3 Affected Environment, Environmental Consequences, and Mitigation Measures

3.4 Noise and Vibration

3.4.1 Introduction

Section 3.4, Noise and Vibration, of the *Merced to Fresno Section: Central Valley Wye Draft Supplemental Environmental Impact Report (EIR)/Environmental Impact Statement (EIS)* (Draft Supplemental EIR/EIS) updates the *Merced to Fresno Section California High-Speed Train Final Project EIR/EIS* (Merced to Fresno Final EIR/EIS) (California High-Speed Rail Authority [Authority] and Federal Railroad Administration [FRA] 2012a) with new and revised information relevant to noise and vibration, analyzes the potential impacts of the No Project Alternative and the Central Valley Wye alternatives, and describes impact avoidance and minimization features (IAMF) that would avoid or minimize these impacts. Where applicable, mitigation measures are proposed to further reduce, compensate for, or offset impacts of the Central Valley Wye alternatives. This section also describes the affected environment within the resource study areas (RSA).

The analysis herein has similarities to and differences from the analysis conducted in the Merced to Fresno Final EIR/EIS. Both analyses examine potential impacts on the exposure to or generation of noise levels in excess of FRA criteria, and exposure to or generation of excess ground-borne vibration or ground-borne noise levels. Both documents use the same methods for evaluating effects within the RSAs. Where information has changed or new information has become available since the Merced to Fresno Final EIR/EIS was prepared in 2012, the Central Valley Wye alternatives analysis uses the updated versions of these sources or datasets. However, relevant portions of the Merced to Fresno Final EIR/EIS that remain unchanged are summarized and referenced in this section but are not repeated in their entirety.

The *Merced to Fresno Section: Central Valley Wye Noise and Vibration Technical Report* (Noise and Vibration Technical Report) (Authority and FRA 2016) provides additional technical details on noise and vibration.[1] This technical report is available on the California High-Speed Rail Authority's (Authority) website: http://hsr.ca.gov/Programs/Environmental_Planning/supplemental_merced_fresno.html. Additional details on noise and vibration resources are provided in the following appendices in Volume II of this Draft Supplemental EIR/EIS:

- Appendix 2-C, Applicable Design Standards, provides the list of relevant design standards for the design of the Central Valley Wye alternatives.
- Appendix 3.4-A, Noise and Vibration Mitigation Guidelines, presents the Authority's noise and vibration mitigation guidelines.

Humans and animals are sensitive to both noise and vibration and the ability to hear is important for communication; high levels of noise can lead to permanent hearing damage. Eight other resource sections in this Draft Supplemental EIR/EIS also provide additional information related to noise and vibration:

[1] The Noise and Vibration Technical Report was finalized in 2016; however, the content of this Draft Supplemental EIR/EIS has continued to evolve to incorporate the most current data and other sources of information relevant to the environmental analyses, some of which were not available at the time that the technical report was prepared. As a result, some of the information presented in the Draft Supplemental EIR/EIS is more current than the information presented in the technical report. To provide clarity on any information and data differences between the Draft Supplemental EIR/EIS and the technical report and the location of the most current information, a Central Valley Wye Technical Report Memorandum of Updates has been produced and included in Appendix 3.1-D, Central Valley Wye Technical Report Memorandum of Updates.

- **Section 3.2, Transportation**—Impacts of the Central Valley Wye alternatives, caused by changes to the existing transportation system as a result of construction, which could affect noise levels.
- **Section 3.7, Biological Resources and Wetlands**—Impacts of constructing the Central Valley Wye alternatives, from noise and vibration impacts on wildlife and domestic animals.
- **Section 3.9, Geology, Soils, Seismicity, and Paleontological Resources**—Impacts of constructing the Central Valley Wye alternatives, from vibration impacts on surrounding land uses and soil.
- **Section 3.11, Safety and Security**—Impacts of constructing the Central Valley Wye alternatives, from interference with the operation of prison facilities by temporary construction-related noise and vibration.
- **Section 3.12, Socioeconomics and Communities**—Impacts of constructing the Central Valley Wye alternatives, from noise impacts on adjacent residents.
- **Section 3.13, Land Use and Development**—Impacts of constructing the Central Valley Wye alternatives, from noise and vibration experienced by land uses and adjacent development.
- **Section 3.15, Parks, Recreation, and Open Space**—Impacts of constructing the Central Valley Wye alternatives, from noise impacts on adjacent parks and recreation areas.
- **Section 3.17, Cultural Resources**—Impacts of constructing the Central Valley Wye alternatives, from noise and vibration impacts on historic architectural resources.

The following topics are not included this Draft Supplemental EIR/EIS because they would not result in an impact as a result of implementing the Central Valley Wye alternatives:

- Vibration impacts during operations are not included in this Draft Supplemental EIR/EIS as the maximum distance from the high-speed rail (HSR) tracks where impacts would occur is 70 feet, which would be contained within the HSR right-of-way. This is because of the very inefficient propagation of vibration through the soils near the Central Valley Wye alternatives, the low vehicle input force, and the use of elevated structures, which provide substantial loss of intensity of vibration levels in areas where vibration-sensitive receptors are located. As a result, vibration levels from operations of the Central Valley Wye alternatives would not cause human annoyance. For more information, see the Noise and Vibration Technical Report (Authority and FRA 2016).
- Corona effect noise impacts during operation of high-voltage transmission lines are not included in this Draft Supplemental EIR/EIS because it is usually not a design problem for lines rated at 230 kilovolt (kV) and lower (California Public Utilities Commission 2009). There are no transmission lines greater than 230 kV associated with the Central Valley Wye alternatives. Moreover, steps to minimize corona effect noise impacts are one of the major factors in transmission line design. See Appendix 2-D, Electrical Interconnections and Network Upgrades, for more information.
- Noise impacts from airports affecting construction workers are not included in this analysis. Aviation facilities near the project footprints of the Central Valley Wye alternatives rail alignments are generally private airstrips that do not provide regular service. The Chowchilla Airport, which would be closest to the three State Route (SR) 152 (North) Wye Alternatives, is a general aviation facility and does not host regularly schedule commercial flights; therefore, the noise exposure would be of a lower magnitude. The closest work area to the Oakdale Municipal Airport is associated with the Site 7—Le Grand Junction/Sandy Mush Road, Warnerville—Wilson 230 kV Transmission Line and is outside of the outermost noise boundary established in the Oakdale Municipal Airport Master Plan, where substantial airport-related noise could be experienced. Therefore, excessive noise levels would not be experienced by workers near an airport or airstrip and this impact will not be discussed further. For more information on local airports and airstrips, see Section 3.2.

- Because no HSR stations or other motor vehicle traffic-generating facilities such as maintenance facilities are proposed for the Central Valley Wye alternatives within the transportation RSA, operations of the Central Valley Wye alternatives are not anticipated to generate any additional traffic beyond intermittent maintenance vehicle trips. Therefore, the discussion does not include analysis of noise or vibration from HSR-generated traffic.

Definition of Resources

The following are definitions for noise analyzed in this Draft Supplemental EIR/EIS. These definitions are the same as those used in the Merced to Fresno Final EIR/EIS (Authority and FRA 2012a).

Noise—Noise is expressed in terms of a "source-path-receptor" framework, as follows:

- **Source**—The *source* generates noise levels that depend on the type of source (e.g., a high-speed train) and its operating characteristics (e.g., speed).
- **Path**—In between the source and the receptor is the *path*, where the noise is reduced by distance, intervening buildings or other features, and topography.
- **Receptor**—The *receptor* is the noise-sensitive land use (e.g., residence, hospital, or school, referred to as *sensitive receptors*) exposed to noise from the source.

Environmental noise impacts are assessed at the receptor. Noise criteria are established for the various types of receptors individually because not all receptors have the same noise sensitivity.

Analysts use three primary noise measurement descriptors to assess noise impacts from traffic and transit projects: equivalent sound level (L_{eq}),[2] day-night sound level (L_{dn}),[3] and sound exposure level (SEL).[4]

Vibration—Vibration is also expressed in terms of a "source-path-receptor" framework, as follows:

- **Source**—The *source* generates energy that causes vibration, such as the operation of construction equipment (e.g. an auger) that could cause ground vibrations that spread through the ground and diminish in strength with distance from the source.
- **Path**—Once the vibration gets into the ground, it propagates through the various soil and rock strata to the foundations of nearby buildings, the *receptors*. Ground-borne vibrations generally decline with distance, depending on the local geological conditions.
- **Receptor—**A *receptor* is a vibration-sensitive building (e.g., residence, hospital, or school), where the vibrations may cause perceptible shaking of the floors, walls, and ceilings, and a rumbling sound inside rooms. Not all receptors have the same vibration sensitivity. Consequently, criteria are established for the various types of receptors.

Vibration above certain levels can damage buildings, disrupt sensitive operations, and annoy people within buildings. The range of interest is approximately 50 to 100 vibration velocity level (VdB) (i.e., from an imperceptible background vibration to the threshold of damage). Although the threshold of human perception to vibration is approximately 65 VdB, annoyance does not usually occur unless the vibration exceeds 70 VdB.

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[2] Equivalent sound level (L_{eq}) refers to a receptor's energy-averaged noise exposure from all events over a specified period (e.g., 1 minute, 1 hour, 24 hours).

[3] Day-night sound level (L_{dn}) refers to a receptor's energy-averaged noise exposure from all events over a 24-hour period with a penalty added for nighttime (10 p.m. to 7 a.m.) noise periods.

[4] Sound exposure level (SEL) refers to a receptor's total noise exposure from a single noise event.

For full details regarding noise and vibration descriptors, see Section 3.4, Noise and Vibration, of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012a: page 3.4-3) or the Noise and Vibration Technical Report (Authority and FRA 2016).

3.4.2 Laws, Regulations, and Orders

This section identifies laws, regulations, and orders that are relevant to the analysis of noise in this Draft Supplemental EIR/EIS. Also provided are summaries of new, additional, or updated laws, regulations, and orders that have occurred since publication of the Merced to Fresno Final EIR/EIS.

3.4.2.1 Federal

The following laws, regulations, and orders are the same as those described in Section 3.4.2, Laws, Regulations, and Orders, of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012a: page 3.4-1):

- Federal Noise Emission Compliance Regulation (49 Code of Federal Regulations (C.F.R.) § 210 and 40 C.F.R. § 201)
- Federal Highway Administration (FHWA) Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 C.F.R. Subchapter H, § 772)

Additional federal laws and regulations not originally presented in the Merced to Fresno Final EIR/EIS follow.

Noise Control Act of 1972 (42 United States Code § 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 served as the catalyst for comprehensive noise studies and the generation of noise assessment and mitigation policies, regulations, ordinances, standards, and guidance at the federal level and for 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 the Draft Supplemental EIR/EIS were largely created in response to passage of the act.

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

The Occupational Safety and Health Administration (OSHA) has identified a permissible worker noise exposure not to exceed a time-weighted-average of 90 dBA over an 8-hour work shift. This noise exposure criterion would apply to construction worker activities associated with the HSR project. In addition, employers are required to administer a continuing, effective hearing conservation program whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level of 85 decibels measured on the A scale (slow response).

Noise from construction and operations of the HSR project might also elevate noise levels at nearby non-related HSR construction sites to levels that exceed 85 dBA and thus trigger the need for administrative/engineering controls and hearing conservation programs as detailed by OSHA for worker safety.

3.4.2.2 State

The California Noise Control Act (Cal. Health and Safety Code § 46010 et seq.) is the same as described in Section 3.4.2 of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012a: page 3.4-1). New, additional, or updated state laws, regulations, and guidance follow.

California Department of Transportation Traffic Noise Analysis Protocol (23 C.F.R. § 772)

The California Department of Transportation (Caltrans) *Traffic Noise Analysis Protocol* (TNAP) *for New Highway Construction, Reconstruction, and Retrofit Barrier Projects* (Caltrans 2011)

implements the requirements of 23 C.F.R. § 772 and establishes guidelines for evaluating traffic noise impacts along roadways where frequent outdoor use areas are located and for determining the feasible abatement measures.

TNAP and FHWA policies (23 C.F.R. § 772) address the timing and applicability of noise abatement measures as part of a roadway project and identify project conditions that trigger the requirement to assess traffic noise impacts. A traffic noise impact assessment is required if a project results in a substantial horizontal or vertical alteration of an existing roadway, which is defined as follows:

- Substantial horizontal alteration: A project that halves the distance between the traffic noise source and the closest receptor between the existing condition to the future build condition.
- Substantial vertical alteration: A project that removes shielding, thereby exposing the line-of-sight between the receptor and the traffic noise source.

A traffic noise impact assessment is also required if a project increases the capacity of a roadway (e.g., by adding lanes). None of the changes proposed as part of the Central Valley Wye alternatives to existing roadways would increase the capacity of an existing roadway.

Noise abatement at noise-sensitive land uses must be considered as part of the project (when FHWA Noise Abatement Criteria are approached or exceeded) if noise-sensitive development was planned, designed, and programmed prior to the 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, issuance of building permits from 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, the Record of Decision). Application of TNAP would be required if the Central Valley Wye alternatives were to require modification of Caltrans roadway facilities.

3.4.2.3 Regional and Local

Table 3.4-1 lists additional or updated city and county general plan goals, policies, and ordinances relevant to the Central Valley Wye alternatives. Refer to the Noise and Vibration Technical Report (Authority and FRA 2016) for more information.

Table 3.4-1 Local Plans and Policies

Policy Title	Summary
Merced County	
2030 Merced County General Plan (2013a)	Merced County adopted the *2030 Merced County General Plan* on December 10, 2013, updating the previous version of the general plan. The general plan includes the following goals and policies: ▪ Health and Safety Element Goal HS-7: Protect residents, employees, and visitors from the harmful and annoying effects of exposure to excessive noise. ▪ Policy HS-7.11: Train Whistle Noise: Support improvements to at-grade crossings in urban areas in order to eliminate the need for train whistle blasts near or within communities.

<table>
<tr><th>Policy Title</th><th>Summary</th></tr>
<tr><td></td><td>Policy HS-7.12: New Project Noise Mitigation Requirements: Require new projec to include appropriate noise mitigation measures to reduce noise levels in compliance with the Table HS-2 standards (below) within sensitive areas. If a project includes the creation of new non-transportation noise sources, require th noise generation of those sources to be mitigated so they do not exceed the interior and exterior noise level standards of Table HS-2 at existing noise-sensiti areas in the project vicinity. However, if a noise-generating use is proposed adjacent to lands zoned for residential uses, then the noise generating use shall be responsible for mitigating its noise generation to a state of compliance with th standards shown in Table HS-2 at the property line of the generating use in anticipation of the future residential development.

