3.4 Noise and Vibration

This section describes the regulatory setting, affected environment, impacts, and mitigation measures to reduce noise and vibration impacts resulting from the Fresno to Bakersfield Project Section of the California High-Speed Rail Project (HSR Project). Noise and vibration are key elements of the environmental impact analysis because some increases in noise levels over existing conditions and the exceedance of vibration thresholds near the HSR project would result in an adverse impact.

This section summarizes detailed information contained in Section 3.4 of the *Fresno to Bakersfield Section California High-Speed Train Final Project Environmental Impact Report/Environmental Impact Statement* (EIR/EIS) (California High-Speed Rail Authority [Authority] and Federal Railroad Administration [FRA] 2014b). This Draft Supplemental EIR/EIS compares the F-B LGA to the complementary portion of the Preferred Alternative that was identified in the Fresno to Bakersfield Section Final EIR/EIS. As discussed in Section 1.1.3 of this Draft Supplemental EIR/EIS, the complementary portion of the Preferred Alternative consists of the portion of the BNSF Alternative from Poplar Avenue to Hageman Road and the Bakersfield Hybrid from Hageman Road to Oswell Street (further referenced as the “May 2014 Project” in this Draft Supplemental EIR/EIS). Since the Fresno to Bakersfield Section Final EIR/EIS does not evaluate the May 2014 Project as a discrete subsection of the Fresno to Bakersfield Project (as it did for example for the Allensworth Bypass), affected environment and impact summary discussion included in this section for the May 2014 Project has been extrapolated from the available information contained within the Fresno to Bakersfield Section Final EIR/EIS.

3.4.1 Regulatory Setting

Federal, state, and local laws, regulations, and orders relevant to noise and vibration affected by the project are presented below.

3.4.1.1 Federal

The following federal regulations related to noise and vibration are defined in Section 3.4.2.1, Noise and Vibration, of the Fresno to Bakersfield Section Final EIR/EIS (Authority and FRA 2014b: page 3.4-1) and are also applicable to the Fresno to Bakersfield Locally Generated Alternative (F-B LGA):

- United States Environmental Protection Agency (USEPA) Railroad Noise Emission Standards (40 C.F.R. 201)
- FRA Railroad Noise Emission Compliance Regulations (49 C.F.R. 210)
- Federal Highway Administration (FHWA) Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 C.F.R. 772)
- Use of Locomotive Horns at Public Highway-Rail Grade Crossings (49 C.F.R. Parts 222 and 229)

The following federal regulations were not discussed in Section 3.4.2.1, Noise and Vibration, of the Fresno to Bakersfield Section Final EIR/EIS. However, these federal regulations would apply to both the May 2014 Project and F-B LGA:

- NEPA (United States Code [U.S.C.] Title 42, Section 4321, et seq.) (Public Law 91–190) (Code of Federal Regulations [C.F.R.] Title 40, Part 1506.5)
- Noise Control Act of 1972 (U.S.C. Title 42, Section 4910)
- Federal Rail Administration High-Speed Ground Transportation Noise and Vibration Impact Assessment Guidelines
- Federal Transit Administration Transit Noise and Vibration Impact Assessment
- Occupational Safety and Health Administration Occupational Noise Exposure (29 C.F.R. 1910.95)

3.4.1.2 State

The following state regulations related to noise are defined in Section 3.4.2.2, Noise and Vibration, of the Fresno to Bakersfield Section Final EIR/EIS (Authority and FRA 2014b: page 3.4-2) and are also applicable to the F-B LGA:

- California Noise Control Act

The following state regulations were not discussed in Section 3.4.2.2, Noise and Vibration, of the Fresno to Bakersfield Section Final EIR/EIS. However, these state regulations would apply to both the May 2014 Project and F-B LGA:

- **California Code of Regulations Title 21, Chapter 2.5, Subchapter 6.** The Caltrans Division of Aeronautics defines a 65 dBA CNEL noise criterion as part of its noise standards with respect to aviation traffic as measured at potentially impacted residences near an airport. Reports of measured noise levels near airports can help describe and/or model current existing noise levels as part of the HSR noise impact assessment.
- **California Code of Regulations Title 24, Part 2.** The California Noise Insulation Standard limits interior noise exposure levels within multi-family residential developments to 45 dBA CNEL or L_{dn}. City and county agencies adopt interior noise standards for land use planning purposes.
- **California Department of Transportation Traffic Noise Analysis Protocol.** The Caltrans Traffic Noise Analysis Protocol establishes guidelines for the construction of noise barriers along highways where receptor are located. It specifies parameters such as barrier dimensions, locations, type of barriers, and standard aesthetic treatments. Under FHWA and Caltrans policies, noise barriers should be considered for transportation improvement projects.

3.4.1.3 Regional and Local

County of Kern

The exterior and interior noise standards from the Noise Element of the County of Kern General Plan (County of Kern 2009), along with the construction-hour limits from the Kern County Code, are provided in Section 3.2.4.4, *Fresno to Bakersfield Noise and Vibration Technical Report* (Authority and FRA 2014a: page 3-21).

City of Shafter, Metropolitan Bakersfield, and City of Bakersfield

The noise standards from the general plan noise elements, along with the construction-hour limits from the municipal codes, for the City of Shafter, Metropolitan Bakersfield, and the City of Bakersfield, are provided in Sections 3.2.5.6 and 3.2.5.7 of the Fresno to Bakersfield Noise and Vibration Technical Report (Authority and FRA 2014a: pages 3-28 through 3-30).

3.4.2 Methods for Evaluating Impacts

The methodology used to analyze project noise and vibration impacts along with defining noise and vibration for HSR are described below.

3.4.2.1 What is Noise

The definition of noise for HSR and noise descriptors are provided in Section 3.4.3.1, Fresno to Bakersfield Section Final EIR/EIS (Authority and FRA 2014b; page 3.4-3).

3.4.2.2 What is Vibration

The definition of vibration for HSR is provided in Section 3.4.3.2, Fresno to Bakersfield Section Final EIR/EIS (Authority and FRA 2014b; page 3.4-4).

3.4.2.3 Impact Assessment Guidance

The impact assessment guidance is defined in Section 3.4.3.3, Noise and Vibration, of the Fresno to Bakersfield Section Final EIR/EIS (Authority and FRA 2014b: page 3.4-5) and remains applicable to the F-B LGA.

