technical report for review and approval. If final design or final vehicle specifications result in changes to the assumptions underlying the existing noise technical report, the Authority will prepare necessary environmental documentation, as required by NEPA and CEQA, to reassess noise impacts and mitigation.

N&V-MM#7: Implement Operation Vibration Mitigation Measures

Vibration mitigation would be evaluated during project design. Mitigation for operational vibration impacts can occur at the source, at the sensitive receiver, or along the propagation path from the source to the receiver. Potential measures from the mitigation guidelines include the following:

- **Vehicle Suspension (Source)**—Rail vehicles should have low steady weight, soft primary suspension, minimum metal-on-metal contact between moving parts of the truck, and smooth wheels that are perfectly round.
- **Special Track Support Systems (Source)**—Floating slabs, resiliently supported ties, high-resilience fasteners, and ballast mats all help reduce vibration from the track support system.
- **Building Modifications (Receiver)**—For existing buildings, if vibration-sensitive equipment is affected by train vibration, the floor upon which the vibration-sensitive equipment is located may be stiffened and isolated from the remainder of the building. For new buildings, the building foundation should be supported by elastomer pads similar to bridge bearing pads.
- **Buffer Zones (Receiver)**—A vibration easement may be negotiated from the affected property owners or the rail right-of-way may be expanded.

Operational vibration impacts were only identified for the Central Subsection of the Refined SR14, SR14A, E1, and E1A Build Alternatives. Therefore, vibration mitigation measures only apply to the Refined SR14, SR14A, E1, and E1A Build Alternatives. Two locations in particular would require vibration mitigation:

- **Osborne Street to Montague Street**—Vibration mitigation of 1,600 feet is proposed in this location. To avoid impact, it is estimated that mitigation will need to be designed to reduce ground-borne vibration levels by at least 2 dB and reduce ground-borne noise levels by at least 4 dB. The type of mitigation will be determined in final design.
- **Wheatland Avenue to Lockheed Drive**—Vibration mitigation of 900 feet is proposed at this location. To avoid impact, it is estimated that mitigation will need to be designed to reduce ground-borne noise levels by at least 3 dB. The type of mitigation will be determined in final design.

N&V-MM#8: Startle Effect Warning Signage

Mitigation Measure N&V-MM#8 will apply to the Refined SR14, E2, and E2A Build Alternatives as they both pass over public recreation areas that provide equestrian trails and/or equestrian facilities. The following signage would be posted along the Pacific Crest Trail and in Vasquez Rocks Natural Area Park, the Hansen Dam Recreation Area, and the Stonehurst Park and Recreation Center:

- A passive warning sign at approximately 1,300 feet or further from the alignment warning of an upcoming train crossing
- An active warning sign at 60+ feet of the alignment, warning users of an upcoming train crossing and the approximate time of the crossing (number of minutes)

3.4.7.1 Impacts from Implementing Mitigation Measures

The mitigation measures could result in secondary environmental effects or environmental effects outside of the current Build Alternative footprint. Such impacts could include emissions and fugitive dust from construction equipment, construction-related noise, construction-related road closures or traffic delays, mobilization of extant hazardous materials or wastes, private property acquisitions or displacements, and impacts on biological and cultural resources. These types of impacts are common to most infrastructure construction projects and are typically reduced to a less than significant level through adhering to applicable regulations, obtaining regulatory permits, incorporating best management practices, and applying standard mitigation measures. The impacts of implementing the eight mitigation measures discussed in this evaluation of noise and vibration impacts are discussed below.