Table HS-2
<table><tr><th>Pre-Project Noise Environment (L_{dn})</th><th>Significant Increase</th></tr><tr><td>Less than 60 dBA</td><td>5+ dBA</td></tr><tr><td>60–65 dBA</td><td>3+ dBA</td></tr><tr><td>Greater than 65 dBA</td><td>1.5+ dBA</td></tr></table>
▪ Policy HS-7.14: Transportation Noise Mitigation Program: Adopt a countywide transportation noise mitigation program to reduce transportation noise levels at existing sensitive land uses.</td></tr>
<tr><td>Merced Vision 2030 General Plan (2015)</td><td>The City of Merced adopted the Merced Vision 2030 General Plan on January 3, 2012, and it amended on August 21, 2015. The Noise Element of the general plan includes the following relevant goals and policies:
▪ Noise Element Goal 1: Protection of City residents from the harmful and annoying effects of exposure to excessive noise.
▪ Policy N-1.2: Reduce surface vehicle noise.
▪ Policy N-1.3: Reduce equipment noise levels.</td></tr>
<tr><td colspan="2">Madera County</td></tr>
<tr><td>Madera County General Plan (1995)</td><td>The Madera County General Plan was adopted in October 1995 and provides the framework for the protection of the county resident’s quality of life. The general plan includes the following policies:
▪ Policy 7.A.1: Development of new noise-sensitive land uses, including residential uses, schools, hospitals and convalescent homes, shall not be permitted in areas exposed to existing or projected future noise levels from transportation noise sources which exceed 60 dBA L_{dn} (exterior standard) and 45 dBA L_{dn} (interior standard) with the exception that in areas adjacent to State Route 99 and the mainlines of the Southern Pacific Railroad and the Santa Fe Railway an exterior noise level standard of 65 dBA L_{dn} will be applied. Transportation noise sources include vehicular traffic on public roadways, aircraft in flight, and railroad line operations.
▪ Policy 7-A.2: Noise created by new transportation noise sources, including roadway improvement projects, shall be mitigated so as not to exceed 60 dBA L_{dn} within the outdoor activity areas of existing or planned noise-sensitive land uses and 45 dBA L_{dn} in interior spaces of existing or planned noise-sensitive land uses</td></tr>
</table>

Policy Title	Summary
Madera County Noise Regulations (2001)	*Madera County Code of Ordinances* includes noise regulations for construction activities. Specifically, these include the following: ▪ Chapter 9.58.020 - General noise regulations (G.): G. Construction activities are limited to the hours of 7:00 a.m. to 7:00 p.m. Monday through Friday and 9:00 a.m. to 5:00 p.m. on Saturdays. Construction activities will be prohibited on Sundays.
City of Chowchilla 2040 General Plan (2011)	The City of Chowchilla adopted the new general plan on May 2, 2011. The general plan includes the following goals and policies: ▪ Policy N 4.1: The City shall require that industrial and commercial uses be designed and operated so as to avoid generation of noise effects on surrounding sensitive land uses from exceeding the following noise levels for exterior environments: a) 65 dBA L50 (7:00 am to 10:00 pm) b) 60 dBA L50 (10:00 pm to 7:00 am) ▪ Policy N 4.2: The City of Chowchilla shall grant exceptions to the noise standards (N4.1) for commercial or industrial uses only if a recorded noise easement is conveyed by the affected property owners. ▪ Policy N 4.5: The City of Chowchilla shall limit construction activities to the hours of 7:00 am to 7:00 pm, Monday through Saturday. No construction shall occur on Sundays or national holidays without a permit from the City. ▪ Implementation Measure N 4.6. A: In order to all for temporary construction, demolition or maintenance noise and other necessary short-term noise events, the stationary noise standards in Policy N 4.2, above may be exceeded within the receiving land use by: a) 5 dBA for a cumulative period of no more than fifteen (15) minutes in any hour. b) 10 dBA for a cumulative period of no more than five (5) minutes in any hour. c) 15 dBA for a cumulative period of no more than one (1) minute in any given hour. d) In order to allow for temporary construction, demolition or maintenance noise and other necessary short-term noise events, the stationary noise standards in Policy N 4.2 above, shall not be exceeded within the receiving land use by more than 15 dBA any period of time.
Fresno County	
Fresno County General Plan (2003)	Fresno County General Plan includes the following goals and policies: ▪ Goal HS-G: To protect residential and other noise-sensitive uses from exposure to harmful or annoying noise levels; to identify maximum acceptable noise levels compatible with various land use designations; and to develop a policy framework necessary to achieve and maintain a healthful noise environment. ▪ Policy HS-G.1: The County shall require that all proposed development incorporate design elements necessary to minimize adverse noise impacts on surrounding land uses. ▪ Policy HS-G.5: Where noise mitigation measures are required to achieve acceptable levels according to land use compatibility or the Noise Control

Policy Title	Summary
	Ordinance, the County shall place emphasis of such measures upon site planning and project design.
Fresno County Code of Ordinances (2016)	Fresno County Code of Ordinances Chapter 8.40.060 - Noise Source Exemptions includes noise exemptions for construction activities including: ▪ Noise sources associated with construction, provided such activities do not take place before six a.m. or after nine p.m. on any day except Saturday or Sunday, or before seven a.m. or after five p.m. on Saturday or Sunday.
Stanislaus County	
Stanislaus County General Plan Noise Element (2016)	Stanislaus County General Plan includes the following relevant goals and policies: ▪ Noise Element Goal 2: Protect the citizens of Stanislaus County from the harmful effects of exposure to excessive noise. ▪ Policy Noise 2: It is the policy of Stanislaus County to develop and implement effective measures to abate and avoid excessive noise exposure in the unincorporated areas of the County by requiring that effective noise mitigation measures be incorporated into the design of new noise generating and new noise sensitive land uses. ▪ Policy Noise 3: It is the objective of Stanislaus County to protect areas of the County where noise-sensitive land uses are located.
Waterford Vision 2025 General Plan (2006)	The City of Waterford adopted the Waterford Vision 2025 General Plan on October 26, 2006. The Noise Element of the general plan includes the following relevant goals and policies: ▪ Noise Element Goal 2: Sensitive land use protected from excessive noise. ▪ Policy N-1.1: Reduce surface vehicle noise. ▪ Policy N-1.2: Reduce equipment noise levels.

Sources: Merced County, 2013a; City of Merced, 2015; Madera County, 1995; City of Chowchilla, 2011; Fresno County, 2003; Stanislaus County, 2016; City of Waterford, 2006
L_{dn} = day-night sound level
L_{eq} = equivalent sound level
dBA = A-weighted decibel

3.4.3 Compatibility with Plans and Laws

As indicated in Section 3.1.3.3, Compatibility with Plans and Laws, the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) regulations[5] require a discussion of inconsistencies or conflicts between a proposed undertaking and federal, state, regional, or local plans and laws. As such, this Draft Supplemental EIR/EIS describes inconsistency of the Central Valley Wye alternatives with federal, state, regional, and local plans and laws to provide planning context.

There are a number of federal and state laws and implementing regulations, listed in Section 3.4.2.1, Federal, and Section 3.4.2.2, State, that govern compliance with noise emission limits for construction projects and for transportation facilities. As noise and vibration assessment is highly technical, there are several published federal and state guidance documents that can be used to

[5] NEPA regulations refer to the regulations issued by the Council on Environmental Quality located at 40 C.F.R. Part 1500.

assess potential impacts. A summary of the federal and state requirements considered in this analysis follows:

- FHWA and FRA guidelines for emissions of noise from transportation sources and for the abatement of excessive noise emissions.
- OSHA regulations that provide permissible construction worker noise exposure limits.
- FHWA and OSHA guidelines regarding modeling and mitigating noise from construction sources for both construction workers and sensitive receptors in proximity to construction.
- Caltrans' Traffic Noise Analysis Protocol (Caltrans 2011), which provides a methodology for evaluating construction and traffic noise and for evaluating the effectiveness and feasibility of different sound abatement methods.

The Authority, as the lead state agency proposing to construct and operate the 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 alternative. Similarly, FRA, as federal lead agency, is required to comply with all federal laws and regulations. Therefore, there would be no inconsistencies between the Central Valley Wye 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 compatible with land use and zoning regulations. For example, the Central Valley Wye alternatives would incorporate an IAMF that requires the contractor to prepare a plan to demonstrate how construction noise levels would be maintained below applicable standards. The Authority has also adopted statewide policies that seek to reduce noise impacts associated with new sources of transportation noise (see Appendix 3.4-A).

Nine local general plans and ordinances were reviewed. The Central Valley Wye alternatives are generally consistent with all plans and policies. However, the existing background noise levels ranged between 48 and 73 dBA L_{dn}. The General Plans of Merced County, Madera County, and the City of Chowchilla all identify noise levels of 60 dBA L_{dn} as a baseline for sensitive land uses such as residential areas. HSR operations could increase noise levels in areas where background noise levels are below the relevant standard applied by the local jurisdiction. This would most likely occur in rural areas away from existing sources of traffic noise such as SR 99 and SR 152. In other areas where existing noise levels currently exceed 60 dBA L_{dn}, there are no noise attenuation methods that can be employed at these locations that could reduce existing background noise levels to the 60 dBA L_{dn} threshold. The Authority seeks to adhere to local policies and has measures and policies to reduce HSR-related noise levels, however there are locations where it is not technically feasible for the Central Valley Wye alternatives to reduce HSR-related noise or reduce background noise levels to achieve the noise limits stated in local plans and policies.

3.4.4 Methods for Evaluating Impacts

Evaluation of noise and vibration impacts is a requirement of the Noise Emission Compliance Regulation adopted by the U.S. Environmental Protection Agency, the California Noise Control Act of 1973 (Cal. Health and Safety Code, § 46010 et seq.), CEQA, NEPA, and the following procedures.

- The methods and criteria for evaluating high-speed ground transportation noise and vibration impacts are found in FRA's *High-Speed Ground Transportation Noise and Vibration Impact Assessment Manual* (FRA 2012).
- The methods and criteria for evaluating non-high-speed transit noise and vibration impacts are found in the Federal Transit Administration's (FTA) Transit Noise and Vibration Impact Assessment *Manual* (FTA 2006).

- The criteria for highway noise impacts (relevant to the extent HSR causes changes in traffic patterns) are included in the FHWA Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 C.F.R. § 772). The FHWA procedures are implemented as defined by Caltrans Traffic Noise Analysis Protocol (Caltrans 2011). FHWA requires each state to write its own noise policy based upon FHWA's *Highway Traffic Noise: Analysis and Abatement Guidance* (FHWA 2011). The state policy must address the issues of (1) required noise reduction needed for a wall to be reasonable, (2) cost of a reasonable wall, and (3) noise level reduction required for a receptor to be considered benefitted. The Caltrans Traffic Noise Analysis Protocol addresses these issues. Caltrans Technical Noise Supplement (Caltrans 1998) gives guidance on how Caltrans requires noise measurements, modeling, and barrier analyses to be done. Caltrans Standard Environmental Reference Volume 1 on Noise gives an outline for the noise report.

The evaluation of impacts from noise and vibration is a requirement of NEPA and CEQA and considers both construction and operations noise and vibration emissions. The following sections summarize the RSAs and the methods used to analyze impacts from noise. As summarized in Section 3.4.1, Introduction, eight other resource sections in this Draft Supplemental EIR/EIS also provide information related to noise and vibration.

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. The RSAs for impacts from noise and vibration include and extend beyond the project footprint of each of the Central Valley Wye alternatives. Separate RSAs are defined for noise impacts and vibration impacts, as shown in Table 3.4-2, and account for permanent and temporary impacts. Tables 3.4-3 and 3.4-4 present the screening distances for the assessment of noise impacts and vibration impacts, respectively, as recommended by FRA.

Table 3.4-2 Definition of Resource Study Area for Noise and Vibration

Source	General Definition
Noise RSA	
Construction	The noise RSA for the Central Valley Wye alternatives extends 2,500 feet from the Central Valley Wye alternatives' centerlines and from the footprints of the electrical interconnections and network upgrades, and includes all sensitive receptors that could potentially be exposed to noise impacts within that distance. The noise RSA for the Central Valley Wye alternatives is larger than the maximum FRA-recommended screening distance from centerline for considering noise impacts, presented in Table 3.4-3. The maximum FRA-recommended screening distance for construction is 690 feet and assumes that the existing noise conditions of the quiet suburban/rural environment would be approximately 50 dBA.
Operations	The noise RSA for the Central Valley Wye alternatives extends 2,500 feet from the Central Valley Wye alternatives' centerlines, and includes all sensitive receptors that could potentially be exposed to noise impacts within that distance. The noise RSA for the Central Valley Wye alternatives is larger than the maximum FRA-recommended screening distance from centerline for considering noise impacts, presented in Table 3.4-3. The maximum FRA-recommended screening distance for a new rail corridor is 1,300 feet for the quiet suburban/rural environments with trains operating at speeds greater than 170 mph; however, this assumes that there would be 50 train operations per day and that the existing noise conditions of the quiet suburban/rural environment would be approximately 50 dBA. The Central Valley Wye alternatives noise RSA was extended farther than the maximum FRA screening distances (to a screening distance of 2,500 feet) because it is expected that there would be almost 232 trains a day based on the Authority's *Connecting and Transforming California: 2016 Business Plan* (Authority 2016a).

Vibration RSA	
Construction	The vibration RSA screening distance is up to 275 feet from the proposed track centerline for each alternative, depending upon the land use and train frequency, and from the electrical interconnection and network upgrade footprints. The vibration impact assessment (Authority and FRA 2016) uses the FRA screening procedure (FRA 2012). Screening distances indicate the potential for vibration impacts on vibration-sensitive receptors (Table 3.4-4). FRA guidance indicates that receptors located beyond the screening distances are not likely to be affected by vibration impacts from the HSR system.

Source: Authority and FRA, 2016
RSA = resource study area
FRA = Federal Railroad Administration
HSR = high-speed rail
dBA = A-weighted decibel
mph = miles per hour

Table 3.4-3 Federal Railroad Administration Recommended Screening Distances for Evaluation of Noise Impacts[1]

Corridor Type	Existing Noise Environment	Screening Distance for High-Speed Rail (feet from centerline)[1]	
		90 to 170 miles per hour	> 170 miles per hour
Railroad	Quiet suburban/rural	500	1,200
Highway	Quiet suburban/rural	600	1,100
New	Quiet suburban/rural	600	1,300*

Source: FRA, 2012
[1] Measured from centerline of the railway corridor. Minimum distance is assumed 50 feet from centerline.
* Distance was extended to 2,500 feet for analysis of Central Valley Wye alternatives.

Table 3.4-4 Federal Railroad Administration Recommended Screening Distances for Evaluation of Vibration Impacts

Land Use	Train Frequency[1]	Screening Distance (feet from centerline)	
		Train Speed of 100 to 200 mph	Train Speed of 200 to 300 mph
Residential	Frequent or Occasional	220	275
	Infrequent	100	140
Institutional	Frequent or Occasional	160	220
	Infrequent	70	100

Source: FRA, 2012
[1] Frequent = greater than 70 passbys per day; occasional = between 70 and 30 passbys per day; infrequent = less than 30 passbys per day.
mph = miles per hour

3.4.4.2 Impact Avoidance and Minimization Features

As noted in Section 2.2.3.7, Impact Avoidance and Minimization Features, the Central Valley Wye alternatives would incorporate standardized IAMFs. The Authority would incorporate IAMFs during project design and construction, and, as such, the analysis of effects of the Central Valley Wye alternatives in this section factors in all applicable IAMFs. Appendix 2-B, California High-Speed Rail: Impact Avoidance and Minimization Features, provides a detailed description of IAMFs that are included as part of the Central Valley Wye alternatives design. One IAMF is directly applicable to noise and vibration, NV-IAMF#1, Noise and Vibration.

3.4.4.3 Methods for NEPA and CEQA Impact Analysis

This section describes the sources and methods the Authority and FRA used to analyze potential impacts from implementing the Central Valley Wye alternatives on noise- and vibration-sensitive

receptors and resources. These methods apply to both NEPA and CEQA unless otherwise indicated. Refer to Section 3.1.3.4, Methods for Evaluating Impacts, for a description of the general framework for evaluating impacts under NEPA and CEQA. As described in Section 3.4.1 and in the following discussions, the Authority and FRA have applied the same methods and many of the same data sources from the Merced to Fresno Final EIR/EIS to this Draft Supplemental EIR/EIS but added some assumptions. More specifically, the following assumptions about operations of the Central Valley Wye alternatives have been added since the Merced to Fresno Final EIR/EIS based on the Authority's 2016 Business Plan (Authority 2016a):

- Modeling used for the current analysis includes the Phase 1 schedule of train operations, as outlined in the Noise and Vibration Technical Report (Authority and FRA 2016).
- Two distinct HSR speeds were used when predicting future noise levels that would result from the Central Valley Wye alternatives at noise-sensitive receptors. A maximum design speed of 220 miles per hour (mph) was used for most of the length of the Central Valley Wye alternatives' alignments. However, because of engineering constraints in some portions of the Central Valley Wye alignment, the top design speed would be constrained to 150 mph in these locations.
- These methods include modeled analysis of rail height and whether the track profile is at grade or elevated. The track is assumed to be on an aerial structure, wherever top-of-rail elevations would be more than 20 feet above the existing grade.
- Helicopters could be used for construction activities associated with electrical network upgrades.