Construction Thresholds

The construction noise and vibration thresholds are defined in Section 3.4.3.3, Noise and Vibration, of the Fresno to Bakersfield Section Final EIR/EIS (Authority and FRA 2014b: pages 3.4-5 through 3.4-7) and remain applicable to the F-B LGA. Table 3.4-1 shows the construction noise criteria, which have an 8-hour daytime and nighttime dBA L_{eq} noise level standard and a 30-day dBA L_{dn} noise level standard for residential, commercial, and industrial land uses. It should be noted that the FTA construction noise criteria cited in the Section 3.4.3.3, of the Fresno to Bakersfield Section Final EIR/EIS (Authority and FRA 2014b: page 3.4-5) are the same detailed construction noise criteria in the FRA manual. Construction vibration criteria are the FRA construction vibration damage criteria for various types of buildings, which are shown in Table 3.4-2.

Table 3.4-1 Federal Rail Administration Construction Noise Assessment Criteria

Land Use	Eight-Hour L_{eq} (dBA)		L_{dn} (dBA)
	Day[1]	Night[2]	30-Day Average
Residential	80	70	75[3]
Commercial	85	85	80[4]
Industrial	90	90	85[4]

Sources: FTA, 2006; FRA, 2012
[1] Daytime hours are 7:00 a.m. to 10:00 p.m.
[2] Nighttime hours are 10:00 p.m. to 7:00 a.m.
[3] In urban areas with very high ambient noise levels (L_{dn} > 65 dB), L_{dn} from construction operations should not exceed existing ambient noise levels + 10 dB.
[4] Twenty-four-hour L_{eq}, not L_{dn}.
dBA = A-weighted decibels
L_{dn} = day-night sound level, dBA
L_{eq} = equivalent continuous sound level, dBA

Table 3.4-2 Construction Vibration Damage Criteria

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

Source: Federal Transit Administration, 2006
[1] RMS velocity in decibels (VdB) re 1 micro in/sec.
in/sec = inches per second
L_V = root-mean-square vibration level

Project Thresholds

Noise and vibration criteria for HSR operations and noise effects on wildlife and domestic animals are defined in Section 3.4.3.3, Noise and Vibration, of the Fresno to Bakersfield Section Final EIR/EIS (Authority and FRA 2014b: pages 3.4-7 through 3.4-12) and remain applicable to the F-B LGA. Table 3.4-3 shows the noise impact criteria for HSR noise effects on animals.

Table 3.4-3 Interim Criteria for High-Speed Rail Noise Effects on Animals

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

Source: Federal Railroad Administration, 2012
dBA = A-weighted decibels
SEL = sound exposure level

There are three types of noise criteria for traffic noise. The first two noise criteria for traffic are related to traffic noise increase. The first noise criterion is the perceptibility of project-related traffic noise increases that are perceptible to the human ear in an outdoor environment. A change in noise level of 3 dBA or less is considered not perceptible to the human ear in an outdoor environment. The second criterion is the substantial (12 dBA) increase in traffic noise levels from existing without project noise levels to future with project noise levels[1]. The third noise criterion is the Noise Abatement Criteria (NAC) defined by FHWA for project-related roadway modifications that are classified as a Type 1 project. Section 3.4.3.3, Noise and Vibration, of the Fresno to Bakersfield Section Final EIR/EIS (Authority and FRA 2014b: pages 3.4-7 through 3.4-12) provides further details and remain applicable to the F-B LGA.

Construction Noise Impact Methodology

The construction noise impact methodology is defined in Section 3.4.3.3, Noise and Vibration, of the Fresno to Bakersfield Section Final EIR/EIS (Authority and FRA 2014b: pages 3.4-12 and 3.4-13) and remains applicable to the F-B LGA. In addition, more details on the construction noise impact methodology is defined in Section 8.4, Fresno to Bakersfield Noise and Vibration Technical Report (Authority and FRA 2014a: page 8-6).

Criteria for Construction Noise Impact Assessment

The criteria for construction noise impact assessment are defined in Section 3.4.3.3, Noise and Vibration, of the Fresno to Bakersfield Section Final EIR/EIS (Authority and FRA 2014b: page 3.4-13) and remain applicable to the F-B LGA.

Construction Vibration Impact Methodology

The construction vibration impact methodology is defined in Section 3.4.3.3, Noise and Vibration, of the Fresno to Bakersfield Section Final EIR/EIS (Authority and FRA 2014b: page 3.4-13) and remains applicable to the F-B LGA. Table 3.4-4 and Table 3.4-5 show the FRA ground-borne vibration and ground-borne noise impact criteria based on land use categories and for special buildings, respectively.

[1] A traffic noise impact from a substantial increase in traffic noise from existing to future with project noise levels is defined by Caltrans in the Traffic Noise Analysis Protocol.

Table 3.4-4 FRA Ground-Borne Vibration and Noise Impact Criteria

Land Use Category	Ground-Borne Vibration Impact Levels (VdB relative to 1 micro inch/sec)			Ground-Borne Noise Impact Levels (dB relative to 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[4]	65 VdB[4]	65 VdB[4]	N/A[5]	N/A[5]	N/A[5]
Category 2: Residences and buildings where people normally sleep	72 VdB	75 VdB	80 VdB	35 dBA	38 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use	75 VdB	78 VdB	83 VdB	40 dBA	43 dBA	48 dBA

Source: FTA, 2006
[1] "Frequent Events" is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.
[2] "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.
[3] "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.
[4] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment, such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.
[5] Vibration-sensitive equipment is generally not sensitive to ground-borne noise.
dB = decibel(s)
dBA = A-weighted decibel(s)
HVAC = heating, ventilation, and air conditioning
inch/sec = inch(es) per second
N/A = not applicable
RMS = root-mean-square
sec = second(s)
VdB = RMS vibration velocity level

Table 3.4-5 FRA Ground-Borne Vibration and Noise Impact Criteria for Special Buildings

Type of Building or Room	Ground-Borne Vibration Impact Levels (VdB relative to 1 micro inch/sec)		Ground-Borne Noise Impact Levels (dB relative to 20 micro-Pascals)	
	Frequent Events[1]	Infrequent Events[2]	Frequent Events[1]	Infrequent Events[2]
Concert hall	65 VdB	65 VdB	25 dBA	25 dBA
Television studio	65 VdB	65 VdB	25 dBA	25 dBA
Recording studio	65 VdB	65 VdB	25 dBA	25 dBA
Auditorium	72 VdB	80 VdB	30 dBA	38 dBA
Theater	72 VdB	80 VdB	35 dBA	43 dBA

Source: FTA, 2006
[1] "Frequent Events" is defined as more than 70 vibration events per day.
[2] "Occasional or Infrequent Events" is defined as fewer than 70 vibration events per day.
dB = decibel(s)
dBA = A-weighted decibel(s)
inch/sec = inch(es) per second
RMS = root-mean-square
sec = second(s)
VdB = RMS vibration velocity level, dB

Train Operation Noise and Vibration Methodology

The train operation noise and vibration methodology is defined in Section 3.4.3.3, Noise and Vibration, of the Fresno to Bakersfield Section Final EIR/EIS (Authority and FRA 2014b: pages 3.4-13 and 3.4-14) and remains applicable to the F-B LGA except for factoring in atmosphere absorption. The FRA noise-sensitive land use categories are shown in Table 3.4-6 and the FRA noise impact criteria are shown in Figure 3.4-1.