- **Mitigation Measure N&V-MM#1** would reduce construction-related noise levels from construction of the project. Measures to reduce construction-related noise levels will not expand beyond the HSR construction area, and the increase in noise would be minimal in comparison to the scope of the project. Mitigation Measure N&V-MM#1 would not result in secondary or off-site environmental impacts.
- **Mitigation Measure N&V-MM#2** would reduce construction-related vibration levels or reduce construction-related vibration impacts. Pre-construction surveys and repair of damaged buildings will likely be conducted outside of the construction boundary. Although minimal, repair of damaged buildings could result in construction noise, emissions, and ground disturbance beyond what is anticipated for the California HSR System. Therefore, this mitigation measure could result in secondary or off-site environmental impacts.
- **Mitigation Measure N&V-MM#3** would reduce operational noise from the proposed HSR by installing noise barriers. The installation of noise barriers along the Build Alternative alignment will generally remain within the construction boundary and will not provide additional obstacles to wildlife movement because the barriers will be installed within the HSR right-of-way. However, several noise barriers proposed for Mitigation Measure N&V-MM#3 will be installed beyond the construction boundary. Therefore, this mitigation measure has the potential to result in several secondary or off-site impacts. Such impacts could include emissions and fugitive dust from construction equipment, construction-related noise, construction-related road closures or traffic delays, mobilization of extant hazardous materials or wastes, private property acquisitions or displacements, a decrease in visual character, and impacts on biological and cultural resources.
- **Mitigation Measure N&V-MM#4** would ensure federal noise regulations are met, as bidders will be required to meet these standards as part of HSR vehicle technology procurement. This would not result in secondary or off-site environmental impacts.
- **Mitigation Measure N&V-MM#5** will require special types of track work to eliminate gaps in order to reduce noise levels generated from rail turnouts. This measure will be conducted within the HSR right-of-way and would not result in secondary or off-site environmental impacts.

- **Mitigation Measure N&V-MM#6** will require the contactor to prepare an HSR operational noise technical report following final design to confirm noise impacts for the Palmdale to Burbank Project Section have been adequately evaluated and no new impacts were identified that may trigger the need for further environmental review. This measure would not result in any secondary impacts.
- **Mitigation Measure N&V-MM#7** will require development of site-specific vibration-reduction measures, including stiffening floors in vibration-sensitive buildings, creating buffer zones, and modifying HSR vehicles. Adjustments made to vibration-sensitive buildings have the potential to result in secondary impacts beyond what is anticipated for the California HSR System. Impacts include noise and dust from construction activities to strengthen buildings. Creating buffer zones and modifying HSR vehicles would not result in secondary impacts.
- **Mitigation Measure N&V-MM#8** would reduce startle effects by requiring warning signs to be posted along the Pacific Crest Trail and in Vasquez Rocks Natural Area Park, the Hansen Dam Recreation Area, and the Stonehurst Park and Recreation Center. These signs will be posted to warn users of an upcoming train crossing and the approximate time for the crossing. Installation of these signs could occur outside the Build Alternative footprint and could result in construction-related impacts such as noise, dust, and tree and shrub trimming from construction activities. These activities and impacts would be minor and of short duration.

3.4.8 NEPA Impacts Summary

This section summarizes NEPA noise and vibration impacts associated with the six Build Alternatives. Impacts are summarized in Table 3.4-49. Under NEPA, project effects are evaluated based on the criteria of context and intensity. The intensity of noise and vibration impacts was evaluated based on the impact criteria presented in Section 3.4.4.4, and includes quantification of future noise and vibration levels at sensitive receivers. The project context is presented in Chapter 2, Alternatives, and in Section 3.4.5.

Table 3.4-49 Comparison of High-Speed Rail Build Alternative Impacts for Noise and Vibration