Definitions for the noise and vibration metrics used in this analysis are provided in the introduction to this section. Refer to the Noise and Vibration Technical Report for more information regarding the methods and data sources used in this analysis (Authority and FRA 2016: pages 5-1 through 5-20) as well as Appendix 2-D.

Federal Railroad Administration Guidelines

The FRA Guidelines were discussed in Section 3.4.2 of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012a: page 3.4-2) but have since been updated. The criteria in the FRA guidance manual (FRA 2012) were used to assess existing ambient noise levels and future noise impacts from proposed high-speed train operations. The Merced to Fresno Final EIR/EIS used criteria in the 2005 FRA guidance manual and performed detailed noise analyses. That manual was updated in 2012, after publication of the Merced to Fresno Final EIR/EIS, and includes clarifications to policy-related topics such as guidance on determining the need for mitigation of moderate noise impacts. However, the noise and vibration impact criteria and the analytical methodologies for noise and vibration impacts in the updated guidance are the same as those provided in the 2005 version. Therefore, there was no change to the analysis methods used.

Baseline Noise and Vibration

A series of noise measurements within the Central Valley Wye alternatives noise and vibration RSAs were conducted to establish the baseline or existing environmental noise levels for project noise impact assessment in accordance with FRA guidelines. Four noise measurements conducted as part of the *Merced to Fresno Section Project EIR/EIS Noise and Vibration Technical Report* (Authority and FRA 2012b) are located within the Central Valley Wye alternatives noise RSA and were incorporated into the Noise and Vibration Technical Report (Authority and FRA 2016). Although development within the Central Valley Wye alternatives noise and vibration RSAs has occurred since 2010, the vast majority of land uses along and adjacent to the Central Valley Wye alternatives remains in agricultural use as it was in 2010. Furthermore, as shown in Table 5-1 in the Noise and Vibration Technical Report, traffic volumes have increased by less than 15 percent between 2012 and 2015 (Authority and FRA 2016). Because land uses and traffic volumes have not substantially changed in the Central Valley Wye alternatives noise and vibration RSAs since 2010, those measurements taken between 2010 and 2012 are sufficient to depict the background noise and vibration levels for this study.

A total of 12 long-term and 4 short-term noise measurements were conducted in October and November 2010, January 2011, and January 2012. Long-term measurement instruments continuously monitored the measurement sites for at least 24 hours to record existing sounds levels averaged over an entire day (recorded as L_{dn}). Short-term measurements were at least 20 minutes in length and were used to help determine the existing peak sound levels (recorded as hourly L_{eq}). Additionally, four of the measurements conducted as part of the Merced to Fresno Noise and Vibration Technical Report (Authority and FRA 2012b) for the Merced to Fresno Final EIR/EIS are located within the Central Valley Wye alternatives noise RSA and were incorporated into the Noise and Vibration Technical Report (Authority and FRA 2016). Furthermore, 12 vibration baseline measurements located within the Central Valley Wye alternatives vibration RSA were incorporated from the Merced to Fresno Noise and Vibration Technical Report.

Noise and Vibration Sensitive Receptors

The noise and vibration impact analysis focuses on the impacts of source noise on sensitive receptors, which are assessed at the receptor location. Sensitive receptors within the RSA include residential dwellings, schools, churches, cemeteries, day care centers, parks, picnic areas, playgrounds, recreation areas, trails, wildlife/biological resources, livestock, historic properties, and other uses that may be sensitive to increased noise and vibration levels.

The noise and vibration impact analysis was based on the distances between the Central Valley Wye alternatives and sensitive receptors (see Table 3.4-3 and Table 3.4-4). All noise- and vibration-sensitive receptors that fall within the screening distances listed in Tables 3.4-3 and 3.4-4 were identified. Noise levels associated with construction and operations of the Central Valley Wye alternatives were then estimated based on the noise impact analysis methods.

HSR operations-related noise were projected using an HSR system operations plan with a high frequency of train operations[6] and the FRA Detailed Noise Analysis and Detailed Vibration Analysis (FRA 2012). Potential noise and vibration impacts on sensitive receptors were also evaluated in accordance with the FRA guidance manual criteria. The following sections describe the applicable criteria used for HSR construction and operation noise and vibration thresholds.

Construction

Noise

In accordance with the FRA guidance manual's procedures for detailed assessment (FRA 2012), the construction noise impact assessment methods use the following information:

- Noise emissions from equipment expected to be used by contractors
- Construction methods using the equipment identified
- Usage scenarios for how the equipment would be operated
- Estimated worksite layouts of equipment within the project footprints
- Distance from the construction worksites to noise-sensitive receptors

To determine the impact from construction noise, the threshold used is the exposure of noise-sensitive receptors to construction noise at levels exceeding guidelines established by the FRA (FRA 2012). Table 3.4-5 shows the FRA assessment criteria for construction noise. The last column applies to construction activities that extend over 30 days near any given receptor. The 8-hour L_{eq} and the 30-day average L_{dn} noise exposure from construction noise calculations use the noise emission levels of the construction equipment, their location, and operating hours. The construction noise limits are normally assessed at the edge of a noise-sensitive receptor's property line.

[6] FRA classifies high-frequency corridors as those with more than 70 train passbys per day.

Table 3.4-5 Federal Railroad Administration Construction Noise Assessment Criteria

Land Use	8-hour L_{eq}, dBA		L_{dn}, dBA
	Daytime[1]	Nighttime[2]	30-day Average
Residential	80	70	75[3]
Commercial	85	85	80[4]
Industrial	90	90	85[4]

Source: FRA, 2012
[1] Day is considered the average workday period from 7 a.m. to 10 p.m.
[2] Night is considered the average workday period from 10 p.m. to 7 a.m.
[3] In urban areas with very high ambient noise levels (L_{dn} > 65 dBA), L_{dn} from construction operations should not exceed existing ambient noise levels + 10 dBA.
[4] Twenty-four-hour L_{eq}, not L_{dn}.
L_{eq} = equivalent sound level
dBA = A-weighted decibel
L_{dn} = day-night sound level

Vibration

The FRA guidance manual (FRA 2012) provided the methods to assess construction-related vibration impacts. The FRA provides construction vibration criteria designed to (1) prevent building damage, (2) assess whether vibration might interfere with vibration-sensitive special-activity buildings, or (3) temporarily cause human annoyance for building occupants during the construction period. The FRA criteria include two ways to express vibration levels:

- Peak particle velocity to assess the potential for building damage, which is the maximum instantaneous peak of a vibration signal
- Root-mean-square VdB for annoyance and activity interference

Construction vibration is assessed quantitatively where a potential exists for vibratory compaction, demolition, or excavation close to sensitive receptors and vibration-sensitive buildings. The construction-related vibration impact assessment used the following information:

- Vibration source levels from equipment expected to be used by contractors
- Construction methods using the identified equipment
- Usage scenarios for how the equipment would be operated
- Estimated worksite layouts of equipment within the project footprints
- Distance from the construction worksites to vibration-sensitive receptors

Table 3.4-6 shows the FRA building damage criteria for construction activity; the table lists peak particle velocity limits for four building categories. These limits are used to determine the potential for construction vibration impacts on buildings. See the Noise and Vibration Technical Report (Authority and FRA 2016: pages 3-3 and 3-4) for additional description of the metrics.

Table 3.4-6 Construction Vibration Damage Criteria

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

Source: FRA, 2012
[1] L_v is the root mean square velocity expressed in VdB.
PPV = peak particle velocity
VdB = vibration velocity level

For the impact assessment for construction vibration, the threshold also considers the exposure of vibration-sensitive receptors to construction vibration at levels exceeding standards established by the FRA for human annoyance (FRA 2012). Table 4-9 in the Noise and Vibration Technical Report shows the FRA human annoyance criteria for special types of buildings very sensitive to ground-borne noise and vibration, such as concert halls, recording studios, and theaters; however, there are no special buildings within the noise and vibration RSA and they are not evaluated further. Vibration from construction activities can also cause human annoyance at sensitive receptor locations. Table 3.4-7 summarizes vibration sensitivity in terms of the three land-use categories and the criteria for acceptable ground-borne vibrations and acceptable ground-borne noise.

Table 3.4-7 Federal Railroad Administration Ground-Borne Vibration and Ground-Borne Noise Impact Criteria

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 micro inch/second)			Ground-Borne Noise Impact Levels (dBA re 20 micropascals)		
	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[3]	65 VdB[3]	65 VdB[3]	N/A[4]	N/A[4]	N/A[4]
Category 2: Residences and buildings where people normally sleep	72 VdB	75 VdB	80 VdB	35 dBA	38 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use	75 VdB	78 VdB	83 VdB	40 dBA	43 dBA	48 dBA

Source: FRA, 2012
[1] "Frequent Events" is defined as more than 70 vibration events of the same kind per day.
VdB = vibration velocity level
dBA = A-weighted decibels

Traffic Noise

Increases in traffic noise could occur during construction because of the rerouting of traffic to alternate routes related to road closures and the addition of construction vehicles on or adjacent to roadways. The FHWA stipulates procedures and criteria for noise assessment studies of highway projects (23 C.F.R. § 772). It requires the consideration of noise abatement measures on all major highway projects if the project would cause a substantial increase in traffic noise levels or if projected traffic noise levels approach or exceed the FHWA Noise Abatement Criteria level for activities occurring on adjacent lands. FHWA Noise Abatement Criteria for various land-use ratings (called activity categories) are given in Table 3.4-8. These noise criteria are assigned to evaluation locations, which include either exterior or interior activities.

Table 3.4-8 Federal Highway Administration Traffic Noise Abatement Criteria

Activity Category	Activity $L_{eq}(h)$[1]	Evaluation Location	Description of Activities
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B[2]	67	Exterior	Residential

Activity Category	Activity $L_{eq}(h)$[1]	Evaluation Location	Description of Activities
C[2]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A–D or F
F	–	–	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	–	–	Undeveloped lands without building permits

Source: 23 Code of Federal Regulations Part 772
[1] The $L_{eq}(h)$ activity criteria values are for impact determination only and are not design standards for noise abatement measures. All values are dBA.
[2] Includes undeveloped lands permitted for this activity category.
$L_{eq}(h)$ = equivalent sound level for a 1-hour period
dBA = A-weighted decibel
– = not applicable

Under the FHWA procedures in 23 C.F.R. Subchapter H, Section 772, changes in noise levels for motor vehicle noise must be assessed for this type of project in cases where road noise sources are moved closer to sensitive receptors by half the distance between the receptor and the noise source (see Section 3.4.2.2). For example, if a highway is proposed to be realigned 500 feet to the west, sensitive receptors within 1,000 feet of the west side of the highway would be evaluated for noise impacts and abatement. If motor vehicle traffic noise from a highway project is predicted to approach (within 1 dBA) or exceed FHWA Noise Abatement Criteria during the noisiest 1-hour period for sensitive receptors, noise abatement measures must be considered, and, if determined to be reasonable and feasible, incorporated as part of the project. For the purposes of this analysis, any exceedance of the FHWA Noise Abatement Criteria at sensitive receptor locations because of the realignment of any state highway or local road would be considered a noise impact and noise abatement would be evaluated.

Operations

As discussed in Section 3.4.1, an assessment of vibration impacts during operations is not included in this Draft Supplemental EIR/EIS because the maximum distance from the HSR tracks where impacts would occur is 70 feet, which would be contained within the HSR right-of-way. The following discussion is focused on the potential for noise impacts during operations.

Noise-Sensitive Land Uses

The descriptors and criteria for assessing noise impacts from HSR operations vary according to land use categories adjacent to the track. For land uses where people sleep (e.g., residential neighborhoods, hospitals, and hotels), the L_{dn} is the assessment parameter. For other land-use types where there are noise-sensitive uses (e.g., parks, schools, and libraries), the $L_{eq}(h)$ for the hour that coincides with maximum (worst-hour) train activity (16 trains per hour) is the assessment parameter (i.e., noise levels fluctuate over time; therefore, an energy averaged sound level over a 1-hour period is used). Table 3.4-9 summarizes the three land use categories used by FRA.

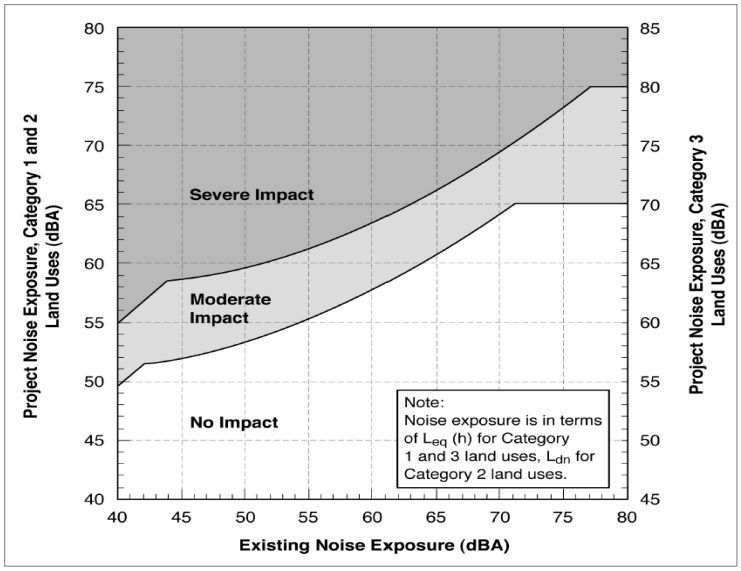
Table 3.4-9 Federal Railroad Administration Noise-Sensitive Land Uses

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor $L_{eq}(h)$	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use.
2	Outdoor L_{dn}	Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor $L_{eq}(h)$	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, and churches, where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Buildings with interior spaces where quiet is important, such as medical offices, conference rooms, recording studios, and concert halls, also fall into this category. Places for meditation or study associated with cemeteries, monuments, and museums are included, as are certain historical sites, parks, and recreational facilities.

Source: FRA, 2012
dBA = A-weighted decibel
L_{dn} = day-night sound level
$L_{eq}(h)$ = equivalent sound level for a 1-hour period

Noise Impact for Human Annoyance

The noise impact criteria used by the FRA is ambient-based; the future noise levels associated with a project compared to existing noise levels are assessed, rather than the noise caused by each passing train. First, the criteria specify drawing a vertical line on the graph on Figure 3.4-1 representing the existing noise and a horizontal line representing future predicted project noise level. Next, the location where these two lines intersect is identified on the figure. Then depending on the location of the intersection, the FRA categorizes impacts as (1) no impact; (2) moderate impact; or (3) severe impact. Severe impact occurs when a majority of people would be highly annoyed by a project's noise. Moderate impact occurs when the change in cumulative noise level would be noticeable to most people, but may not be sufficient to generate strong adverse reactions. No impact is where the change in cumulative noise level would not be noticed by most people, and is likely not sufficient to generate reactions. Under the FRA guidance, mitigation measures are strongly encouraged for areas with severe impact.