Table 3.4-6 Land Use Categories and Metrics for High-Speed Rail Noise Impact Criteria

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor $L_{eq}(h)$[1]	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 nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor $L_{eq}(h)$[1]	Institutional land uses with primarily daytime and evening uses. This category includes schools, libraries, and churches, where it is important to avoid interference with such activities as speech, meditation, and concentration. Buildings with interior spaces where quiet is important, such as medical offices, conference rooms, recording studios, and concert halls, fall into this category, as well as places for meditation or study associated with cemeteries, monuments, and museums. Certain historical sites, parks, and recreational facilities are also included.

Source: FTA, 2006
[1] L_{eq} for the noisiest hour of transit-related activity during hours of noise sensitivity.
dBA = A-weighted decibels
L_{dn} = day-night sound level, dBA
$L_{eq(h)}$ = equivalent continuous sound level for a one-hour period, dBA

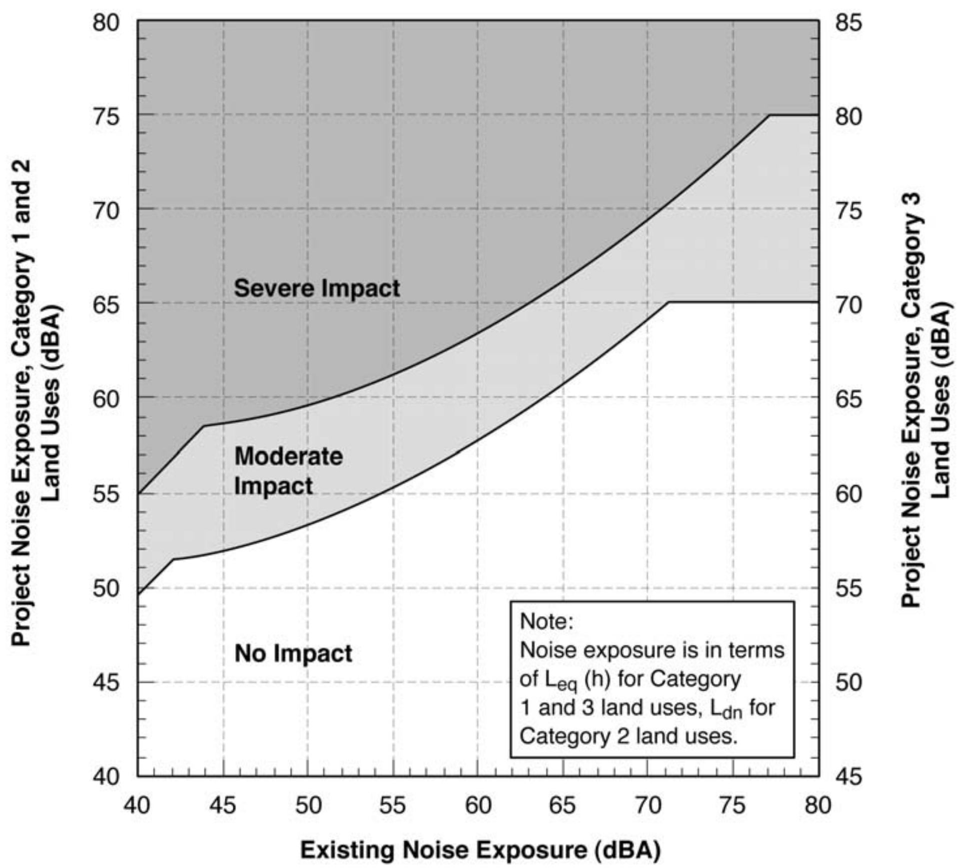


Figure 3.4-1 Noise Impact Criteria for High-Speed Rail Projects

Station Noise

The noise impacts associated with HSR stations are evaluated and discussed separately based on two types of noise sources: mobile noise sources and stationary noise sources. The methodology to evaluate mobile noise sources associated with the HSR station is defined in Section 3.4.3.3, Noise and Vibration, of the Fresno to Bakersfield Section Final EIR/EIS (Authority and FRA 2014b: page 3.4-15) and remains applicable to the F-B LGA. It should also be noted that this methodology is the same as the methodology described above for train operations. The methodology to evaluate stationary noise sources associated with the HSR station is defined in the methodology below under stationary HSR-related noise sources.

Traffic Noise at Stations

Traffic noise at the HSR station is defined in Section 3.4.3.3, Noise and Vibration, of the Fresno to Bakersfield Section Final EIR/EIS (Authority and FRA 2014b: page 3.4-15) and remains applicable to the F-B LGA. In addition, traffic noise at the Maintenance of Infrastructure Facility (MOIF) and Traction Power Supply Stations (TPSS) would be applicable as well.

Stationary HSR-related Noise Sources

Stationary HSR-related noise sources from the MOIF and TPSS are defined in Section 3.4.3.3, Noise and Vibration, of the Fresno to Bakersfield Section Final EIR/EIS (Authority and FRA 2014b: page 3.4-15) and remain applicable to the F-B LGA. In addition, stationary noise sources from the HSR station would be applicable as well.

3.4.2.4 Method for Evaluating Effects under NEPA

In the Fresno to Bakersfield Section Final EIR/EIS, analysts applied specified thresholds for each resource topic to assess whether the intensity of each impact is negligible, moderate, or substantial for the Build Alternatives, and provided a conclusion of whether the impact was “significant”. Since the Fresno to Bakersfield Section Final EIR/EIS does not evaluate the May 2014 Project as a discrete subsection of the Fresno to Bakersfield Project (as it did for example for the Allensworth Bypass), it does not provide conclusions using intensity thresholds for the May 2014 Project. Therefore, intensity thresholds are not used for the F-B LGA. Instead, the evaluation of impacts under NEPA in this Draft Supplemental EIR/EIS focuses on a comprehensive discussion of the project’s potential impacts in terms of context, intensity, and duration and provides agency decision makers and the public with a comparison between the May 2014 Project and the F-B LGA.