Impacts	Build Alternative						NEPA Conclusion before Mitigation (All Build Alternatives)	Mitigation	NEPA Conclusion post Mitigation (All Build Alternatives)
	Refined SR14	SR14A	E1	E1A	E2	E2A			
Construction Impacts									
Impact N&V#1: Construction Noise Impacts on Sensitive Receivers. While the duration and location of construction noise would vary according to the Build Alternative, the types of effects on sensitive receivers would remain generally consistent across the Build Alternatives. While mitigation measures may help reduce effects on sensitive receivers, some receivers may still experience construction noise above applicable thresholds.									
Residential communities affected by aboveground construction activities	Harold/ Alpine Agua Dulce	Harold/ Alpine Agua Dulce	Harold/ Alpine Near SCE Vincent Substation	Harold/ Alpine Near SCE Vincent Substation	Harold/ Alpine Near SCE Vincent Substation Lake View Terrace Sun Valley	Harold/ Alpine Near SCE Vincent Substation Lake View Terrace Sun Valley	Adverse Effect	N&V-MM#1	Adverse Effect See Section 3.4.8.1
Impact N&V#2: Spoils Haul Route Noise Impacts on Sensitive Receivers									
Noise-sensitive areas affected by traffic noise from truck trips hauling construction spoils	Big Springs Road northwest of Acton	No severe construction noise impacts from spoils hauling are anticipated for this Build Alternative	Portals: Aliso Canyon Road, Soledad Canyon Road, and Crown Valley Road south of Palmdale Adit: Sand Canyon Road and Placerita Canyon Road in ANF	Portals: Aliso Canyon Road, Soledad Canyon Road, and Crown Valley Road south of Palmdale Adit: Sand Canyon Road and Placerita Canyon Road in ANF	Wheatland Avenue (Shadow Hills neighborhood); Foothill Boulevard (Lake View Terrace neighborhood); Aliso Canyon Road, Soledad Canyon Road, and Crown Valley Road south of Palmdale	Wheatland Avenue (Shadow Hills neighborhood); Foothill Boulevard (Lake View Terrace neighborhood); Aliso Canyon Road, Soledad Canyon Road, and Crown Valley Road south of Palmdale	**Refined SR14, E1, E1A, E2, E2A:** Adverse Effect **SR14A:** No Adverse Effect	N&V-MM#1	**Refined SR14, E1, E1A, E2, E2A:** Adverse Effect **SR14A:** N/A See Section 3.4.8.1

<table>
<tr><th rowspan="2">Impacts</th><th colspan="6">Build Alternative</th><th rowspan="2">NEPA Conclusion before Mitigation (All Build Alternatives)</th><th rowspan="2">Mitigation</th><th rowspan="2">NEPA Conclusion post Mitigation (All Build Alternatives)</th></tr>
<tr><th>Refined SR14</th><th>SR14A</th><th>E1</th><th>E1A</th><th>E2</th><th>E2A</th></tr>
<tr><td colspan="7">Impact N&V#3: Construction Vibration Impacts on Sensitive Receivers. Sensitive receivers would experience construction-related vibration annoyance from construction activities such as pile driving for all Build Alternatives, but the duration and location of construction vibration would vary according to the Build Alternative=. Construction activity resulting in vibration effects would be temporary and intermittent and would cease once work is complete. Additionally, implementation of a vibration technical memorandum would further reduce vibration effects.</td><td>Adverse Effect</td><td>N&V-MM#2</td><td>No Adverse Effect
See Section 3.4.8.1</td></tr>
<tr><td colspan="10">Operations Impacts</td></tr>
<tr><td colspan="7">Impact N&V#4: Operational Traffic Noise Impacts on Sensitive Receivers. Roadway changes near the Burbank Airport Station would not meet the criteria for sensitive receivers to be affected. Operational traffic noise from increased trips would result in five moderate and severe effects on residential receivers at the Palmdale Station, within the Palmdale to Burbank Project Section.</td><td>Adverse Effect</td><td>N&V-MM#3</td><td>Adverse Effect
See Section 3.4.8.2</td></tr>
<tr><td colspan="7">Impact N&V#5: Operational Annoyance and Startle Effects for Humans. Because all Build Alternatives would include operation of high-speed trains, effects would be identical across Build Alternatives. Startle effects due to rapid onset rates could occur within 45 feet of any aboveground tracks; however, areas 45 feet from the track centerline are typically within the area acquired for right-of-way and would not contain sensitive receivers.</td><td>No Adverse Effect</td><td>No mitigation needed</td><td>N/A
See Section 3.4.8.2</td></tr>
<tr><td colspan="10">Impact N&V#6: Operational Train Noise Impacts</td></tr>
<tr><td>California HSR System operations in the rail corridor would result in moderate and severe noise effects.</td><td>Moderate Noise Effects: 129
Severe Noise Effects: 55</td><td>Moderate Noise Effects: 99
Severe Noise Effects: 19</td><td>Moderate Noise Effects: 143
Severe Noise Effects: 108</td><td>Moderate Noise Effects: 173
Severe Noise Effects: 44</td><td>Moderate Noise Effects: 141
Severe Noise Effects: 164</td><td>Moderate Noise Effects: 168
Severe Noise Effects: 102</td><td>Adverse Effect</td><td>N&V-MM#3
N&V-MM#4
N&V-MM#5
N&V-MM#6</td><td>Adverse Effect.
See Section 3.4.8.2</td></tr>
</table>