Source: FRA, 2012

Figure 3.4-1 Federal Railroad Authority Noise Impact Criteria for Human Annoyance

HSR Pass-By Startle and Annoyance Effects

HSR passbys would result in a sudden increase in noise for receptors near the alignment and have the potential to startle humans. *Onset rate* is the average rate of change of increasing sound pressure level measured in decibels per second during a single noise event. Research shows that people are increasingly annoyed by sudden sounds with onset rates greater than approximately 15 dBA per second. There is considerable evidence that increased annoyance is likely to occur for train noise events with rapid onset rates. When onset rates exceed approximately 30 dBA per second, people tend to be startled, or surprised by the sudden onset. Startle, caused by rapid onset rates that cause a noise-sensitive receptor to be startled or surprised by the sudden approaching sound, is an added factor in annoyance. The onset rate of 30 dBA per second is used as the basis for establishing distances within which startle is likely to occur. The relationship between speed and distance defines the locations where the onset rate for HSR operations can cause increased annoyance or startle, according to the FRA guidance manual (FRA 2012).

HSR Pass-By—Wildlife and Domestic Animals

The FRA guidance manual (FRA 2012) addresses the potential for disturbance from HSR on wildlife (mammals and birds) and domestic animals (livestock and poultry). For disturbance of wildlife and domestic animals, the noise exposure from an individual train passage, called the SEL, is determined. Noise exposure limits for each are an SEL of 100 dBA from passing trains, as shown in Table 3.4-10 (FRA 2012).

Table 3.4-10 Interim Criteria for High-Speed Train Noise Impacts on Wildlife and Domestic Animals[1]

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

Source: FRA, 2012
SEL = sound exposure level
[1] These criteria are considered interim until further specific research results are known.

3.4.4.4 Determining Significance under CEQA

CEQA requires an EIR to identify the significant environmental impacts of a project (CEQA Guidelines § 15126). One of the primary differences between NEPA and CEQA is that CEQA requires a significance determination for each impact using a threshold-based analysis (see Section 3.1.3.4 for further information). By contrast, under NEPA, significance is used to determine whether an EIS will be required; NEPA requires that an EIS is prepared when the proposed federal action (project) as a whole has the potential to "significantly affect the quality of the human environment." Accordingly, Section 3.4.9, CEQA Significance Conclusions, summarizes the significance of the environmental impacts on noise- and vibration-sensitive receptors and resources for each Central Valley Wye alternative. The Authority is using the following thresholds to determine if a significant impact on noise- and vibration-sensitive receptors and resources would occur as a result of the Central Valley Wye alternatives. A significant impact is one that would:

- Expose persons to or generate noise levels in excess of FRA standards for severe noise impacts. These standards cover both permanent and temporary or periodic increases in ambient noise levels in the project vicinity above levels existing without the project.
- Expose persons to or generate excessive ground-borne vibration or ground-borne noise levels.
- Permanently increase ambient noise levels substantially in the project vicinity above levels without the project.
- Temporarily or periodically substantially increase ambient noise levels in the project vicinity above levels without the project.

3.4.5 Affected Environment

This section describes the affected environment for noise and vibration sources and sensitive receptors in the noise and vibration RSAs. Noise and vibration measurements that were taken as part of the analysis for the Merced to Fresno Final EIR/EIS and that are within the noise and vibration RSA for the Central Valley Wye alternatives are also discussed in this section along with measurements that were taken solely for the Central Valley Wye alternatives. This information provides the context for the environmental analysis and evaluation of impacts. Figures showing details of these sensitive receptors, noise measurement locations, and associated noise contours under each Central Valley Wye alternative are provided in the Noise and Vibration Technical Report (Authority and FRA 2016).

3.4.5.1 Land Uses and Noise Levels

The Central Valley Wye alternatives extend through various noise-sensitive land-use areas in unincorporated Merced and Madera Counties, the city of Chowchilla, and the community of Fairmead, terminating just north of Madera Acres. The Central Valley Wye alternatives would be located adjacent to Henry Miller Road and either SR 152 or Avenue 21 in the east-west direction;

adjacent to Road 11, Road 13, or Road 19 in the north-south direction; and then would curve north toward the Union Pacific Railroad (UPRR)/SR 99 corridor and south toward the BNSF Railway (BNSF) corridor. Adjacent land uses consist primarily of agriculture, undeveloped land, and institutional areas. Noise-sensitive receptors in the noise and vibration RSAs include those identified as sensitive to increased noise or vibration levels that are within the screening distances (see Tables 3.4-3 and 3.4-4) from the Central Valley Wye alternatives. The noise-sensitive receptors that fall within the screening distances are nearly all single-family residences, though there are also three schools (Fairmead Elementary, Fairmead Head Start, Chowchilla Seventh-Day Adventist School), the Chowchilla Seventh-Day Adventist Church, and a portion of the Chowchilla Cemetery. All other schools and churches within the noise and vibration RSA for the Central Valley Wye alternatives fall outside of the screening distances where noise impacts could occur and are not evaluated further in this analysis.[7]

Section 3.4.4.3, Methods for NEPA and CEQA Impact Analysis, describes the process of establishing the baseline of existing noise conditions for the noise RSA. The ambient noise sources along all alternatives for the Central Valley Wye are primarily traffic from vehicles on SR 99 and SR 152; trains on the BNSF and UPRR corridors; and vehicles (including light aircraft) or other machinery in agricultural areas. The existing L_{dn} in the noise RSA ranges between 48 and 73 dBA. Specific noise sources and sensitive receptors for each Central Valley Wye alternative are presented in Section 3.4.5.2, Existing Noise Levels by Alternative.

3.4.5.2 Existing Noise Levels by Alternative

This section describes existing noise levels by each Central Valley Wye alternative. Details of existing noise measurements are provided in Section 6.1, Existing Noise Environment, of the Noise and Vibration Technical Report (Authority and FRA 2016).

SR 152 (North) to Road 13 Wye Alternative

Henry Miller Road to SR 152 Segment

This portion of the noise RSA is predominately rural agricultural, with scattered rural residential and commercial buildings along SR 152, a cemetery, and several small private airstrips. The SR 152 (North) to Road 13 Wye Alternative would begin along Henry Miller Road and continue parallel to the north side of SR 152. The ambient noise sources in this area include traffic on SR 152 and SR 99, trains on the UPRR, small aircraft, and agricultural activities. L_{dn} in this portion of the noise RSA, as indicated by the measurement results at monitoring sites N75 to N78, ranged from 60 to 70 dBA (Authority 2016a).

Road 13 Wye Segment

This portion of the noise RSA is rural agricultural, with some scattered rural residences. The SR 152 (North) to Road 13 Wye Alternative would curve north from SR 152 through agricultural lands in a new right-of-way. This alternative would continue north, adjacent to the east side of Road 13, then curve west toward and along the SR 99/UPRR corridor. The ambient noise sources in this area are traffic on Road 13 and SR 99, trains on the UPRR, small aircraft, and agricultural activities. L_{dn} in the area, as indicated by the measurement results at monitoring sites N85, and LT 8, ranged from 51 to 71 dBA.

[7] These facilities have no potential for noise and vibration impacts from the Central Valley Wye alternatives and are not discussed further: Alamo Assembly of God Church, Alview Elementary School, El Capitan High School, Grace Tabernacle Church, Washington Elementary School, and Yosemite Church. The Avenue 21 to Road 13 Wye Alternative's project footprint requires a permanent utility easement that encroaches on the property of Alview Elementary. While the school buildings are relatively distant from noise-intensive construction activities, some work associated with this utility easement would occur on the western side of the school property. This would not directly affect the school's facilities and, as it would only require brief trenching activities, it is not expected to generate noise or vibration above applicable limits at the school. Therefore, there is no further analysis of this property.

Chowchilla to Madera Acres Segment

This portion of the noise RSA, where the SR 152 (North) to Road 13 Wye Alternative would be situated along SR 152, extends through the rural residential community of Fairmead, with surrounding land uses of low-density single-family residences and two school facilities—Fairmead Elementary School and Fairmead Head Start—and then curves southeast. South of Fairmead, the Chowchilla to Madera Acres portion of the alignment would be the same as the other Central Valley Wye alternatives and would continue through rural agricultural lands towards the BNSF corridor where the alternative terminates at Avenue 19, just north of Madera Acres. The ambient noise sources are traffic along Avenue 23 and Maple Street in Fairmead, trains on the BNSF, and agricultural activities. The L_{dn} in the area, as indicated by the measurement results at monitoring sites N79 to N81, N84, and LT26, ranged from 62 to 73 dBA.

Electrical Interconnections and Network Upgrades: Site 6—El Nido and Site 7—Wilson

Existing land uses associated with Site 6—El Nido are dominated by agricultural uses with rural single-family residences. Ambient noise sources are generally limited to local roadway traffic and agricultural operations. Near the Los Banos–Oro Loma–Canal 70 kV and Oro Loma–Panoche Junction 115 kV power line alignments, daytime average noise levels range between 38 and 41 dBA Leq (Merced County 2013b). Near the Site 7—Wilson, Wilson Substation, industrial uses are located to the east, west, and south. Proximate to the existing Wilson Substation, ambient noise sources are generally limited to local roadway traffic with noise levels being approximately 52 dBA Ldn and average daytime noise levels typically range from 48 to 53 dBA Leq (Merced County 2012). Near the Site 7—Wilson, 230 kV Tie-Line, SR 99 represents the dominant noise source because of the volume and speed of vehicles along the highway. Ambient noise levels are approximately 56 dBA Ldn and average noise levels are approximately 59 dBA Leq during the peak hour (Authority and FRA 2012a).

SR 152 (North) to Road 19 Wye Alternative

Henry Miller Road to SR 152 Segment

This portion of the noise RSA is the same as that described for the SR 152 (North) to Road 13 Wye Alternative.

Road 19 Wye Segment

This portion of the noise RSA is primarily rural agricultural, with scattered rural residences. East of SR 99, a large cluster of low-density residences associated with the community of Fairmead is located near Road 19 and bounded by SR 99, Avenue 25, and Road 20 1/2. The SR 152 (North) to Road 19 Wye Alternative would curve north from SR 152, cross the SR 99/UPRR corridor into the northern portion of Fairmead, and continue north along the east side of Road 19. The SR 152 (North) to Road 19 Wye Alternative would then curve west through agricultural lands, continue west along the north side of Porters Road, and curve north toward and across the UPRR/SR 99 corridor. The ambient noise sources in this area include vehicular traffic on Avenue 26 and SR 99, trains on the UPRR, and agricultural activities. L_{dn} in the area, as indicated by the measurement results at monitoring sites N82, N83, and LT 31, ranged from 48 to 64 dBA.

Chowchilla to Madera Acres Segment

This portion of the noise RSA is the same as described for the SR 152 (North) to Road 13 Wye Alternative.

Electrical Interconnections and Network Upgrades: Site 6—El Nido and Site 7—Le Grand Junction/Sandy Mush Road

Existing land uses associated with Site 6—El Nido and Site 7—Le Grand Junction/Sandy Mush Road predominately include agricultural uses with rural single-family residences. Ambient noise sources are generally limited to local roadway traffic and agricultural operations. Near the Site 6—El Nido, Los Banos–Oro Loma–Canal 70 kV and Oro Loma–Panoche Junction 115 kV power line alignments, daytime average noise levels range between 38 and 41 dBA Leq (Merced County 2013b). Suburban single-family residences occur along a 2.5-mile-portion of the Site 7—Le Grand Junction/Sandy Mush

Road, Warnerville–Wilson 230 kV Transmission Line. Noise levels in the area are approximately 44 dBA Ldn and average daytime noise levels typically range from 41 to 45 dBA Leq (Merced County 2012). Near the Site 7—Le Grand Junction/Sandy Mush Road, 115 kV Tie-Line, SR 99 represents the dominant noise source because of the volume and speed of vehicles along the highway. Ambient noise levels are approximately 67 dBA Ldn, and average noise levels are approximately 58 dBA Leq during the peak hour (Authority and FRA 2012a).

Avenue 21 to Road 13 Wye Alternative

Henry Miller Road to Avenue 21 Segment

This portion of the noise RSA is mostly rural agricultural, with scattered rural residences and one small private airstrip. The Fossil Discovery Center of Madera County, located along Avenue 21 1/2, is within the noise RSA of the Avenue 21 to Road 13 Wye Alternative. This alternative would begin along Henry Miller Road and curve south and east along the north side of Avenue 21. The ambient noise sources in this area include traffic on Avenue 21 and SR 99, trains on the UPRR, small aircraft, and agricultural activities. L_{dn} in the area, as indicated by the measurement results at monitoring sites N70, N73, N74, and LT 29, ranged from 49 to 57 dBA.

Road 13 Wye Segment

This portion of the noise RSA is the same as described for the SR 152 (North) to Road 13 Wye Alternative but extends farther south, passing the Chowchilla Seventh Day Adventist Church and School facility.

Chowchilla to Madera Acres Segment

This portion of the noise RSA is the same as described for the SR 152 (North) to Road 13 Wye Alternative. However, this segment of the Avenue 21 to Road 13 Wye Alternative would be farther south in the east–west direction and would avoid most residences and community facilities associated with Fairmead.

Electrical Interconnections and Network Upgrades: Site 6—El Nido and Site 7—Wilson

This portion of the noise RSA is the same as described for the SR 152 (North) to Road 13 Wye Alternative.

SR 152 (North) to Road 11 Wye Alternative

Henry Miller Road to SR 152 Segment

This portion of the noise RSA is the same as that described for the SR 152 (North) to Road 13 Wye Alternative.

Road 11 Wye Segment

This portion of the noise RSA is rural agricultural, with some scattered rural residences. The SR 152 (North) to Road 11 Wye Alternative would curve north from SR 152 through agricultural lands in a new right-of-way. This alternative would continue north, adjacent to the east side of Road 11, then curve west toward and along the SR 99/UPRR corridor. The ambient noise sources in this area are traffic on Road 11 and SR 99, trains on the UPRR, small aircraft, and agricultural activities. L_{dn} in the area, as indicated by the measurement results at monitoring sites N85, and LT 8, ranged from 51 to 71 dBA.

Chowchilla to Madera Acres Segment

This portion of the noise RSA is the same as described for the SR 152 (North) to Road 13 Wye Alternative.

Electrical Interconnections and Network Upgrades: Site 6—El Nido and Site 7—Wilson

This portion of the noise RSA is the same as described for the SR 152 (North) to Road 13 Wye Alternative.

3.4.5.3 Existing Vibration Levels

The vibration-sensitive receptors are similar to the noise-sensitive receptors described in Section 3.4.5.2 but are limited to those sensitive receptors that fall within the smaller vibration RSA for the Central Valley Wye alternatives. Existing vibration sources within the vibration RSA for all of the Central Valley Wye alternatives are primarily train operations near the city of Chowchilla. Trains traveling within the vibration RSA include freight services operated by UPRR and BNSF, and Amtrak passenger trains. Detailed discussions of vibration measurements are provided in Section 6.2, Existing Vibration Environment, of the Merced to Fresno Noise and Vibration Technical Report (Authority and FRA 2012b), which includes measurements conducted within the RSA.