3.4.2.5 CEQA Significance Criteria

The FRA noise and vibration criteria for evaluating effects under NEPA may be used as the CEQA significance criteria. In addition to these criteria, the CEQA Guidelines also define an impact pertaining to noise and vibration as significant if it would result in any of the following environmental effects:

- Exposure of persons to or generation of noise levels in excess of standards for a severe impact established by the FRA for high-speed ground transportation and by the FTA for transit projects and other changes to non-HSR rail tracks. These standards cover both permanent and temporary/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.

3.4.2.6 Study Area

Noise Study Area

The noise study area of the project includes sensitive receivers located within 2,500 feet of the proposed HSR track. This study area is consistent with that identified in the Fresno to Bakersfield Section Final EIR/EIS and has been determined based on typical screening distances (Table

3.4-7) defined by the FRA and project-specific conditions. Screening distances indicate whether any noise-sensitive receivers are near enough to the proposed alignment for a noise impact to be possible under typical conditions. If receivers are located farther away than these screening distances, FRA guidance has determined that impacts would be unlikely. Table 3.4-7, which groups screening distances by the type of corridor the project would occupy, takes into account whether the HSR alignment follows along an existing rail line or highway or along a new transportation corridor.

Table 3.4-7 Screening Distances for Noise Assessments

Corridor Type	Existing Noise Environment	Screening Distance in Feet for HSR[1]	
		Steel-Wheeled	
		90 to 170 mph	170 mph or more
Railroad	Urban/noisy suburban – unobstructed	300 feet	700 feet
	Urban/noisy suburban – obstructed[2]	200 feet	300 feet
	Quiet suburban/rural	500 feet	1,200 feet
Highway	Urban/noisy suburban – unobstructed	250 feet	600 feet
	Urban/noisy suburban – obstructed[2]	200 feet	350 feet
	Quiet suburban/rural	400 feet	1,100 feet
New	Urban/noisy suburban – unobstructed	350 feet	700 feet
	Urban/noisy suburban – obstructed[2]	250 feet	350 feet
	Quiet suburban/rural	600 feet	1,300 feet

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

The FRA noise impact screening distances for noise-sensitive receivers depend on the existing noise environment and speeds of the trains. For noise impact screening distance purposes, existing noise environments are defined by the existence of rail corridors, by the type of existing noise environment based on the nearby population density (urban, suburban, and rural), and by whether the noise-sensitive receiver is obstructed or unobstructed from view of the alternative alignments. Screening distances change based on the speeds of the trains. Trains moving up to 100 mph have a shorter screening distance than trains moving up to 200 mph. Since train speeds are planned for 220 mph, the highest speed range category (Regime III – 170 miles per hour [mph] or greater) was used to define the screening distance for the F-B LGA alignment. These screening distances are based on general assumptions associated with typical projects, such as the number of train operations, train speeds, and existing noise conditions. The maximum screening distance of 1,300 feet was replaced by a screening distance of 2,500 feet because the FRA screening distance is based on the assumption of 50 trains per day, whereas the proposed F-B LGA project would operate at 225 trains per day. Therefore, specific factors of the HSR project were considered when the potential impact was assessed for all noise-sensitive receivers within approximately 2,500 feet.

Vibration Study Area

For the F-B LGA, the study area for vibration is as follows:

- HSR station study area: 150 feet from the station boundary
- HSR alignment study areas, including existing railroads: up to 275 feet from the edge of the right-of-way
- Highway study areas: 50 feet from the roadway centerline

The vibration impact assessment uses the FRA screening procedure. Screening distances indicate the potential for vibration impact on vibration-sensitive receivers. FRA guidance has determined that receivers located beyond the screening distances are not likely to be affected by the HSR project. Table 3.4-8 presents the screening distances for vibration assessment. As shown in Table 3.4-8, screening distances change based on the speeds of the train. Trains moving up to 100 mph have a shorter screening distance than trains moving up to 200 mph.

Table 3.4-8 Vibration Impact Screening Distances

Land Use	Train Frequency	Screening Distance for HSR (in feet from centerline)		
		Up to 100 mph	Up to 200 mph	Up to 300 mph
Residential	Frequent or Occasional	120 feet	220 feet	275 feet
	Infrequent	60 feet	100 feet	140 feet
Institutional	Frequent or Occasional	100 feet	160 feet	220 feet
	Infrequent	20 feet	70 feet	100 feet

Source: FRA, 2012
Frequent = Greater than 70 passbys per day.
Infrequent = Less than 70 passbys per day.

The study area for the vibration impact assessment analysis documented in this Draft Supplemental EIR/EIS generally follows the HSR corridor between Shafter and Bakersfield. Most of the study area along the north-south alignment lies along active railroad and highway rights-of-way. Vibration study areas are defined within the FRA vibration screening distances as ranging from 220 feet for institutional land uses to 275 feet for residential land uses (Table 3.4-8).

3.4.3 Affected Environment

3.4.3.1 Summary of the May 2014 Project Affected Environment

This section provides a summary of those effects of the May 2014 Project using information from the Fresno to Bakersfield Section Final EIR/EIS. The May 2014 Project is the comparable portion of the Preferred Alternative used to compare impacts to the F-B LGA. In Shafter, noise levels measured along the May 2014 Project alignment generally ranged from 70 to 79 dBA L_{dn}. These levels reflect the proximity of an active freight rail line. Between Shafter and Bakersfield, the May 2014 Project alignment continues through agricultural land, which includes some of the least-populated areas in the study area. Noise levels measured along this segment of the May 2014 Project alignment ranged from 54 to 61 dBA L_{dn}, as expected in a quiet, rural environment. For residences adjacent to well-traveled roadways, noise levels ranged from 67 to 71 dBA L_{dn}. South of Reina Road, land uses transition from agricultural to residential, with several single-family residential neighborhoods. The noise levels measured at these residences ranged from 65 to 77 dBA L_{dn}, which is reflective of residences directly adjacent to an active railroad line. Beyond this point, the May 2014 Project alignment turns east toward the freight yard and station in the city of Bakersfield. The land uses along this segment of the alignment are urban; roadways, freeways, and rail lines dominate the noise environment. The noise measurements conducted near the May 2014 Project alignment and the Truxtun Avenue Station in this area ranged from 59 to 70 dBA L_{dn}, which are consistent with an urban environment.

Vibration measurements ranged between 70 and 80 VdB with the highest measured vibration level being 92 VdB and the lowest measurement being 59 VdB. Specific vibration measurements were not taken at the Truxtun Avenue Station location as vibration sensitive receivers were not located within the FRA screening distances (275 feet from edge of right-of-way).

3.4.3.2 Fresno to Bakersfield Locally Generated Alternative

This section discusses the affected environment related to noise and vibration in the study area of the F-B LGA.