<table>
<tr><th rowspan="2">Impacts</th><th colspan="6">Build Alternative</th><th rowspan="2">NEPA Conclusion before Mitigation (All Build Alternatives)</th><th rowspan="2">Mitigation</th><th rowspan="2">NEPA Conclusion post Mitigation (All Build Alternatives)</th></tr>
<tr><th>Refined SR14</th><th>SR14A</th><th>E1</th><th>E1A</th><th>E2</th><th>E2A</th></tr>
<tr><td colspan="7">Impact N&V#7: Noise Impacts on Domestic Animals. Domestic animals would not be located close enough to the E1 and E1A Build Alternatives to experience startle effects. Domestic animals such as dairy cows, horses, and other farm animals near the California HSR System corridor may be affected by train pass-bys if they are located within 40 to 50 feet of the Refined SR14, SR14A, E2, and E2A Build Alternative aboveground alignment centerline. Active and passive warning signs located along the Pacific Crest Trail and in Vasquez Rocks Natural Area Park, the Hansen Dam Recreation Area, and Stonehurst Park and Recreation Area would reduce startle effects on animals located along the Refined SR14, SR14A, E2, and E2A Build Alternatives. Vibration from train passage is not anticipated to affect domestic animals.</td><td>Refined SR14, SR14A, E2, and E2A: Adverse Effect
E1 and E1A: No Adverse Effect</td><td>N&V-MM#8</td><td>Refined SR14, SR14A, E2, and E2A: No Adverse Effect
E1 and E1A: N/A
See Section 3.4.8.2</td></tr>
<tr><td colspan="7">Impact N&V#8: Operational Train Vibration Impacts. There are no vibration-sensitive receivers in the Burbank Subsection. Operation of the E2 and E2A Build Alternatives would not exceed any relevant vibration impact criteria and would not generate excessive ground-borne noise or vibration impacts. Operation of the Refined SR14, SR14A, E1, and E1A Build Alternatives would exceed vibration and ground-borne effects criteria at residential receivers and institutional receivers. Site-specific vibration-reduction measures would reduce vibration and ground-borne noise levels below applicable thresholds.</td><td>Refined SR14, SR14A, E1, and E1A: Adverse Effect
E2 and E2A: No Adverse Effect</td><td>N&V-MM#7</td><td>Refined SR14, SR14A, E1, and E1A: No Adverse Effect
E2 and E2A: N/A
See Section 3.4.8.2</td></tr>
<tr><td colspan="7">Impact N&V#9: Noise and Vibration from High-Speed Rail Stationary Facilities. Operations from the Burbank Airport Station would not meet the criteria for sensitive receivers to be affected. Noise from adits would result in increased noise to sensitive receivers within 200 feet of the adit. Vibration from adits would not meet the criteria for sensitive receivers to be affected. Operation of substations and electric power utility improvements would not meet the criteria for sensitive receivers to be affected.</td><td>Adverse Effect</td><td>N&V-MM#3
N&V-MM#6</td><td>No Adverse Effect
See Section 3.4.8.2</td></tr>
</table>

ANF = Angeles National Forest; HSR = high-speed rail

3.4.8.1 Construction

Construction of the six Build Alternatives would generate construction noise at sensitive receivers. Construction activities would be similar for all six Build Alternatives; therefore, the intensity of noise impacts would also be similar for each Build Alternative. All six Build Alternatives would also involve at-grade construction activities within the community of Harold/Alpine just south of Lake Palmdale.