3.4.6 Environmental Consequences

3.4.6.1 Overview

This section evaluates how the No Project Alternative and the Central Valley Wye alternatives could affect sensitive receptors and structures through emissions of noise and vibration during construction and operations. The impacts of the Central Valley Wye alternatives are described and organized in Section 3.4.6.3, Central Valley Wye Alternatives, as follows:

Construction Impacts

- Impact NV#1: Temporary Exposure of Sensitive Receptors to Construction Noise
- Impact NV#2: Temporary Exposure of Sensitive Receptors and Buildings to Vibration from Construction
- Impact NV#3: Temporary Traffic-Generated Noise from Rerouting Traffic during Construction
- Impact NV#4: Permanent Traffic-Generated Noise from Realigned State Highways and Local Roads

Operations Impacts

- Impact NV#5: Intermittent Permanent Exposure of Sensitive Receptors to Noise from Operations
- Impact NV#6: Intermittent Permanent Human Startle Effect from Passing Trains
- Impact NV#7: Intermittent Wildlife and Domestic Animal Stress from Passing Trains
- Impact NV#8: Permanent Exposure of Sensitive Receptors to Noise from New and Altered Electrical Infrastructure

3.4.6.2 No Project Alternative

The population in the San Joaquin Valley is expected to grow through 2040 (see Section 2.2.2.2, Planned Land Use). Development in the San Joaquin Valley to accommodate projected population increase would continue under the No Project Alternative and result in an increase in noise levels. Such planned projects anticipated to be constructed by 2040 include residential, commercial, industrial, recreational, transportation, and agricultural projects, all of which would encourage population, housing, and job growth.

Future development projects in Merced and Madera Counties include dairy farm expansions, implementation of airport development and land use plans, and implementation of general and specific plans throughout both counties. Planned projects under the No Project Alternative would also include transportation projects, such as the expansion of SR 99, and residential, commercial, and industrial developments. A full list of anticipated future development projects is provided in Appendix 3.19-A, Cumulative Plans and Non-Transportation Projects List, and Appendix 3.19-B, Cumulative Transportation Projects List. Changes in noise and vibration sources from additional development projects and infrastructure improvements and an increase in freight traffic could result from other future transportation improvement projects. Existing land would be converted for residential, commercial, and industrial development, as well as for transportation infrastructure, to

accommodate future growth, increasing the noise and vibration levels in the region. Taken together, these planned development and transportation projects, along with these changes in sources, would increase background noise and vibration levels and could cause localized noise and vibration impacts.

Planned development and transportation projects that would occur as part of the No Project Alternative would likely include project design features and mitigation to reduce impacts on noise and vibration. Future roadway projects under the No Project Alternative would require individual environmental review, including an analysis of traffic noise and vibration impacts on sensitive receptors that would be analyzed under state and federal highway noise criteria. Any increases in noise and vibration from development projects would be regulated by local general plans and noise and vibration ordinances. It will be the responsibility of the affected jurisdiction to ensure that consistency with local regulations and ordinances aimed at avoiding or reducing permanent increases in noise and vibration levels is achieved.

3.4.6.3 Central Valley Wye Alternatives

Construction and operations of the Central Valley Wye alternatives could result in temporary and permanent noise and vibration impacts on sensitive receptors. Impacts could include noise and vibration from construction equipment, as well as pass-by impacts, including annoyance and startle, from train operations.

Construction Impacts

Implementation of the Central Valley Wye alternatives would involve, for example, demolishing existing structures; clearing and grubbing; handling, storing, hauling, excavating, and placing fill; and construction of aerial structures, bridges, road modifications, utility upgrades and relocations, HSR electrical systems, and railbeds. Construction activities are described in Chapter 2, Alternatives.

Impact NV#1: Temporary Exposure of Sensitive Receptors to Construction Noise

Construction of the Central Valley Wye alternatives would require the use of mechanical equipment, including hand-held pneumatic tools, scrapers, bulldozers, dump trucks, and tie and rail handling equipment that could generate temporary increases in noise over a period of 1 to 3 years at any given location along the rail alignments or along local roads that provide access to the project footprints for the Central Valley Wye alternatives. Reconductoring activities associated with Site 7 – Le Grand Junction/Sandy Mush Road, Warnerville – Wilson 230 kV Transmission Line are not anticipated to occur until 2031, but could also require the use of helicopters. These activities would result in the transmission of construction noise on a periodic and temporary basis and an increase in ambient noise levels in locations where construction of the Central Valley Wye alternatives are in close proximity to sensitive receptors.

The types of construction activities are anticipated to be the same under all Central Valley Wye alternatives, with the same types of construction equipment and hours of construction used for each alternative. Most construction is expected to occur 5 days a week between the hours of 7:00 a.m. and 7:00 p.m., though some construction activities may be conducted outside this time interval. Likely exceptions to the anticipated construction times include construction over a freeway and construction at Pacific Gas & Electric facilities. Work would more likely occur at night for these activities in order to limit impacts on highway traffic. Detailed information on the noise levels generated by different types of construction activities are found in Section 7.3, Construction Noise and Vibration Effects, in the Noise and Vibration Technical Report (Authority and FRA 2016). Table 3.4-11 shows distances at which construction-related noise levels would reach FRA limits for residential receptors during daytime (defined by FRA as 7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) for seven construction phases expected for the Central Valley Wye alternatives.

Reconductoring of the Site 7 – Le Grand Junction/Sandy Mush Road, Warnerville – Wilson 230 kV Transmission Line beginning in 2031 may require the use of up to two helicopters at one time to facilitate access to the tower/pole work areas. Helicopter flight paths from designated day-use

landing zones would generally follow the existing electrical line alignments and avoid flying over residences when transporting material and crews. If a helicopter were to hover as low as 50 feet from the ground, it would result in approximately 72 dBA L_{eq} at 50 feet from the construction site where a helicopter is hovering for 10 minutes. Assuming the simultaneous use of two helicopters in addition to the 12 pieces of the loudest construction equipment, combined total noise levels would be approximately 89 dBA L_{eq}. Refer to Appendix 2-D for noise modeling results.

Table 3.4-11 Distance from Construction Activities at which Noise Levels Would Exceed Federal Railroad Administration Noise Level Limits

Construction Phase	Distance at which Daytime 80 dBA Leq Would Occur from Construction (feet)	Distance at which Nighttime 70 dBA Leq Would Occur from Construction (feet)
Mobilization	95	290
Land Clearing	150	460
Earthmoving	210	660
Grade Separation—No Pile Driving	180	575
Elevated Track—No Pile Driving	220	690
Lay Track	340	*
Demobilization	95	290

Source: Authority and FRA, 2016
dBA = A-weighted decibels
L_{eq} = equivalent sound level
* There would be no nighttime activity

The Central Valley Wye alternatives would require the contractor to prepare a noise-monitoring program that would apply FRA guidelines to minimize noise and vibration impacts at sensitive receptors (NV-IAMF#1). This IAMF would include measures such as:

- Constructing temporary sound barriers between noise-generating activities and noise-sensitive receptors
- Routing truck traffic away from residential streets, if possible
- Avoiding nighttime construction activities
- Using specially quieted equipment, such as quieted and enclosed air compressors, and mufflers on all engines

By complying with these guidelines, noise impacts would be minimized for sensitive receptors during construction. However, even with this feature, noise generated by construction activities could annoy nearby sensitive receptors because construction noise would be above levels the FRA has determined cause annoyance. These noise levels would be considered impacts on nearby sensitive receptors.

All of the impacted sensitive receptors would be single-family residences for the three SR 152 Wye alternatives. Other sensitive receptor types (e.g. schools. churches, cemeteries) are located farther from the project footprints and would not be impacted under any of these alternatives. Under the Avenue 21 to Road 13 Wye Alternative, grading and construction of the HSR embankment would result in daytime impacts at the Chowchilla Seventh Day Adventist Church and School in addition to single-family residences. The Noise and Vibration Technical Report (Authority and FRA 2016) provides additional detail regarding the location of the sensitive receptors in the RSA.

The FRA noise criteria (as shown previously in Table 3.4-5) 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 the

Central Valley Wye alternatives would exceed these criteria for both daytime and nighttime activities for some sensitive receptors. As shown in Table 3.4-12, depending on the construction phase and the alternative selected, construction of the Central Valley Wye would temporarily affect between 57 and 106 sensitive receptors during daytime construction and between 80 and 314 sensitive receptors because of nighttime construction. For both daytime and nighttime impacts, the SR 152 (North) to Road 19 Wye Alternative would result in a much greater number of impacts at sensitive receptors than the other alternatives. For nighttime impacts, this alternative would result in impacts at three to four times as many sensitive receptors. For daytime impacts, the SR 152 (North) to Road 11 Wye Alternative would have the fewest impacts. The Avenue 21 to Road 13 Wye Alternative would have the fewest nighttime construction impacts.

Table 3.4-12 Construction Noise Impacts on Sensitive Receptors

Construction Activity	Daytime Impacts Number of Sensitive Receptors Affected per Alternative				Nighttime[1] Impacts Number of Sensitive Receptors Affected per Alternative			
	SR 152 (North) to Road 13 Wye	SR 152 (North) to Road 19 Wye	Avenue 21 to Road 13 Wye	SR 152 (North) to Road 11 Wye	SR 152 (North) to Road 13 Wye	SR 152 (North) to Road 19 Wye	Avenue 21 to Road 13 Wye	SR 152 (North) to Road 11 Wye
Lay Track	35	41	33	33	-	-	-	-
Electrical Interconnections and Network Upgrades[2]	11	48	11	11	25	216[3]	25	25
Other Activities[4]	19	17	27	13	82	98	55	76
Total Impacts[5]	65	106	71	57	107	314	80	101

Source: Authority and FRA, 2016

[1] L_{eq} (night) = $L_{eq}(h)|_{v=vn}$

[2] Impact data is from Appendix 2-D Electrical Interconnections and Network Upgrades construction impacts

[3] The number of sensitive receptors is substantially higher because one of the network upgrades associated with this alternative, Site 7 – Le Grand Junction/Sand Mush Road, Warnerville – Wilson 230 kV Transmission Line, passes through three communities whereas the other electrical interconnections and network upgrades are located in more rural locations with far fewer sensitive receptors present.

[4] Other Activities might include heavy earthmoving equipment, use of power tools, and construction traffic.

[5] Total may include multiple impacts on the same sensitive receptor location if it is affected by more than one construction activity.

CEQA Conclusion

Noise impacts during construction would be significant under CEQA for all Central Valley Wye alternatives, because they would affect sensitive receptors by temporarily and periodically increasing ambient noise levels in the project vicinity above levels without construction of the Central Valley Wye alternatives. The Central Valley Wye alternatives would incorporate NV-IAMF#1 to minimize noise impacts by requiring the contractor to prepare a noise-monitoring program as well as apply recommended FRA construction mitigation procedures. However, even with NV-IAMF#1, there could still be some sensitive receptors where temporary and periodic construction noise would exceed FRA guidelines. These impacts would be greatly reduced through implementation of NV-MM#1: Construction Noise Mitigation Measures. This mitigation requires the contractor to conduct construction noise monitoring and provides them with the flexibility to implement different tools to meet FRA standards for limiting both daytime and nighttime noise during construction. With implementation of this mitigation measure, the impacts would be reduced to less than significant under CEQA for all Central Valley Wye alternatives.

Impact NV#2: Temporary Exposure of Sensitive Receptors and Buildings to Vibration from Construction

Construction of the Central Valley Wye alternatives would require the use of equipment that could generate temporary and periodic ground-borne vibration for a period of 1 to 3 years at any given location. The individual effects of construction-related vibration at a given receptor location would not be substantively different between the four Central Valley Wye alternatives for several reasons:

- The types of construction activities are anticipated to be the same under all Central Valley Wye alternatives, with the same types of construction equipment and hours of construction used for any alternative.
- The sensitive receptors close enough to perceive construction vibrations are single-family residences and the Chowchilla Seventh Day Adventist Church and School, generally of a similar construction type (wood-frame on a concrete foundation).
- All of the Central Valley Wye alternatives would affect sensitive receptors close enough to perceive construction vibration.

Construction-related vibration could result in human annoyance or building damage. As with construction noise effects (see Impact NV#1), these vibration effects are anticipated to be greatest for the Central Valley Wye alternative with the most sensitive receptors nearest to the project footprint for a given alternative, which is the SR 152 (North) to Road 19 Wye Alternative. Human annoyance occurs when construction vibration levels rise above the threshold of human perception for extended periods. Building damage occurs when construction activities produce waves in the ground that are strong enough to cause cosmetic or structural damage.

The Central Valley Wye alternatives also incorporate NV-IAMF#1, which would require the contractor to document how FRA guidelines would be met for minimizing construction vibration impacts when work is being conducted within 1,000 feet of sensitive receptors. Typical practices to minimize vibration include routing the travel of heavy construction vehicles away from sensitive receptors; using alternate equipment that generates less vibration; phasing demolition, earthmoving, and ground impacting operations so as not to occur in the same period; and avoiding impact pile driving. Calculations were performed to determine the distances at which construction-related vibration impacts would occur according to the criteria discussed in Section 3.4.4.3. Table 3.4-13 shows the maximum distances at which short-term construction vibration impacts on nearby structures and buildings could occur (Authority and FRA 2016). The results show that none of the vibration sources would be expected to produce sustained vibration levels that would cause structural damage beyond 37 feet from the construction activity, which would generally not fall outside of the project footprints at distances where sensitive receptors are found. The most vibration-intensive type of equipment would be a vibratory roller, which is used to compact asphalt paving in road work. Therefore, this piece of equipment would be used in limited situations for construction of over- and under-crossings of roads; it would generally not be used for construction of the track bed or HSR embankment, further limiting the potential for vibration impacts to structures.

Similarly, construction vibration would not cause human annoyance because the vibration impacts would occur predominantly within the project footprints for the Central Valley Wye alternatives. Thresholds for human annoyance are presented in Table 3.4-7. With incorporation of NV-IAMF#1, the contractor would be required to develop plans and adopt methods to maintain vibration emissions below these thresholds for any sensitive receptors within 1,000 feet of the project footprints. Therefore, it is not anticipated that there would be any temporary vibration impacts on sensitive receptors or buildings under any of the Central Valley Wye alternatives.

Table 3.4-13 Construction Equipment Vibration Impact Distances for Buildings for the Central Valley Wye Alternatives

Vibration Source[1]	PPV at Receptor (inches per second)	Threshold for Potential Structural Damage L_V[2] at Receptor (VdB)[3]	Distance from Construction Activity at Which This Vibration Level Would Occur (feet)
Vibratory Roller	0.12	90	37
Caisson Drilling	0.12	90	21
Large Bulldozer	0.12	90	21

Source: Authority and FRA, 2014a
[1] Data derives from the Fresno to Bakersfield Noise and Vibration Technical Report (Authority and FRA 2014a)
[2] L_V is the root mean square velocity expressed in VdB.
[3] For buildings extremely susceptible to vibration damage (Building Category IV in FRA guidance).
PPV = peak particle velocity
VdB = vibration velocity level

CEQA Conclusion

The impact under CEQA would be less than significant because Central Valley Wye alternatives construction would not expose persons to excessive ground-borne vibration. Construction controls required by IAMFs for the Central Valley Wye alternatives would include effective measures to minimize vibration impacts by reducing construction vibration and preventing it from causing damage to buildings and human annoyance. Therefore, CEQA does not require any mitigation.

Impact NV#3: Temporary Traffic-Generated Noise from Rerouting Traffic during Construction

This analysis addresses any possible additional traffic noise as a result of traffic being rerouted because of local road closures during construction of the Central Valley Wye alternatives. Construction of the Central Valley Wye alternatives would result in temporary or permanent closure of some local roads, which would require rerouting traffic and other roadway modifications. Rerouted traffic could affect existing noise levels in the noise RSA, as would the construction of any needed roadway modifications. Any changes in traffic that expose sensitive receptors to noise levels exceeding FHWA Noise Abatement Criteria would be considered noise impacts.

Within the noise RSA, the majority of local roadways have very low average daily traffic volumes of less than 500 vehicles, with many having average daily traffic volumes of less than 50 vehicles, indicating that there is presently less than one car per minute travelling these roads on average.