Noise-Sensitive Receivers

Noise-sensitive receivers located near the proposed alignment would experience potential noise impacts related to the proposed project. The FRA screening distances were used to identify noise-sensitive receivers based on the existing land uses and the speeds at which future railroad operations are expected to function. The FRA screening distances are shown in Table 3.4-7. As shown in Table 3.4-7, the proposed project would have a maximum screening distance of 1,300 feet. However, this screening distance was replaced with a screening distance of 2,500 feet because the FRA screening distance is based on the assumption of 50 trains per day, whereas the proposed F-B LGA project would operate at 225 trains per day. Noise-sensitive land uses include residences, schools, parks, libraries, and hospitals. There are two schools located within the screening distance of 2,500 feet.

Measured Noise Levels

Ambient noise level measurements were conducted at representative noise-sensitive receiver locations within 2,500 feet of the proposed rail line to document the existing noise environment for project noise impact assessment. A combination of 37 long-term (24 hours in duration) and 126 short-term (20 minutes [2] in duration) noise level measurements were conducted consistent with the May 2014 Project and to represent the study area. Short-term noise level measurements were selected in areas not covered by the long-term noise level measurement in order to estimate the day-night average noise level (L_{dn}). The long-term and short-term noise level measurement locations are shown on Figure 3.4-2 and Figure 3.4-3. Table 3.4-B-1 in Appendix 3.4-B, Noise and Vibration Measurements, provides a summary of the long-term noise level measurement results. Table 3.4-B-2 in Appendix 3.4-B, Noise and Vibration Measurements, provides a summary of the short-term noise level measurement results. Each measurement location includes the date, start time, address, city/county, land use type, noise sources, and estimated L_{dn} noise level. The L_{dn} noise levels were estimated by comparing the short-term measured values to the corresponding equivalent continuous sound level (L_{eq}) values at a nearby long-term measurement location subjected to a similar characteristic noise environment according to the following method:

A. Note the L_{eq} value for the short-term measurement.

B. Compare the monitored short-term (ST) L_{eq} value from Step A to the monitored L_{eq} value for the nearby long-term (LT) measurement location for the same measurement period used for the short-term (ST) L_{eq} value.

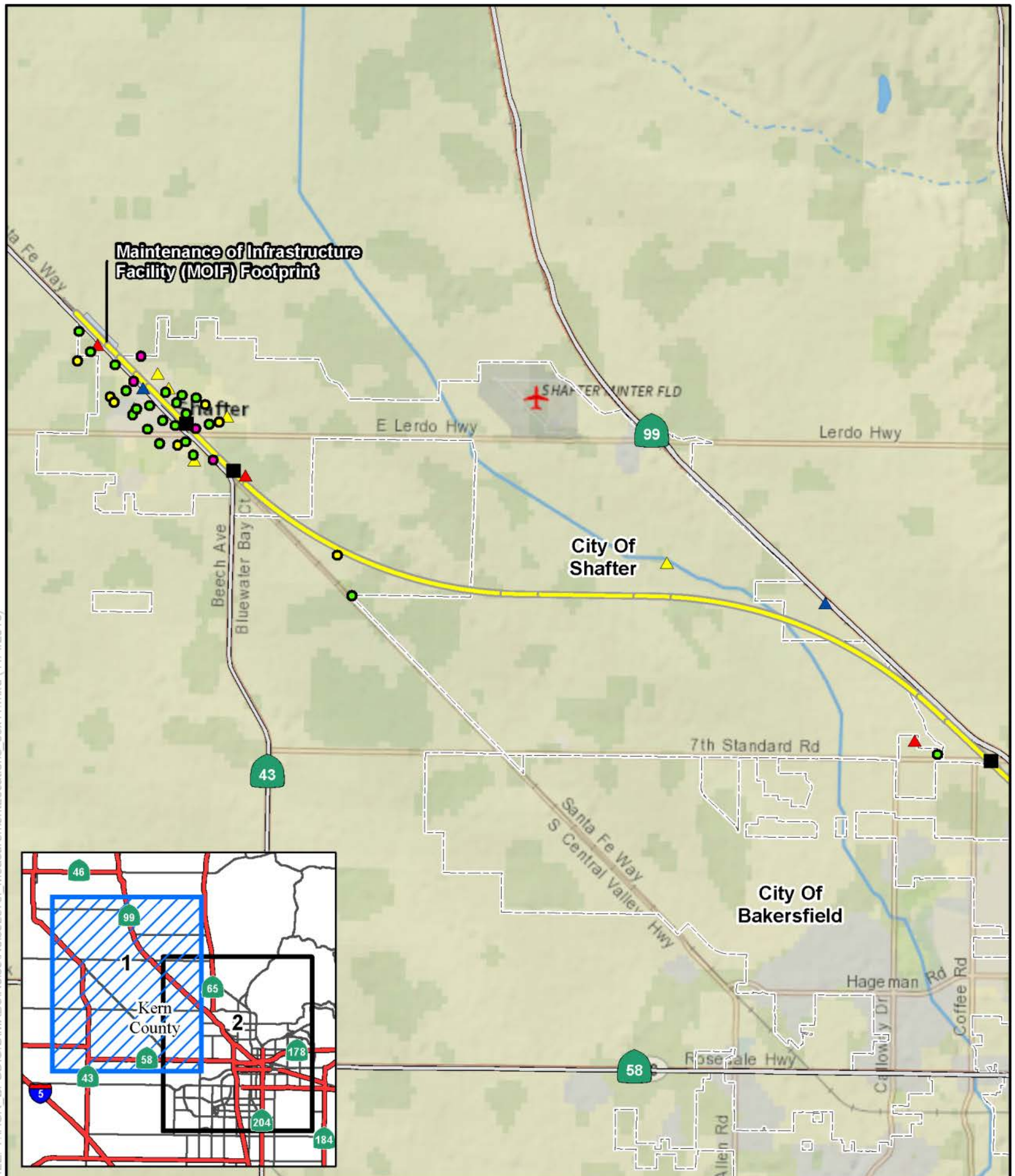
Then:

$$L_{eq}\,(ST) - L_{eq}\,(simultaneous)\,(LT) = delta$$

and

$$L_{dn}\,(ST) = L_{dn}\,(LT) + delta$$

[2] Although the May 2014 Project conducted short-term 1-hour noise level measurements, short-term 20-minute noise level measurements of the ambient noise and traffic noise would be relatively the same as a short-term 1-hour noise level measurement because the ambient noise and traffic noise levels are constant.