The Refined SR14 Build Alternative and the SR14A Build Alternative would be constructed above ground in an area of low-density residential development in Agua Dulce. While the E1, E1A, E2, and E2A Build Alternatives would avoid the community in Agua Dulce, they would involve at-grade construction work in a community located near the SCE Vincent Substation. Additionally, the E2 and E2A Build Alternatives would involve at-grade construction work in the Los Angeles communities of Lake View Terrace and Sun Valley. While the intensity of construction-related noise effects would be similar for all six Build Alternatives, the E2 Build Alternative and the E2A Build Alternative alignments would require at-grade construction work adjacent to more communities than the other Build Alternatives, resulting in more sensitive receivers being exposed to construction noise. While noise reduction measures would be implemented, some receivers would still experience noise in exceedance of acceptable noise thresholds.

Construction-period vibration would also occur at the same areas described for construction noise above. Vibration during project construction would occur within 175 feet of sensitive receivers but Build Alternative techniques would substantially reduce vibration during construction. For residences within 141 feet of the alignment, construction impacts would be of moderate intensity under NEPA. However, with implementation of mitigation measures, construction noise and vibration impacts would be reduced to a lesser intensity for all six Build Alternatives.

Hauling construction spoils along roadways in residential communities and recreation areas would result in traffic noise impacts. Under the Refined SR14 Build Alternative, only one area would be affected along Big Springs Road outside of Acton. No severe construction noise impacts from spoils hauling are anticipated for the SR14A Build Alternative. Under the E1, E1A, E2, and E2A Build Alternatives, sensitive receivers south of Palmdale would experience noise impacts along Aliso Canyon Road, Soledad Canyon Road, and Crown Valley Road. Additionally, under the E1 and E1A Build Alternatives sensitive receivers would experience noise impacts from hauling spoils from the San Gabriel Adit along Sand Canyon Road and Placerita Canyon Road in the ANF. Under the E2 Build Alternative and the E2A Build Alternative, sensitive receivers would experience noise impacts from hauling tunnel portal spoils along Wheatland Avenue and Foothill Boulevard in the Shadow Hills and Lake View Terrace neighborhoods. While noise reduction measures would be implemented, some receivers would still experience noise in exceedance of acceptable noise thresholds. Based on the above, the E2 and E2A Build Alternatives would have the potential to impact the greatest density of sensitive receivers from hauling of construction spoils.

3.4.8.2 Operations

Rail operations associated with all six Build Alternatives would result in moderate and severe noise effects and significant vibration and ground-borne noise effects. The number of impacted sensitive receivers would be similar for all six Build Alternatives, with the Refined SR14 and SR14A Build Alternatives resulting in slightly fewer total noise impacts (129/99 moderate and 55/19 severe, respectively) and the E2 and E2A Build Alternatives having the most noise impacts on sensitive receivers (141/168 moderate and 164/102 severe, respectively).

The Refined SR14 Build Alternative includes two proposed noise barriers, one of which eliminates all severe noise impacts where it is proposed while the other does not (two residual severe noise impacts would remain). For the SR14A Build Alternative in the Central Subsection one noise barrier is proposed which would eliminate all severe noise impacts at that location. For the E1 Build Alternative five noise barriers were evaluated. Three of the five proposed noise barriers would eliminate all severe noise impacts at their respective locations within the Central Subsection. One barrier was determined to not be reasonable, and one would not reduce all impacts (15 residual severe noise impacts would remain). For the E1A Build Alternative two noise barriers were evaluated. One would eliminate all severe noise impacts at its location while the other was determined to not be reasonable. For the E2 Build Alternative seven noise barriers were evaluated. Three of the noise barriers would eliminate all severe noise impacts at their respective locations. Three of the noise barriers would not reduce all severe noise impacts resulting residual severe noise impacts at their respective locations. One noise barrier was determined to not be reasonable. For the E2A Build Alternative four noise barriers were evaluated. One would eliminate all severe noise impacts at its location. Two noise barriers would not reduce all severe noise impacts resulting in residual severe noise impacts at their locations, and one noise barrier was determined to not be reasonable.