The exceptions to this are the traffic volumes on SR 152 and SR 99, which dominate noise levels in areas close to these highways. During HSR construction, temporary lane closures would be required on SR 152 and SR 99, but full closures would not be required. While these temporary lane closures could be required during various stages of construction, these roads have multiple lanes, and it is not anticipated that full closures would be required that would stop vehicles or that would divert these larger traffic volumes onto local roads. For the SR 152 to Road 19 Wye Alternative, SR 99 would be temporarily realigned during construction and reconstructed on top of a cut-and-cover tunnel in its original location. However, no residences or other sensitive receptors would be near the temporarily realigned sections of SR 99. Therefore, it is not anticipated that construction of the Central Valley Wye alternatives affecting these two high-traffic volume state routes would result in noise impacts from rerouted traffic.

Because of the distance between exits and the narrow width of most of the local roads paralleling these state routes, it is also not anticipated that traffic would divert to local roads during such lane closures; see Impact TR#1 in Section 3.2.6.3, Central Valley Wye Alternatives, for more

information on traffic diversions. Therefore, no additional traffic noise impacts are anticipated to result from lane closures during construction.

Effects from traffic generated noise would be greatest under the SR 152 (North) to Road 19 Wye Alternative because it includes the most roadway modifications, and least under the SR 152 (North) to Road 11 Wye Alternative because it includes the fewest roadway modifications (see Section 2.2.3, Description of Central Valley Wye Alternatives, for more information on road closures for each of the four Central Valley Wye alternatives). Furthermore, the existing traffic volumes on local roads are relatively low and would only produce small contributions to overall background noise levels. Because the low traffic volumes on local roads are not expected to change for the construction traffic operations (see Section 3.2 for more information on traffic volumes on local roads during construction), the noise levels from traffic rerouted by temporary or permanent road closures would not be noticeable by most people. Moreover, traffic noise as a result of road closures would not increase the ambient noise level in the vicinity of any of the Central Valley Wye alternatives above existing levels or above FHWA Noise Abatement Criteria.

CEQA Conclusion

The impact under CEQA would be less than significant because traffic volumes on local roads produce only small contributions to ambient noise levels and temporary noise from rerouted traffic would not expose sensitive receptors to noise levels in excess of FHWA Noise Abatement Criteria. Therefore, CEQA does not require any mitigation.

Impact NV#4: Permanent Traffic-Generated Noise from Realigned State Highways and Local Roads

State and local roadways would be realigned under each of the four Central Valley Wye alternatives, potentially bringing traffic closer to sensitive receptors such as residences. As discussed under Impact NV#3, local roads carry low traffic volumes of fewer than 500 vehicles per day, and any changes in the alignment of these roads would not result in an exceedance of FHWA Noise Abatement Criteria at sensitive receptors. Additionally, at most locations where local roads would be realigned, the realignment would not reduce the distance between the existing roadways and receptors by more than half, and, accordingly, these changes would not meet the FHWA threshold to conduct a traffic noise impact assessment (see Section 3.4.2.2).

State routes and related ramps in the area carry more traffic, and noise impacts would occur if the noise levels related to this traffic being moved closer to sensitive receptors approached or exceeded FHWA Noise Abatement Criteria. As described in Table 2-9 in Chapter 2, the existing at-grade interchanges of SR 223, Road 9, and SR 59 with SR 152 would be elevated under implementation of the three SR 152 (North) Wye alternatives where these roadways cross over the HSR tracks. These roadways have low average daily traffic volumes near the SR 152 interchange and low truck volumes (Figure 3.2-3). In addition, the changes to these interchanges would not remove any existing noise shielding, thereby exposing the line-of-sight between receptors and the traffic noise source. Therefore, the vertical changes to the interchanges would not result in any increases in noise levels over existing conditions; the roadways would not be moved closer to sensitive receptors; and there would not be any noise impacts on sensitive receptors from traffic on these elevated interchanges.

As discussed in Section 2.2.3, a section of SR 152 up to 1.25 miles in length would be realigned to the south to accommodate the SR 152 alternatives and new overcrossings. In most instances, this realignment would not result in impacts on sensitive receptors from traffic noise. For residences on the north side of this portion of SR 152, the roadway would be farther away and traffic noise would diminish relative to existing conditions. Almost all residences on the south side of SR 152 that fall within the distance where they could experience noise levels above FHWA Noise Abatement Criteria are presently very close to the road and all but two would be removed during construction. Therefore, only two sensitive receptors would remain that would experience an increase in traffic noise following a realignment of this portion of SR 152.

These two sensitive receptors (residences) would experience a permanent increase in noise levels where roadway realignments would move traffic noise sources more than half the distance

toward the receptors. At the Road 9 interchange with SR 152, SR 152 and related ramps would be moved closer to the existing residence located in the southwest quadrant of the interchange. At the SR 233/SR 152 interchange, SR 152 and related ramps also would be moved closer to the existing residence located in the southwest quadrant of the interchange. Traffic on these realigned roads near these residences would permanently increase ambient noise levels and potentially expose people to noise levels that would approach or exceed the FHWA Noise Abatement Criteria.

CEQA Conclusion

Changes in roadway alignments would permanently increase ambient noise levels at sensitive receptors. For most sensitive receptors, the impact under CEQA would be less than significant because none of the realignment of state or local routes would result in noise levels that exceed FHWA Noise Abatement Criteria for any sensitive receptors remaining after construction. Therefore, CEQA does not require any mitigation at these locations. However, the realignment of the Road 9 and SR 233 interchanges with SR 152 would increase ambient noise levels and expose people at two sensitive receptors to noise levels potentially approaching or exceeding FHWA Noise Abatement Criteria. For these two residences, this would be considered a significant noise impact under CEQA.

Sound wall abatement/mitigation would not be considered reasonable because it would only benefit a single sensitive receptor in each location. Although sound barriers are not presently proposed, NV-MM#3: Implement Proposed California High-Speed Rail Project Noise and Vibration Mitigation Guidelines, provides other measures to reduce sound levels, including the installation of sound insulation to provide outdoor-to-indoor noise reduction. This measure may provide some level of noise attenuation, but with implementation of this measure, the impact would remain significant.

Operations Impacts

As documented in the Merced to Fresno Final EIR/EIS (Authority and FRA 2012a: page 3.4-43) there would be no operational vibration impacts under the Merced to Fresno Section: Hybrid Alternative because of the limited propagation of vibration through the soils in the project corridor, the low vehicle input force, and the use of elevated structures in areas with numerous sensitive receptors, which is also the case for the Central Valley Wye alternatives.[8] Additionally, for the Central Valley Wye alternatives, the maximum distance where human annoyance would occur is 70 feet from the nearest track, which would be contained within the HSR right of way in at-grade or embanked sections. See the Noise and Vibration Technical Report (Authority and FRA 2016: pages 3-3 and 3-4) for additional information. Therefore, no vibration impacts during operations are anticipated for the Central Valley Wye alternatives and are not evaluated further in this discussion.

Impact NV#5: Intermittent Permanent Exposure of Sensitive Receptors to Noise from HSR Operations

Operations of any of the Central Valley Wye alternatives would generate noise levels above existing ambient levels. The level of operations noise would depend on the number of trains per day, speed of the trains, track configuration, and receptor distance to the tracks. The impacts presented represent a conservative analysis assuming the maximum frequency of trains anticipated with Phase 1 operations in 2040. The 2016 Business Plan anticipates that 40 trains per day would operate in 2025 between the Central Valley and Silicon Valley via the Central Valley Wye alternatives. When the HSR is fully operational in 2040, 232 trains per day would operate throughout the HSR system. Train service in the corridor is anticipated to run from around 6:00 a.m. to midnight, and non-service activities to maintain the system are anticipated to occur overnight during non-revenue service hours.

[8] In elevated sections, vibration is absorbed by the structure and is not noticeable outside of the right-of-way.

Table 3.4-14 compares the number of noise-sensitive receptors that could be exposed to moderate and severe noise impacts under each Central Valley Wye alternative. Moderate and severe impacts are defined in accordance with FRA guidance and are shown on Figure 3.4-1. The locations of these sensitive receptors and noise impacts are shown on Figure 3.4-2.[9] The Noise and Vibration Technical Report (Authority and FRA 2016) provides noise impact tables with additional details for sensitive receptors including alignment location, land use, existing noise level, noise impact level limits, and associated noise contour impact distances under each Central Valley Wye alternative.

Table 3.4-14 Summary of Operational Noise Impacts for the Central Valley Wye Alternatives

Alternative	Train Speed Range, (mph)	Range of Existing Noise Level L_{dn}, (dBA)	Projected Noise Level Range from HSR Only L_{dn}, (dBA)	Number of Moderate Impacts	Number of Severe Impacts
SR 152 (North) to Road 13 Wye	150–220	51–73	45–72	65 single-family residences	27 single-family residences
SR 152 (North) to Road 19 Wye	150–220	48–73	46–80	58 single-family residences	23 single-family residences
Avenue 21 to Road 13 Wye	150–220	49–73	44–72	40 single-family residences	39 single-family residences
SR 152 (North) to Road 11 Wye	150-220	51-73	45-72	61 single-family residences	35 single-family residences

Source: Calculated based on Merced to Fresno Project Section: Central Valley Wye Design Baseline Engineering Report Record Set 15% Design; Authority, 2016b
mph = miles per hour
L_{dn} = day-night sound level
dBA = A-weighted decibels
HSR = high-speed rail

The Central Valley Wye alternatives could have moderate and severe noise impacts on 79 to 96 single-family residences, depending on the alternative. All of the sensitive receptors affected are single-family residences; no other sensitive receptor types (e.g. schools. churches, cemeteries) would be affected because they are of sufficient distance from the centerline that noise levels would not exceed the moderate and severe noise impact threshold. The SR 152 (North) to Road 13 Wye Alternative would have the most moderate noise impacts (65), followed by the SR 152 (North) to Road 11 Wye Alternative (61), and then the SR 152 (North) to Road 19 Wye Alternative (58). The Avenue 21 to Road 13 Wye Alternative would have the fewest moderate noise impacts (40). However, for severe noise impacts, the Avenue 21 to Road 13 Wye Alternative would have the most severe noise impacts (39), followed by the SR 152 (North) to Road 11 Wye Alternative (35), and then the SR 152 (North) to Road 13 Wye Alternative (27). The SR 152 (North) to Road 19 Wye Alternative would have the fewest severe noise impacts (23). The Avenue 21 to Road 13 Wye Alternative would expose one sensitive residential receptor to a maximum increase in noise levels of up to 19 dBA. The three SR 152 alternatives would each expose one residential sensitive receptor to a maximum increase in noise levels of up to 15 dBA.

[9] The electrical interconnections and network upgrades are not included on this figure because they would not result in moderate or severe operational impacts on sensitive receptors.

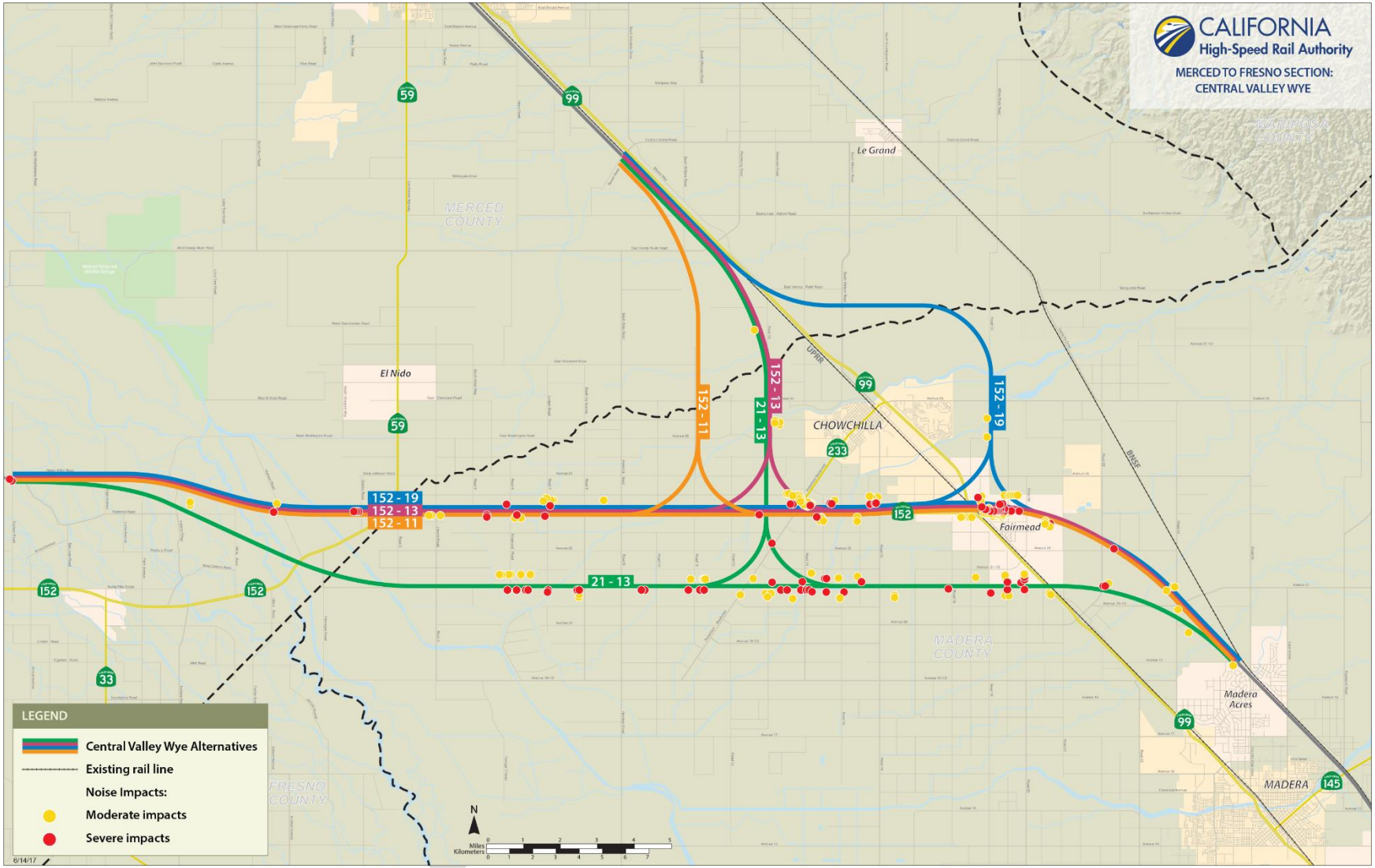
No operational noise impacts are anticipated along the portion of the HSR alignment that connects the western wye segment (the leg to/from San Jose and San Francisco) to the northern wye segment (connecting to/from Merced and Sacramento) under any of the alternatives. There is no scheduled service proposed along this leg of the wye, and it is anticipated that these tracks would only be used occasionally to move trains (without passengers) during non-peak hours for operational efficiency.[10] Therefore, noise levels would not exceed L_{dn} thresholds for moderate or severe impacts along the Merced to San Jose connections for any of the wye alternatives.

CEQA Conclusion

The impact under CEQA would be significant because the Central Valley Wye alternatives would generate noise levels above existing ambient levels, causing severe noise impacts at sensitive receptors. The Authority would implement NV-MM#2: Additional Noise Analysis during Final Design, which would conduct additional noise analysis during final design. The Authority would also implement NV-MM#4: Vehicle Noise Specification, which would potentially further reduce noise levels by selecting train sets that meet more stringent noise emissions guidelines. However, NV-MM#2 and NV-MM#4 would likely not avoid all severe operational noise impacts on sensitive receptors, the impact under CEQA would remain significant.

Sound barriers are not proposed for any of the Central Valley Wye alternatives because they are not required under the Authority's Noise and Vibration Mitigation Guidelines as shown in Appendix 3.4-A. The Authority's criteria are not met because of the low density of receptors in the Noise RSA. Although sound barriers are not presently proposed, NV-MM#3 provides other measures to reduce sound levels, including the installation of sound insulation to provide outdoor-to-indoor noise reduction. This measure may provide some level of noise attenuation, but with implementation of this measure, the impact would remain significant.