FILE: Y:\HSR_BFSS\GIS\MXDs\Noise\NoiseLevel_MeasurementLocations_85x11.mxd (11/4/2016)

PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
SOURCE: ESRI (2014); TY Lin (2016)

November 4, 2016

N

0 1 2 Miles

0 1.5 3 Kilometers

Short-Term Measurement Locations
- Between 40.0 - 49.9 dBA L_{eq}
- Between 50.0 - 59.9 dBA L_{eq}
- Between 60.0 - 69.9 dBA L_{eq}
- Between 70.0 - 79.9 dBA L_{eq}

Long-Term Measurement Locations
- Between 50.0 - 59.9 dBA L_{dn}
- Between 60.0 - 69.9 dBA Ldn
- Between 70.0 - 79.9 dBA L_{dn}

Vibration Measurement Location
Alignment Centerline
City Boundary

Figure 3.4-2 Noise and Vibration Level Measurement Locations (North End)

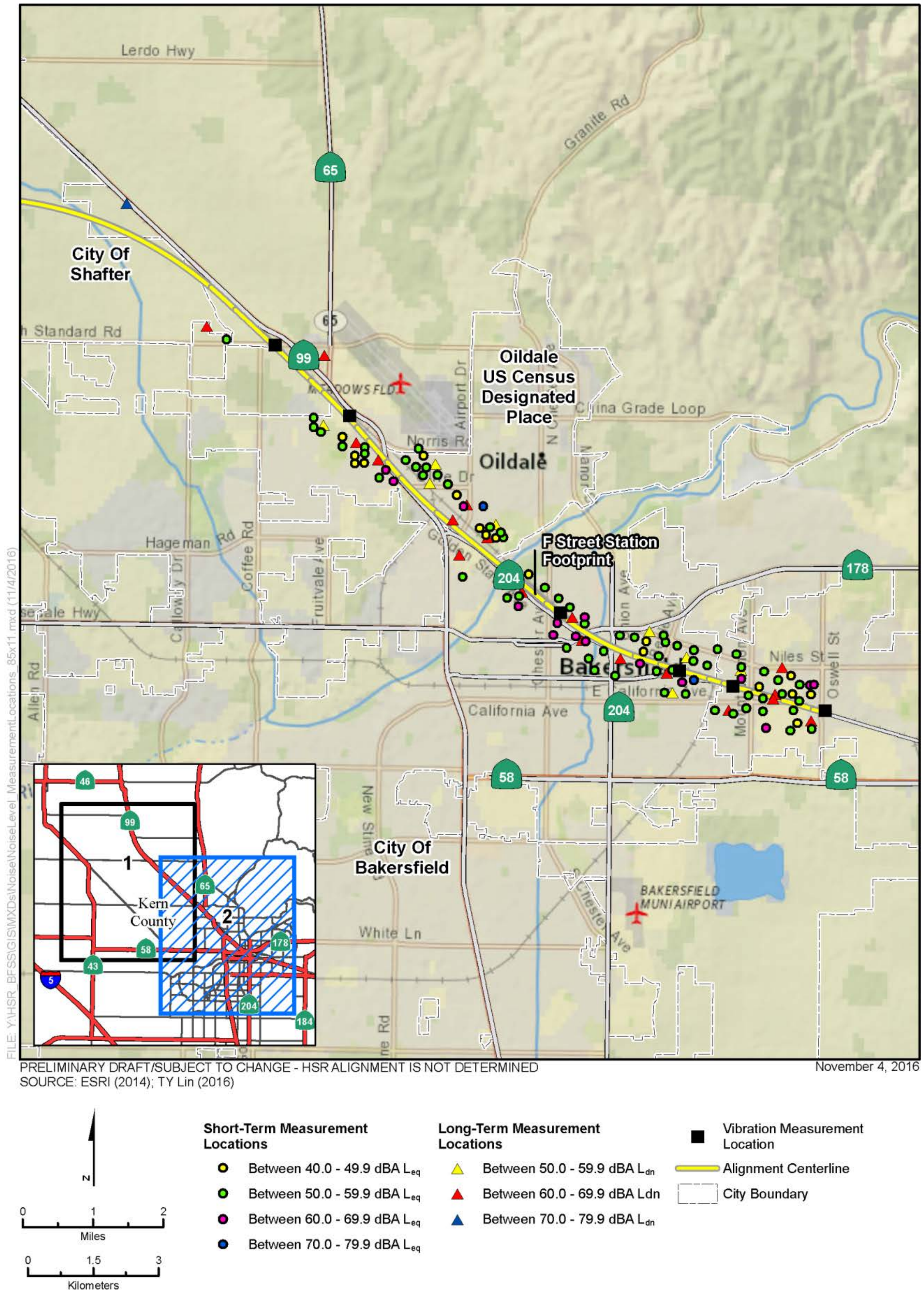


Figure 3.4-3 Noise and Vibration Level Measurement Locations (South End)

Existing Noise Conditions

- The existing noise environment within the project vicinity is dominated by traffic on the local streets, nearby freeways, and train operations along the BNSF Railway (BNSF) and Union Pacific Railroad (UPRR) lines. Noise levels were measured at the noise-sensitive land uses throughout the area, as indicated in Tables 3.4-B-1 and 3.4-B-2 in Appendix 3.4-B, Noise and Vibration Measurements, and the measured noise levels ranged from 48 A-weighted decibels (dBA) L_{dn} along a quiet residential street to 81 dBA L_{dn} near a major roadway. These noise levels are typical for urban settings dominated by vehicular traffic and railroad operations. Below is a detailed description of the existing noise environment within the project vicinity.From Poplar Avenue to Cherry Avenue, the F-B LGA is within the city of Shafter. Land uses in this area are primarily residential and agricultural. The measured ambient noise levels ranged from 48 to 74 dBA L_{dn}. These noise levels are dominated by traffic on local streets, traffic on State Route (SR) 43, and train operations along the BNSF line. From Cherry Avenue to 7th Standard Road, the F-B LGA is within the limits of the city of Shafter and Kern County. Land uses in this area are primarily agricultural. The measured ambient noise levels ranged from 51 to 72 dBA L_{dn}. These noise levels are dominated by traffic on local streets. Tables 3.4-B-1 and 3.4-B-2 in Technical Appendix 3.4-B provide the sources contained in each noise level measurement.
- From 7th Standard Road to Chester Avenue, the F-B LGA is within Kern County and the city of Bakersfield. Land uses in this area are primarily residential, commercial, and industrial. The measured ambient noise levels ranged from 48 to 80 dBA L_{dn}. These noise levels are dominated by traffic on local streets, traffic on SR 99, and train operations along the UPRR line.
- From Chester Avenue to Beale Avenue, the F-B LGA is within the city of Bakersfield. Land uses in this area are primarily residential, commercial, and industrial. The measured ambient noise levels ranged from 50 to 66 dBA L_{dn}. These noise levels are dominated by traffic on local streets, SR 99, and SR 178, and by train operations along the UPRR line.
- From Beale Avenue to Oswell Street, the F-B LGA is within the city of Bakersfield and Kern County. Land uses in this area are primarily residential. The measured ambient noise levels ranged from 51 to 81 dBA L_{dn}. These noise levels are dominated by traffic on local streets and train operations along the UPRR line.