Additionally, for all six Build Alternatives, there are scattered and isolated residences that would experience severe noise impacts for which noise barriers would not meet the criteria discussed in Section 3.4.7. The Refined SR14 and SR14A Build Alternatives would have 34 and 11 of these impacts, respectively. The E1 and E1A Build Alternatives have 38 and 37 of these impacts, respectively. The E2 and E2A Build Alternatives each have 33 of these impacts. Implementation of mitigation measures would reduce effects on noise sensitive receivers but would not fully reduce noise levels below applicable thresholds.

The Refined SR14, SR14A, E1, and E1A Build Alternatives would result in operational vibration impacts on residential receivers, with the Refined SR14 and SR14A Build Alternatives having slightly more than the E1 and E1A Build Alternatives (27 and 20 impacted receivers, respectively). The E2 and E2A Build Alternatives would not result in operational vibration impacts on residential receivers. The Refined SR14, SR14A, E1, E1A, E2, and E2A Build Alternatives would result in operational vibration impacts on one institutional building. Implementation of mitigation measures would reduce operation vibration levels below threshold levels for the Refined SR14, SR14A, E1, E1A, E2, and E2A Build Alternatives.

The operation of HSR trains could result in startle-effects to noise-sensitive human receivers within 45 feet of the Build Alternative alignment centerline. However, this area is typically within the California HSR System right-of-way and would not contain sensitive receivers. As such, operations of the six Build Alternatives would not result in startle effects on humans.

Because of the location of equestrian facilities such as stables and riding trails, the Refined SR14, SR14A, E2, and E2A Build Alternative alignments would result in startle effects on horses. Under the Refined SR14 and SR14A Build Alternative alignments, these impacts would occur along the Pacific Crest Trail and near Vasquez Rocks Natural Area Park. Under the E2 and E2A Build Alternative alignments, these impacts would occur in the Hansen Dam Recreation Area and near Stonehurst Park and Recreation Center. The E1 Build Alternative and the E1A Build Alternative would not result in startle effects on horses.

3.4.9 CEQA Significance Conclusions

Table 3.4-50 summarizes noise-related impacts, the level of significance before mitigation, mitigation measures, and the level of CEQA significance after mitigation for all six Build Alternatives.

Table 3.4-50 Summary of CEQA Significance Conclusions and Mitigation Measures for Noise and Vibration

Impact	Level of CEQA Significance before Mitigation						Mitigation Measure	Level of CEQA Significance after Mitigation					
	Refined SR14	SR14A	E1	E1A	E2	E2A		Refined SR14	SR14A	E1	E1A	E2	E2A
Construction Impacts													
N&V#1: Construction Noise Impacts on Sensitive Receivers.	S	S	S	S	S	S	N&V-MM#1	SU	SU	SU	SU	SU	SU
N&V#2: Spoils Haul Route Noise Impacts on Sensitive Receivers.	S	LTS	S	S	S	S	N&V-MM#1	SU	N/A	SU	SU	SU	SU
N&V#3: Construction Vibration Impacts on Sensitive Receivers.	S	S	S	S	S	S	N&V-MM#2	LTS	LTS	LTS	LTS	LTS	LTS
Operations Impacts													
N&V#4: Operational Traffic Noise Impacts on Sensitive Receivers. ▪ 95 Severe Impacts ▪ 847 Moderate Impacts	S	S	S	S	S	S	N&V-MM#3	SU	SU	SU	SU	SU	SU
N&V#5: Operational Annoyance and Startle Effects for Humans.	LTS	LTS	LTS	LTS	LTS	LTS	No mitigation measures are required.	N/A	N/A	N/A	N/A	N/A	N/A
N&V#6: Operational Train Noise Impacts.	S Mod: 129 Severe: 55	S Mod: 99 Severe: 19	S Mod: 143 Severe: 108	S Mod: 173 Severe: 44	S Mod: 141 Severe: 164	S Mod: 168 Severe: 102	N&V-MM#3 through N&V-MM#6	SU Sever: 36	SU Severe: 11	SU Severe: 53	SU Severe: 37	SU Severe: 69	SU Severe: 54