[10] Table 3.2, High-Speed Rail Service Plan Assumptions by Scenario, in the 2016 Business Plan indicates that transfers from Merced and Sacramento to the Bay Area would be made via timed bus transfers rather than by rail.



Source: Authority, 2016

DRAFT – JUNE 14, 2017

Figure 3.4-2 Operational Noise Impacts on Sensitive Receptors in the Central Valley Wye Alternatives Noise Resource Study Area

Impact NV#6: Intermittent Permanent Human Startle Effect from Passing Trains

The potential for startle impact from the rapid approach of a high-speed train and a quick onset rate is confined to an area closest to the HSR tracks and would only last for a few seconds. The effect would be greatest under the SR 152 (North) to Road 13, SR 152 (North) to Road 19, and SR 152 (North) to Road 11 Wye Alternatives because they pass through Fairmead, an area with a greater number of residents where more people would be near passing trains. Impacts would be least under the Avenue 21 to Road 13 Wye Alternative because it bypasses Fairmead. For the Central Valley Wye alternatives, maximum train speeds would be 220 mph, or 150 mph through portions where the top design speed is limited by engineering constraints. At 220 mph, the distance from the centerline of each set of tracks within which startle impacts could occur would be 45 feet (FRA 2012). This distance is almost entirely within the width of the Central Valley Wye alternatives' right-of-way;[11] therefore, no startle impact is anticipated because the public would not be occupying the space within the right-of-way.

CEQA Conclusion

The impact under CEQA would be less than significant because the area where startle impacts could occur is almost entirely within the HSR right-of-way. Therefore, CEQA does not require any mitigation.

Impact NV#7: Intermittent Wildlife and Domestic Animal Stress from Passing Trains

Operation of the Central Valley Wye alternatives could place new stress on wildlife and domestic animals by subjecting them to noise. According to the screening distance information provided in Table 3.4-15, wildlife and domestic animals could be affected if they are located within 100 feet of the tracks. Because security fences would limit access to the right-of-way and the right-of-way would be at least 100 feet wide in rural locations, with 16 feet of track separation, wildlife and domestic animals within approximately 50 feet of the edge of the HSR right-of-way could experience noise levels above the recommended threshold.

Table 3.4-15 Screening Distances for Noise Impacts on Wildlife and Domestic Animals for the Central Valley Wye Alternatives

Track Location	Speed (mph)	SEL[1] (dBA)	Distance from Trackway Centerline Where Impacts Could Result (feet)
HSR at-grade	220	100	100
HSR 60-foot-high elevated structure	220	100	15[2]
Freight train, no horn noise	50	100	75
Freight train, sounding horn at at-grade crossing	50	100	400

Source: FRA, 2012

[1] The SEL represents a receptor's cumulative noise exposure from an event and represents the total A-weighted sound during the event normalized to a 1-second interval. This noise descriptor is used to assess impacts on wildlife and domestic animals.

[2] These projections assume a safety barrier on the edge of the aerial structure as shown in typical cross-sections. The safety barrier is assumed to be 3 feet above the top of rail height and 15 feet from the track centerline.

dBA = A-weighted decibels SEL = sound exposure level
mph = miles per hour HSR = high-speed rail

[11] The right-of-way extends a minimum of 100 feet from fence to fence, with 16 feet of track separation, although it would be wider in many places, including any areas where the rail would be constructed above grade on embankment. At the design speed of 220 mph, a startle effect is anticipated up to 3 feet outside of each side of the right-of-way where the right-of-way is 100 feet and the rail alignment is at grade. There are no noise sensitive receptors within 3 feet of the right of way, or immediately adjacent to the right-of-way, under any of the CVY alternatives.

Wild and free-range domestic animals may come within 50 feet of the right-of-way fence while foraging or trying to cross the HSR alignment using crossing structures. The SR 152 (North) to Road 13 Wye Alternative passes through 11.01 miles of wildlife movement corridors, and the SR 152 (North) to Road 19 Wye Alternative passes through the most wildlife movement corridor, 17.47 miles. The Avenue 21 to Road 13 Wye Alternative passes through 11.84 miles of wildlife movement corridor, and the SR 152 (North) to Road 11 Wye Alternative passes through the least, 10.43 miles. There are no current methods to measure the impacts on a species-by-species basis. However, in all areas that are at-grade where the right-of-way is adjacent to substantive wildlife habitat (e.g., identified habitat linkages), the HSR could expose wildlife to noise levels that exceed the 100-dBA SEL threshold, and which may elicit a startle, avoidance, or negative behavior by wildlife species. It is also unknown if wildlife would have sufficient warning to move away from a passing train or if animals would choose to move.

In most cases, livestock or wildlife could avoid noise stress by not foraging near the tracks or by moving away from the track after using the wildlife crossing or as a train approaches. However, it is expected that because of the speed of the train and the short duration of any passbys, there would be few animals within this zone and noise impacts on any animals within this zone would be of short duration. For additional information about the potential impacts of the Central Valley Wye alternatives on wildlife, refer to Section 3.7.

As described in Appendix 3.12-E, High-Speed Rail Impacts on Confined Animal Agriculture Facilities, several confined animal agriculture facilities along the HSR alignment are located within 100 feet of the centerline of the HSR, and domestic and livestock animals within 30 feet of the right-of-way fence could be affected by train passbys. There are nine confined animal agriculture facilities along the SR 152 (North) to Road 13 Wye Alternative, five along the SR 152 (North) to Road 19 Wye Alternative, eleven along the Avenue 21 to Road 13 Wye Alternative, and five along the SR 152 (North) to Road 11 Wye Alternative. The figures in Attachment 1 of Appendix 3.12-E, show confined animal agriculture facilities affected by the alternatives. In most cases, livestock could avoid noise stress by staying away from the tracks and moving away during train passbys, and they could become habituated to train noise over time. In addition, at locations adjacent to the UPRR/SR 99 or BNSF corridors, where existing noise levels are already high, impacts would be minimal because animals are already habituated to train passby noise (Authority and FRA 2014a). It is also unknown if livestock would have sufficient warning to move away from a passing train or if animals would choose to move. Additional measures to reduce impacts for confined and free-range livestock would be addressed on a case-by-case basis during the right-of-way acquisition process during final design.

CEQA Conclusion

The impact under CEQA would be less than significant because unconfined livestock or wildlife could avoid ground-borne noise levels by moving away from the track as trains approach and noise from passbys would be short. Confined animals could move away from the tracks in some cases and could become habituated to train noise. Therefore, CEQA does not require any mitigation.

Impact NV# 8: Permanent Exposure of Sensitive Receptors to Noise from New and Altered Electrical Infrastructure

The operation of the Site 7—Le Grand Junction/Sandy Mush Road, Dutchman Switching Station associated with the SR 152 (North) to Road 19 Wye Alternative would result in increases in noise levels; however, because the nearest receptor is located approximately 1 mile away, no perceivable increases in ambient noise levels would occur. The reconfiguration of the Site 7—Wilson, Wilson Substation and expansion of the Site 6—El Nido, El Nido Substation associated with the SR 152 (North) to Road 13, Avenue 21 to Road 13, and SR 152 (North) to Road 11 Wye Alternatives would result in incremental increases in noise levels in the vicinity of these existing facilities. The Site 7—Wilson, Wilson Substation is located approximately 360 feet northwest of the nearest residential structure, and the Site 6—El Nido, El Nido Substation is located

approximately 160 feet east of the nearest residential structure. Potential increases in operational noise would be greatest at these locations. In general, noise associated with substation operation (i.e., humming) would range between 60 and 62 dBA L_{eq} at 50 feet depending on the voltage of the substation, with the higher noise level associated with 230 kV transformers (California Public Utilities Commission 2002, 2013).

Based on ground conditions and the distance (i.e., approximately 160 feet) between the Site 6—El Nido, El Nido Substation fence line and the residential structure, exterior noise levels would be approximately 48 dBA $L_{eq,}$ resulting in approximately 55 dBA L_{dn}. Moreover, exterior noise levels for the Site 7—Wilson, Wilson Substation would be even less because of the increased distance between the source (substation) and the receptor (residence). These exterior noise levels are considered normally acceptable by both Merced County and the City of Merced (City of Merced 2015; Merced County 2013a). As a result, the potential operational noise levels would not be substantial or result in excessive noise levels beyond existing noise levels already generated by the substations.

The switching station and traction power substations sited next to SR 152 for the SR 152 (North) to Road 13, SR 152 (North) to Road 19, and SR 152 (North) to Road 11 Wye Alternatives, as well as the traction power substation at the intersection of Sandy Mush Road and SR 99 under the SR 152 (North) to Road 19 Wye Alternative and the traction power substation along Avenue 21 for the Avenue 21 to Road 13 Wye Alternative, would have the same impacts as described for sites 6 and 7.

Noise impacts would be greatest under the SR 152 (North) to Road 13, Avenue 21 to Road 13, and SR 152 (North) to Road 11 Wye Alternatives because these alternatives would require the reconfiguration of the Site 7—Wilson, Wilson Substation and expansion of the Site 6—El Nido, El Nido Substation. Noise impacts would be least under the SR 152 (North) to Road 19 Wye Alternative because it would only require reconfiguration of one site, the Site 7—Le Grand Junction/Sandy Mush Road, Dutchman Switching Station.

CEQA Conclusion

The impact under CEQA would be less than significant because ambient noise levels in the vicinity would not substantially increase above levels without the Central Valley Wye alternatives, and the incremental increase would not be perceptible to most sensitive receptors. Therefore, CEQA does not require any mitigation.

3.4.7 Mitigation Measures

Four mitigation measures to address noise and vibration impacts have been identified. As described for each mitigation measure, the construction noise and vibration mitigation measures would effectively reduce impacts on sensitive receptors. The operations measures would minimize operational impacts on sensitive receptors, but would not completely avoid impacts.

NV-MM#1: Construction Noise Mitigation

Monitor construction noise to verify compliance with the limits. Provide the contractor the flexibility to meet the FRA construction noise limits in the most efficient and cost-effective manner. The contractor would have the flexibility of either prohibiting certain noise-generating activities during nighttime hours or providing additional noise control measures to meet the noise limits. To meet required noise limits, the following noise control mitigation measures would be implemented as necessary, for nighttime and daytime:

- Install a temporary construction site sound 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-related truck traffic along roadways that would cause the least disturbance to residents.

- During nighttime work, use smart back-up alarms, which automatically adjust the alarm level based on the background noise level, 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 sound barriers at the source of the construction activity.
- Limit or avoid certain noisy activities during nighttime hours.
- To mitigate noise related to pile driving, the use of an augur to install the piles instead of a pile driver would reduce noise levels substantially. If pile driving is necessary, limit the time of day that the activity can occur.

NV-MM#2: Additional Noise Analysis during Final Design

During final design and prior to construction, the Authority will review the Central Valley Wye Noise and Vibration Technical Report (Authority and FRA 2016). If final design or final vehicle specifications result in changes to the assumptions underlying the analysis in that report, the Authority would prepare additional environmental analysis, as required by CEQA and NEPA, to reassess noise impacts and potential mitigation.

This mitigation measure is anticipated to be effective because it would provide detailed operational noise information that would inform potential refinements to the final design and mechanisms to monitor changes by reviewing the report prepared during the final design. In addition, it could provide information that would lead to the development of additional mitigation measures or modifications to existing ones. Implementation of this measure would not trigger secondary environmental impacts because it would not change the scope, scale, or location of construction activities beyond those described as part of the Central Valley Wye alternatives.

NV-MM#3: Implement Proposed California High-Speed Rail Project Noise and Vibration Mitigation Guidelines

Various options exist to address the potentially severe noise effects from high-speed trains. With input from local jurisdictions and balancing technological factors, such as structural and seismic safety, cost, number of affected receptors, and effectiveness, mitigation measures would be selected and implemented. The mitigation measure or suite of mitigation measures for severe noise impacts would be designed to reduce the noise level from HSR operations from severe to moderate according to the provisions of the FRA noise and vibration manual (FRA 2012). The noise guidelines include the following mitigation measures:

Sound Barriers

Prior to operation of the HSR, the Authority will install sound barriers where they can achieve between 5 and 15 dBA of noise reduction, depending on sound barrier height and location relative to the tracks. The primary requirements for an effective sound 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 receptor, (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 sound barriers. Depending on the situation, sound barriers can become visually intrusive. Typically, the sound barrier's style is selected with input from the local jurisdiction to reduce the visual effect of barriers on adjacent lands uses. For example, sound barriers could be solid or transparent, of various colors, materials, and surface treatments.

The maximum sound barrier height would be 14 feet for at-grade sections; however, all sound barriers would be designed to be as low as possible while still achieving a substantial noise reduction. Berm and berm/wall combinations are the preferred types of sound barriers where space and other environmental constraints permit. On aerial structures, the maximum sound barrier height would also be 14 feet, but barrier material would be limited by engineering weight restrictions for barriers on the structure. Sound barriers on the aerial structure should still be designed to be as low as possible while achieving a substantial noise reduction. Sound barriers on aerial structures and at grade could consist of solid, semitransparent, and transparent materials.

As stated in Appendix 3.4-A, at least 10 sensitive receptors must benefit for a sound barrier to be recommended. However, there are no instances where a sound barrier would reduce at least 10 severe noise impacts under any of the four Central Valley Wye alternatives. There would be no reduction in severe noise impacts with the use of a sound barrier under the SR 152 (North) to Road 19 Wye Alternative and 23 severe noise impacts would remain. Under the SR 152 (North) to Road 13 Wye Alternative, a sound barrier could reduce the number of single-family residences affected by severe noise from 27 to 19, a reduction of 8 severe noise impacts. Similarly, that application of a sound barrier for the Avenue 21 to Road 13 Wye Alternative could reduce the number of severe noise impacts by 6, from 39 to 31, with one sound barrier. The construction of a sound barrier for the SR 152 (North) to Road 11 Wye Alternative would benefit 7 residences, reducing the number of severe impacts from 35 to 27. Therefore, because no sound barriers would reduce severe noise impacts on at least 10 residences, no sound barriers are considered feasible and none are proposed for any of the four Central Valley Wye alternatives.

Install Building Sound Insulation

If sound walls are not proposed or do not reduce sound levels to below a severe impact level, building sound insulation can be installed. Sound insulation of residences and institutional buildings to improve the outdoor-to-indoor noise reduction is a mitigation measure that can be considered when the use of sound barriers is not feasible in providing a reasonable level (5 to 7 dBA) of noise reduction. Although this approach has no effect on noise in exterior areas, it may be the best choice for sites where sound 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. Performance criteria would be established to balance existing noise events and ambient noise conditions as factors for determining mitigation measures.

Noise Easements

If a substantial noise reduction cannot be completed through the installation of sound barriers or building sound insulation, the Authority can acquire easements on properties severely affected by noise. This entails the establishment of an agreement between the Authority and the property owner wherein the Authority compensates the property owner for an easement that would encompass the property boundaries to the right-of-way of the rail line. In return, the property owner would accept the future noise conditions and release their right to petition the Authority regarding the noise level and subsequent disruptions. This approach would only be offered in isolated cases where other mitigation options are ineffective, infeasible, impractical, or too costly.

NV-MM#4: Vehicle Noise Specification.

In the procurement of an HSR vehicle technology, the Authority would require bidders to meet the federal regulations (40 C.F.R. § 201.12/13) at the time of procurement for locomotives (currently a 90-dBA level standard) and rail cars (currently a 93-dBA level standard for cars operating at speeds of greater than 45 mph). Depending on the available technology, this could substantially reduce HSR noise levels during operation throughout the corridor.