Vibration-Sensitive Receivers

The vibration-sensitive receivers would be similar to the noise-sensitive receivers described in Section 3.4.2.1, except they would be limited to those with sensitive structures within an appropriate screening distance of the F-B LGA, as described in Table 3.4-8.

In general, the noise-sensitive receiver locations with structures that are within the limited vibration screening distance would be a small subset of the list of noise-sensitive receiver locations.

Unlike the FTA/FRA noise impact assessment method, train-related vibration impact thresholds are not dependent on existing ground vibration levels. Therefore, the empirical documentation of existing ground vibration levels is not as critical as for noise levels. However, ground propagation characteristics are inherently variable from one location to another, so it is helpful to collect train-induced ground vibration level data, where available, to assess whether established general train-related ground vibration prediction methods (such as those provided by the FRA) are sufficiently conservative.

Vibration measurements were conducted at a total of eight locations that were representative of actual potentially impacted areas within 220 feet of the F-B LGA and within approximately 260 feet of an existing active rail line. The field vibration data was processed in accordance with the established FTA/FRA impact criteria (i.e., maximum event vibration level) and then compared to the value generated by the FTA general vibration assessment procedure (FTA 2006; page 10-2), (using the Generalized Ground Surface Vibration Curve for “locomotive-powered passenger or freight”).

The vibration level measurement locations are shown on Figure 3.4-2 and Figure 3.4-3. The summary of the vibration level measurement results are provided in Table 3.4-B-3 in Appendix 3.4-B, Noise and Vibration Measurements. Each vibration level measurement includes the measured vibration levels for various train-related vibration events and a comparison to predicted values using the FTA prediction method (FTA 2006; page 10-2). As shown in Table 3.4-B-3 in Appendix 3.4-B, a majority of the measurements were approximately 70 VdB with the highest measured vibration level of 84.1 VdB and the lowest measured vibration level of 62.6 VdB. Vibration measurements were not conducted at the proposed F Street Station because there are no vibration sensitive receptors within the FRA screening distance of 275 feet from the proposed alignment at the proposed F Street Station. Based on the above, vibration levels are not expected to exceed the vibration criteria for vibration sensitive land uses located near the proposed F Street Station.

3.4.4 Environmental Consequences

This section describes the impact analysis relating to noise and vibration for the F-B LGA. Potential noise and vibration impacts that would result from both construction and operation of the F-B LGA were evaluated within the study area.

3.4.4.1 Summary of Analysis for the May 2014 Project

This section provides a summary of those effects of the May 2014 Project using information from the Fresno to Bakersfield Section Final EIR/EIS. The May 2014 Project would create noise impacts during construction. Prior to mitigation, impacts would be significant under CEQA. Mitigation for these impacts (N&V-MM#1) includes noise monitoring during construction and requiring the contractor to implement one or more noise control measures to meet the noise limits prescribed by FTA for construction noise limits, as shown in Table 3.4-1. Following implementation of mitigation measures, temporary impacts related to construction noise would be less than significant under CEQA.

Building damage from construction vibration is only anticipated from impact pile driving very close to buildings; impacts would be of moderate intensity. Damage from construction vibration is not anticipated if pile driving takes place more than 25 to 50 feet from buildings or if alternative methods, such as push driving or auger installation, can be used. Mitigation includes pre-construction surveys to document the existing condition of buildings located within 50 feet of pile installation and using methods other than a hammer to install piles close to buildings that could be damaged by vibration. Impacts from construction vibration would be significant under CEQA. However, arrangement for the repair of damaged buildings or compensation paid to the property owner would reduce impacts from construction vibration to less than significant under CEQA.

The May 2014 Project would result in operational noise impacts. Slab track was assumed to be 3 dBA louder than ballast and tie track; therefore, slab track may result in additional noise impacts. Prior to mitigation, impacts would be significant under CEQA. Mitigation for operational noise includes the installation of sound barriers, vehicle noise specifications, special track work at crossovers and turnouts, and additional noise analysis during final design. In some locations, operational noise impacts would be significant under CEQA even after implementation of mitigation measures.

In addition, no sensitive vibration receivers would be subject to impacts from project operations. Therefore, vibration levels generated from project operations would be less than significant under CEQA.

3.4.4.2 Fresno to Bakersfield Locally Generated Alternative

Impact N&V #1 – Construction Noise

Rail Corridor Construction

The detailed FRA construction noise criteria were used to evaluate potential noise impacts from the construction of the proposed project. As discussed in Section 3.4.2.3, the detailed FRA construction noise criteria are the same as the detailed FTA construction noise criteria. Two types of short-term noise impacts would occur during the rail corridor construction. The first type would be from construction crew commutes. Also, the transport of construction equipment and materials to the project site as part of the rail corridor construction would incrementally raise noise levels on local roads leading to the site. The pieces of construction equipment would be moved on-site, where they would remain for the duration of each construction phase, and would not add to the daily traffic volumes in the project vicinity. The projected construction traffic volume would be minimal when compared to existing traffic volumes on affected local streets. Therefore, potential noise impacts from short-term construction-related worker commutes and equipment transport would be less than significant under CEQA.

The second type of short-term noise impact is related to noise generated during rail corridor construction. Construction of the HSR corridor consists of seven construction phases that make up the construction schedule: mobilization, demolition, land clearing, earthmoving, road and canal overcrossing, track construction, and demobilization. Each phase has a unique set of construction equipment that will be utilized. Table 3.4-B-4 in Appendix 3.4-A, Noise and Vibration, provides a complete list of the construction equipment that will be used for each phase of construction for the F-B LGA. In addition to the construction equipment list, pile driving may be used for road and canal overcrossing and track construction. Table 3.4-9 lists typical maximum construction equipment noise levels (L_{max}) recommended for use in noise impact assessments based on a distance of 50 feet between the equipment and a noise receiver.