Impact	Level of CEQA Significance before Mitigation						Mitigation Measure	Level of CEQA Significance after Mitigation					
	Refined SR14	SR14A	E1	E1A	E2	E2A		Refined SR14	SR14A	E1	E1A	E2	E2A
N&V#7: Noise Impacts on Domestic Animals.	S	S	LTS	LTS	S	S	N&V-MM#8	LTS	LTS	N/A	N/A	LTS	LTS
N&V#8: Operational Train Vibration Impacts.	S	S	S	S	LTS	LTS	N&V-MM#7	LTS	LTS	LTS	LTS	N/A	N/A
N&V#9: Noise and Vibration from High-Speed Rail Stationary Facilities.	S	S	S	S	S	S	N&V-MM#3 N&V-MM#6	LTS	LTS	LTS	LTS	LTS	LTS

CEQA = California Environmental Quality Act; N/A = not applicable; LTS = Less than Significant; S = Significant; SU = Significant and Unavoidable; Mod = Moderate

3.4.10 United States Forest Service Impact Analysis

This section summarizes noise and vibration effects associated with the six Build Alternatives on the ANF, including lands that are within the SGMNM.

3.4.10.1 Consistency with Applicable United States Forest Service Policies

Appendix 3.1-B, USFS Policy Consistency Analysis, contains a comprehensive evaluation of relevant laws, regulations, plans, and policies relative to areas within the ANF, including the SGMNM, potentially affected by the six Build Alternatives. Based on this analysis, the six Build Alternatives would be consistent with applicable policies associated with the ANF, including the SGMNM, pertaining to noise and vibration. Each of the six Build Alternatives would be consistent with USFS policies because they would not result in adverse effects associated with noise and vibration. Though construction of the six Build Alternatives would generate noise and vibration, lands managed by the USFS adjacent to California HSR System facilities do not contain designated recreational areas (e.g., trails, and campgrounds), which are generally likely to host human sensitive receivers, and they are not considered sensitive receivers. Other ANF land use designations, such as Backcountry, may contain a low to moderate level of human use. However, the six Build Alternative alignments are located beneath the ANF in tunnels, and therefore operations would not produce perceptible noise or vibration aboveground. As such, noise and vibration generated by implementation of the Build Alternatives would not conflict with any applicable USFS regulations pertaining to noise and vibration.

3.4.10.2 United States Forest Service Resource Analysis

As described in Section 3.4.5, noise-sensitive receivers within the noise RSA that would be affected by project-related noise were identified through a review of existing noise-sensitive land uses within the appropriate noise impact screening distances. Screening distances were used to narrow the area within which noise-sensitive receivers would be impacted by the project. This screening analysis determined that the portions of the ANF, including areas within the SGMNM, adjacent to the proposed Build Alternative construction footprint and permanent right-of-way do not contain designated recreational facilities, including trails and campgrounds, that would be considered sensitive receivers. Therefore, the California HSR System would not result in adverse noise or vibration effects on sensitive receivers on USFS lands.[6]

Noise and vibration effects would occur at the following California HSR System facilities and locations within and adjacent to the ANF, including the SGMNM. Effects at these facilities and locations are discussed below.

- Aliso Canyon (E1, E1A, E2, and E2A Build Alternative alignments)
- Arrastre Canyon (E1, E1A, E2, and E2A Build Alternative alignments)
- Soledad Canyon (Refined SR14 and SR14A Build Alternative alignments)
- Tunnel portal north of the Big Tujunga Wash (E2 and E2A Build Alternative alignments)
- Adit facilities (SR14-A1, SR14A-A1, E1-A1, E1-A2, E1A-A1, E1A-A2, E2-A1, E2-A2, E2A-A1, and E2A-A2)

Construction Impacts

Although the Build Alternative alignments would involve tunneling beneath the ANF, including portions of the SGMNM, tunnel construction would not result in noise or vibration impacts at the surface because of the depths of the tunnels beneath the surface of the ANF. Some portions of the Build Alternative alignments would entail surface construction activities (e.g., construction of adits) within and immediately adjacent to the ANF, including the SGMNM. Structures west of E2-A2 may be affected by construction noise, but it is unknown whether these structures are sensitive to noise effects. No other in-holdings would be affected by noise resulting from construction of adits. As discussed in Section 3.4.6.3, Build Alternatives, construction activities