3.4.8 Impacts Summary for NEPA Comparison of Alternatives

This section summarizes and compares the impacts of the Central Valley Wye alternatives and the No Project Alternative. Under the No Project Alternative, development pressures resulting from an increasing population in Merced and Madera Counties would continue to lead to associated impacts on noise and vibration. The No Project Alternative is anticipated to result in a continuation of recent development trends that have led to noise and vibration impacts. Planned residential, commercial, industrial, recreational, transportation, and agricultural projects would lead to impacts on socioeconomics and communities from temporary construction activities, permanent conversion of Important Farmland to nonagricultural use, and displacements of residential, commercial, and industrial property.

The Merced to Fresno Final EIR/EIS concluded that development of the Central Valley Wye alternatives would result in moderate and severe operational noise impacts around the Community of Fairmead and north of SR 152.[12] Implementation of the Central Valley Wye alternatives could also result in noise impacts from temporary construction activities, construction traffic noise, and operational noise. The Central Valley Wye alternatives would incorporate IAMFs to minimize and avoid impacts related to noise and vibration as part of the design. These features would include compliance with FRA guidelines for minimizing noise and vibration impacts at sensitive receptors during construction.

Table 3.4-16 provides a comparison of the potential impacts of the Central Valley Wye alternatives on changes to noise and vibration. Data from this table and the information in this summary are described in detail in Section 3.4.6, Environmental Consequences.

Construction of the Central Valley Wye alternatives would require the use of mechanical equipment that would generate temporary increases in noise over a period of 1 to 3 years at any given location. The impacts from construction-related noise would be greatest under the SR 152 (North) to Road 19 Wye Alternative, which would temporarily affect up to 314 single-family residences during nighttime construction and 106 single-family residences during daytime construction. Daytime construction-related noise would be least under the SR 152 (North) to Road 11 Wye Alternative, affecting 57 single-family residences. Nighttime construction-related noise would be least under the Avenue 21 to Road 13 Wye Alternative, affecting 80 single-family residences. Construction of the Central Valley Wye alternatives would temporarily affect sensitive receptors along the selected alternative where construction-related noise levels would reach FRA limits for daytime and nighttime “human noise annoyance” levels.

Construction-related vibration could result in human annoyance. Construction of the Central Valley Wye alternatives would generate vibration increases that could temporarily annoy people at or near construction sites, even with the IAMFs as part of the design. These impacts are anticipated to be greatest for sensitive receptors (single-family residences and their occupants) under the SR 152 (North) to Road 19 Wye Alternative. However, the results show that none of the vibration sources would produce construction-related vibration outside of the project footprints of

[12] Figure 3.4-20 in the Merced to Fresno Final EIR/EIS shows a proposed sound barrier through the community of Fairmead under the UPRR/SR 99 Alternative area to mitigate impacts on sensitive receptors in this area. Because the Central Valley Wye alternatives have different alignments, this sound barrier is not proposed under any of the four alternatives because it no longer would provide sound reductions to these same sensitive receptors and there were no other locations where a sound barrier would be considered feasible under FRA guidelines based on the number of sensitive receptors benefited.

any of the Central Valley Wye alternatives that could result in sustained vibration that would cause structural damage to buildings. Additionally, construction vibration would not annoy people because levels of vibration that would cause annoyance would occur predominantly within the project footprints.

Building the Central Valley Wye alternatives would result in temporary and permanent closure of some local roads as well as temporary lane closures for SR 152 and SR 99, which would require rerouting traffic and other roadway modifications. Rerouted traffic could affect existing noise levels within the noise RSA. The impact would be greatest under the alternative with the most roadway modifications and closures—specifically, the SR 152 (North) to Road 19 Wye Alternative and lowest under the SR 152 (North) to Road 11 Wye Alternatives. Noise impacts related to changes in traffic noise because of road closures and realignments would not increase the ambient noise level above existing FHWA Noise Abatement Criteria for most receptors. State route realignments would bring traffic closer to sensitive receptors under all three SR 152 (North) Wye alternatives, which would increase noise levels for some sensitive receptors, although most sensitive receptors would not be exposed to an increase in noise levels that exceed FHWA Noise Abatement Criteria. Two sensitive receptors would be exposed to an increase in ambient noise levels that would exceed FHWA Noise Abatement Criteria for these realignments.

All four of the Central Valley Wye alternatives would have moderate and severe noise impacts on single-family residences. All of the sensitive receptors affected are single-family residences, and no other sensitive receptor types (e.g. schools. churches, cemeteries) would be affected. The SR 152 (North) to Road 13 Wye Alternative would have moderate or severe noise impacts on the second-most sensitive receptors (65 moderate impacts and 27 severe impacts receptors), including exposure of one residential sensitive receptor to an increase in noise levels of up to 15 dBA. The SR 152 (North) to Road 19 Wye Alternative would result in the third-highest number of moderate and severe noise impacts on noise-sensitive receptors (58 moderate impacts and 23 severe impacts), including exposure of one residential sensitive receptor to an increase in noise levels of up to 15 dBA. The Avenue 21 to Road 13 Wye Alternative would have moderate and severe impact on the fewest sensitive receptors (40 moderate impacts and 39 severe impacts), including exposure of one residential sensitive receptor to an increase in noise levels of up to 15 dBA. The SR 152 (North) to Road 11 Wye Alternative would have moderate and severe noise impacts on the most sensitive receptors (61 moderate impacts and 35 severe impacts), including exposure of one residential sensitive receptor to an increase in noise levels of up to 15 dBA.

Table 3.4-16 Comparison of Central Valley Wye Alternative Impacts

Resource Category	Central Valley Wye Alternatives			
	SR 152 (North) to Road 13 Wye	SR 152 (North) to Road 19 Wye	Avenue 21 to Road 13 Wye	SR 152 (North) to Road 11 Wye
Construction-Related Noise				
Impact NV#1: Temporary Exposure of Sensitive Receptors to Construction Noise (Daytime)	65 single-family residences	106 single-family residences	70 single-family residences, 1 church and school property	57 single-family residences
Impact NV#1: Temporary Exposure of Sensitive Receptors to Construction Noise (Nighttime)	107 single-family residences	314 single-family residences	80 single-family residences	101 single-family residences
Impact NV#2: Temporary Exposure of Sensitive Receptors and Buildings to Vibration from Construction	Likely to affect a smaller number of sensitive receptors based on proximity of single-family residences to the project footprint for this alternative	Likely to affect the greatest number of sensitive receptors based on proximity of single-family residences to the project footprint for this alternative	Likely to affect a smaller number of sensitive receptors based on proximity of single-family residences to the project footprint for this alternative	Likely to affect a smaller number of sensitive receptors based on proximity of single-family residences to the project footprint for this alternative
Impact NV#3: Temporary Traffic-Generated Noise from Rerouting Traffic during Construction	Fewer roadway closures resulting in intermediate noise impacts related to traffic diversion	Most roadway closures resulting in greatest noise impacts related to traffic diversion	Fewer roadway closures resulting in intermediate noise impacts related to traffic diversion	Fewest roadway closures resulting in least noise impacts related to traffic diversion
Impact NV#4: Permanent Traffic-Generated Noise from Realigned State Highways and Local Roads	Potential for exposure of sensitive receptors to increased traffic noise related to permanent vertical or horizontal realignment of three state routes. Traffic on local roads provides only a minor contribution to overall noise levels, diversion of traffic on these roads is not expected to affect noise levels.	Potential for exposure of sensitive receptors to increased traffic noise related to permanent vertical or horizontal realignment of three state routes. Traffic on local roads provides only a minor contribution to overall noise levels, diversion of traffic on these roads is not expected to affect noise levels.	No realignment of state routes. Traffic on local roads provides only a minor contribution to overall noise levels, diversion of traffic on these roads is not expected to affect noise levels.	Potential for exposure of sensitive receptors to increased traffic noise related to permanent vertical or horizontal realignment of three state routes. Traffic on local roads provides only a minor contribution to overall noise levels, diversion of traffic on these roads is not expected to affect noise levels.

Resource Category	Central Valley Wye Alternatives			
	SR 152 (North) to Road 13 Wye	SR 152 (North) to Road 19 Wye	Avenue 21 to Road 13 Wye	SR 152 (North) to Road 11 Wye
Operations-Related Noise				
Impact NV#5: Intermittent Permanent Exposure of Sensitive Receptors to Noise from Operations (moderately affected)	65 single-family residences	58 single-family residences	40 single-family residences	61 single-family residences
Impact NV#5: Intermittent Permanent Exposure of Sensitive Receptors to Noise from Operations (severely affected)	27 single-family residences	23 single-family residences	39 single-family residences	35 single-family residences
Impact NV#6: Intermittent Permanent Human Startle Effect from Passing Trains	Greater potential for startle impacts because of alignment route through community of Fairmead	Greater potential for startle impacts because of alignment route through community of Fairmead	Less potential for startle impacts because of alignment route through more rural areas, avoiding community of Fairmead	Greater potential for startle impacts because of alignment route through community of Fairmead
Impact NV#7: Intermittent Wildlife Stress from Passing Trains	Impacts related to train passing through 11.01 miles of wildlife movement corridors	Impacts related to train passing through 17.47 miles of wildlife movement corridors	Impacts related to train passing through 11.84 miles of wildlife movement corridors	Impacts related to train passing through 10.43 miles of wildlife movement corridors
Impact NV#7: Intermittent Domestic Animal Stress from Passing Trains	Impacts related to train passing nine confined animal facilities	Impacts related to train passing five confined animal facilities	Impacts related to train passing 11 confined animal facilities	Impacts related to train passing five confined animal facilities
Impact NV#8: Permanent Exposure of Sensitive Receptors to Noise from New and Altered Electrical Infrastructure	Greater potential for impact based on the reconfiguration of the Site 7—Wilson, Wilson Substation and expansion of the Site 6—El Nido, El Nido Substation	Less potential for impact based on the reconfiguration of only one site, the Site 7—Le Grand Junction/Sandy Mush Road, Dutchman Switching Station	Greater potential for impact based on the reconfiguration of the Site 7—Wilson, Wilson Substation and expansion of the Site 6—El Nido, El Nido Substation	Greater potential for impact based on the reconfiguration of the Site 7—Wilson, Wilson Substation and expansion of the Site 6—El Nido, El Nido Substation

Source: Authority and FRA, 2018
SR = State Route

Operations of the HSR would result in a sudden increase in noise for sensitive receptors along the Central Valley Wye alternatives, resulting from the rapid approach of a high-speed train and a quick onset rate. The three SR 152 (North) Wye Alternatives have a greater potential for startle impacts in areas where people may be active outdoors, such as the community of Fairmead. However, the distance from the centerline of the tracks where startle can occur is 45 feet. As this distance is within the Central Valley Wye alternatives right-of-way where people are not permitted, startle impacts from the sudden increased noise levels are not generally expected to occur.

Operations of the Central Valley Wye alternatives could place new stress on wildlife and domestic animals by subjecting them to uncomfortable noise levels located within 100 feet of the HSR centerline. For wildlife, these impacts would be greatest for the alternative that crosses the most linear distance of wildlife movement corridors—specifically, the SR 152 (North) to Road 19 Wye Alternative, and least for the SR 152 (North) to Road 11 Wye Alternative. For domestic animals, these impacts are anticipated to be greatest for the Avenue 21 to Road 13 Wye Alternative, which would pass 11 confined animal operations and least for the SR 152 (North) to Road 19 Wye Alternative and SR 152 (North) to Road 11 Wye Alternative, which each would pass five confined animal operations.

New electrical infrastructure required to provide power to the HSR system could result in new permanent sources of noise for sensitive receptors near these sites. These impacts would be lowest for the SR 152 (North) to Road 19 Wye Alternative, which would only require one reconfigured site, and greatest for the three other alternatives, which would each require two reconfigured sites.

3.4.9 CEQA Significance Conclusions

Table 3.4-17 provides a summary of the CEQA determination of significance for all construction and operations impacts discussed in Section 3.4.6.3. The CEQA level of significance before and after mitigation for each impact in this table is the same for all Central Valley Wye alternatives.

Table 3.4-17 CEQA Significance Conclusions for Noise and Vibration for the Central Valley Wye Alternatives

Impact	CEQA Level of Significance before Mitigation	Mitigation Measures	CEQA Level of Significance after Mitigation
Construction			
Impact NV#1: Temporary Exposure of Sensitive Receptors to Construction Noise	Significant for all alternatives	NV-MM#1, Construction Noise Mitigation	Less than significant for all alternatives
Impact NV#2: Temporary Exposure of Sensitive Receptors and Buildings to Vibrations from Construction	Less than significant for all alternatives	No mitigation measures are required	Not applicable
Impact NV#3: Temporary Traffic-Generated Noise from Rerouting Traffic During Construction	Less than significant for all alternatives	No mitigation measures are required	Not applicable
Impact NV#4: Permanent Traffic-Generated Noise from Realigned State Highways and Local Roads	Significant for the SR 152 alternatives	NV-MM#3, Implement Proposed California High-Speed Rail Project Noise and Vibration Mitigation Guidelines	Significant and unavoidable for the SR 152 alternatives

Impact	CEQA Level of Significance before Mitigation	Mitigation Measures	CEQA Level of Significance after Mitigation
Operations			
Impact NV#5: Intermittent Permanent Exposure of Sensitive Receptors to Noise from Operations	Significant for all alternatives	NV-MM#2, Additional Noise Analysis during Final Design NV-MM#3, Implement Proposed California High-Speed Rail Project Noise and Vibration Mitigation Guidelines	Significant and unavoidable for all alternatives for a subset of sensitive receptors
Impact NV#6: Intermittent Permanent Human Startle Effect from Passing Trains	Less than significant for all alternatives	No mitigation measures are required	Not applicable
Impact NV#7: Intermittent Wildlife and Domestic Animal Stress from Passing Trains	Less than significant for all alternatives	No mitigation measures are required	Not applicable
Impact NV#8: Permanent Exposure of Sensitive Receptors to Noise from New and Altered Electrical Infrastructure	Less than significant for all alternatives	No mitigation measures are required	Not applicable

Source: Authority and FRA, 2018
CEQA = California Environmental Quality Act
SR = State Route

3.4.10 Unmitigated Severely Affected Noise-Sensitive Land Uses

Preliminary impact results indicate between 23 and 39 noise-sensitive receptors would experience severe noise impacts during rail operations, depending on the Central Valley Wye alternative selected. These severely affected noise-sensitive receptors are not eligible for sound barriers because of parameters in the screening procedure as set forth by Appendix 3.4-A. Table 3.4-18 provides a summary of the remaining severely affected noise-sensitive receptors for each Central Valley Wye alternative.

Table 3.4-18 Summary of Severe Rail Noise Impacts for the Central Valley Wye Alternatives after Mitigation

Alternative	Total Number of Severe Impacts after Mitigation
SR 152 (North) to Road 13 Wye	27 single-family residences
SR 152 (North) to Road 19 Wye	23 single-family residences
Avenue 21 to Road 13 Wye	39 single-family residences
SR 152 (North) to Road 11 Wye	35 single-family residences

Source: Authority and FRA, 2018
SR = State Route

Traffic noise impacts could occur at the Road 16 and SR 233 interchanges with SR 152. Because construction of sound barriers at these locations would likely be unreasonable from a cost perspective, these impacts would remain unabated and unmitigated.

Although these single-family residences would not be eligible for sound barriers, they would still be eligible to receive other forms of noise mitigation identified in NV-MM#3, such as the installation of building sound insulation. These measures are anticipated to be effective at reducing HSR and traffic noise levels inside residences and would be discussed with the property owners to develop treatments appropriate to the specific property. However, these measures are voluntary and property owners may choose not to participate.