[6] Refer to Chapter 3.7, Biological Resources and Aquatic Resources, for a discussion of noise effects on special-status wildlife during construction.

would generate noise at the screening distances listed in Table 3.4-24. Furthermore, surface construction activities may cause ground-borne vibration levels that range from 87 VdB to 94 VdB at a distance of 25 feet from construction activities. Construction activities within and adjacent to the ANF including the SGMNM (listed above) would result in perceptible noise and vibration during construction activities. However, this does not represent an adverse effect because the USFS lands adjacent to the California HSR System facilities do not contain designated recreational areas (e.g., trails, and campgrounds) and are not considered sensitive receivers.

Spoils Hauling

The spoils hauling noise assessment compared existing traffic noise levels against future noise levels generated by trucks hauling spoils material from HSR construction sites to deposition areas. There would be one severe noise impact from truck traffic on spoils haul routes that would occur within the ANF boundaries, which would occur at the intersection of Sand Canyon Road and Placerita Canyon Road. Residences on private in-holdings would experience noise effects at this location. In order to minimize this effect, the project would implement NV-IAMF#1 and Mitigation Measure N&V-MM#1 (discussed in Section 3.4.7), to reduce construction-period noise effects on sensitive receivers near this intersection.

Operations Impacts

The six Build Alternative alignments would generally continue beneath the ANF including SGMNM in tunnel; therefore, operations would not produce perceptible noise or vibration aboveground. Operation of HSR trains adjacent to the ANF, including portions of SGMNM, could generate noise and vibration on USFS lands; however, there are no designated recreational areas, formal campgrounds, or other sensitive receivers located within these areas. Therefore, no adverse effect would occur.

Adits

Long-term operation of the adits would not generate noticeable vibration. Long-term operational noise generated by ventilation equipment associated with adits would be limited to noise-sensitive receivers within 200 feet (the FTA screening distance for ventilation structures) of the proposed adits. The adit options within the ANF would be located within an in-holding (private property not for recreational use) near existing roadways within the ANF. Potential long-term operational noise effects from ventilation equipment associated with adits would be limited to noise-sensitive receptors within 200 feet (the FTA screening distance for ventilation structures) of the proposed adits. There are two adit locations where noise-sensitive receptors are located within this screening distance:

- E1-W2b/SR14-W2—The nearest noise-sensitive receptor is 30 feet from the edge of the adit footprint and 500 feet from the center of the adit footprint.
- E2-W2—The nearest noise-sensitive receptor is 60 feet from the edge of the adit footprint and 530 feet from the center of the adit footprint.

If the adit openings and any ventilation structures are located more than 200 feet from the nearest noise-sensitive receptor, there would be no noise effects. Structures west of E2-A2 may be affected by operational noise, but it is unknown whether these structures are sensitive to noise effects. No other in-holdings would be affected by noise resulting from operation of adits. Portions of ANF would experience perceptible vibration during operations activities at the adit locations listed above. However, there are no designated recreational areas, formal campgrounds, or other sensitive receivers located near the adits. Therefore, no adverse effects from noise or vibration would occur.

Startle Effects and Noise Impacts on Wildlife

Wildlife could be startled or disturbed by HSR trains passing by, and wildlife communication could be affected by project noise. The noise exposure limit of an SEL of 100 dBA for wildlife and domestic animals would be limited to locations within 100 feet of the aboveground portions of the Build Alternative alignments. There would be no aboveground Build Alternative alignment within the ANF, and wildlife would not experience adverse noise or startle effects on USFS lands. Startle effects associated with long-term operation of the adits would be limited, as activities would involve occasional access for maintenance, and noise generated by ventilation equipment. This level of activity would be minimal and have a low level of noise associated with it; therefore, it would be unlikely for wildlife to experience noise or startle effects as a result of adit operation and maintenance. Noise effects on wildlife are discussed in more detail in Section 3.7.