Table 3.4-9 Typical Construction Equipment Noise Levels

Equipment Description	Spec 721.560[1] L_{max} at 50 feet	Actual Measured[2] L_{max} at 50 feet
All Other Equipment > 5 HP	85	85
Auger Drill Rig	85	84
Backhoe	80	78
Crane	85	81
Dozer	85	82
Drill Rig Truck	84	79
Dump Truck	84	76
Excavator	85	81
Flat-Bed Truck	84	74
Front-End Loader	80	79
Grader	85	85
Impact Pile Driver	95	101
Jackhammer	85	89
Man Lift	85	75
Mounted Impact Hammer (hoe ram)	90	90
Paver	85	77
Pickup Truck	55	75

Equipment Description	Spec 721.560[1] L_{max} at 50 feet	Actual Measured[2] L_{max} at 50 feet
Pneumatic Tools	85	85
Pumps	77	81
Rock Drill	85	81
Roller	85	80
Sand Blasting (single nozzle)	85	96
Scraper	85	84
Shears (on backhoe)	85	96
Slurry Plant	78	78
Slurry Trenching Machine	82	80
Tractor	84	84
Vacuum Excavator (vac-truck)	85	85
Vacuum Street Sweeper	80	82
Impact Pile Driver	95	101

Source: Authority and FRA, 2017

[1] Maximum noise levels were developed based on Spec 721.560 from the Central Artery/Tunnel program to be consistent with the City of Boston's Noise Code for the "Big Dig" project.

[2] The maximum noise level was developed based on the average noise level measured for each piece of equipment during the Central Artery/Tunnel program in Boston, Massachusetts.

Note: The noise levels reported in this table are rounded to the nearest whole number.

HP = horsepower

L_{max} = maximum instantaneous noise level

Table 3.4-10 summarizes the distance to construction noise impact thresholds for daytime and nighttime work for each phase of construction when a small set of construction equipment was assumed to operate simultaneously as a worst-case scenario. As shown in Table 3.4-10, residences located up to 156 feet from the construction boundary (without pile driving) would be exposed to noise levels greater than the detailed Federal Rail Administration (FRA) construction noise criteria of 80 dBA L_{eq} during daytime hours. There are 105 residences located within 156 feet from the rail corridor footprint. Residences located up to 493 feet from the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 70 dBA L_{eq} during nighttime hours. If pile driving is required and is conducted simultaneously with other construction, residences located up to 316 feet from the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 80 dBA L_{eq} during daytime hours. There are 443 residences located within 316 feet from the rail corridor footprint. Residences located up to 998 feet from the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 70 dBA L_{eq} during nighttime hours. Even though these impacts are temporary during construction, potential noise impacts would be significant under CEQA. If pile driving is required, the potential noise impacts would be significant under CEQA. The implementation of mitigation measures N&V-MM#1 would reduce potential noise impacts to less than significant under CEQA.

Table 3.4-10 Distances to Federal Railroad Administration Noise Impact Contours from Construction Activities for the High-Speed Rail Corridor

Construction Activity	Daytime[1] 80 dBA L_{eq} (feet)	Nighttime[2] 70 dBA L_{eq} (feet)
Mobilization	80	253
Demolition	63	199
Land Clearing	156	493
Earthmoving	141	447
Road and Canal Overcrossing	143	454
Road and Canal Overcrossing (with pile driving)	316	998
Track Construction		
At-Grade Track	50	158
Elevated Track	113	357
Elevated Structure	134	424
Track Construction (with pile driving)		
At-Grade Track	286	903
Elevated Track	303	958
Elevated Structure	311	985
Demobilization	113	357

Source: Authority and FRA, 2017
[1] Daytime hours are 7:00 a.m. to 10:00 p.m.
[2] Nighttime hours are 10:00 p.m. to 7:00 a.m.
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level

Schools

Schools located along the HSR alignment and HSR stationary facilities would be exposed to construction-related noise. The transport of construction equipment and materials to the project site as part of the rail corridor construction or HSR stationary facilities would incrementally raise noise levels on local roads leading to the site. The pieces of construction equipment would be moved on-site, where they would remain for the duration of each construction phase and would not add to the daily traffic volumes in the project vicinity. The projected construction traffic volume would be minimal when compared to existing traffic volumes on affected local streets. Therefore, potential noise impacts at schools within the project area from short-term construction-related worker commutes and equipment transport would be less than significant under CEQA.

As shown in Table 3.4-10, schools located up to 156 feet from the construction boundary (without pile driving) would be exposed to noise levels greater than the detailed FRA construction noise criteria of 80 dBA L_{eq} during daytime hours. There are no schools located within 156 feet from the rail corridor footprint. If pile driving is required and is conducted simultaneously with other construction, schools located up to 316 feet from the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 80 dBA L_{eq} during daytime hours. Schools would not be impacted during nighttime hours because they would not be in operation. Even though these impacts are temporary during construction, potential noise impacts would be significant under CEQA. If pile driving is required, the potential noise impacts would be significant under CEQA. The implementation of mitigation measures N&V-MM#1 would reduce potential noise impacts to less than significant under CEQA.

The following construction noise analysis is provided due to the availability of project specific information and more detailed construction information. In addition, the construction of the following HSR facilities may or may not coincide with the construction of the rail corridor.

Elevated BNSF Construction

Potential construction noise impacts from constructing the elevated BNSF railway would be similar to the construction noise impacts from high-speed rail corridor track construction, as discussed above. Table 3.4-10 shows the noise impact distance to the daytime noise threshold of the detailed FRA construction noise criteria of 80 dBA L_{eq} and the nighttime threshold of the detailed FRA construction noise criteria of 70 dBA L_{eq} from the construction boundary for each construction phase. As shown in Table 3.4-10, residences and schools located up to 156 feet from the construction boundary (without pile driving) would be exposed to noise levels greater than the detailed FRA construction noise criteria of 80 dBA L_{eq} during daytime hours. There are 12 residences and no schools located within 156 feet from the environmental footprint (without pile driving). Residences located up to 493 feet from the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 70 dBA L_{eq} during nighttime hours (without pile driving). There are 244 residences located within 493 feet from the elevated BNSF footprint. If pile driving is required and is conducted simultaneously with other construction, residences and schools located up to 316 feet from the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 80 dBA L_{eq} during daytime hours. There are 100 residences and no schools located within 316 feet from the elevated BNSF footprint. Residences located up to 998 feet from the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 70 dBA L_{eq} during nighttime hours. There are 842 residences located within 998 feet from the elevated BNSF footprint. Schools would not be impacted during nighttime hours because they would not be in operation. Even though these impacts are temporary during construction, potential noise impacts would be significant under CEQA. If pile driving is required, the potential noise impacts would be significant under CEQA. The implementation of mitigation measures N&V-MM#1 would reduce potential noise impacts to less than significant under CEQA.

Roadway Construction

The proposed F-B LGA would improve a number of local roadways in the project vicinity. Some roadway improvements are considered minor while others are considered more extensive, such as grade separations. Below is a list of roadways that would be improved as part of the proposed F-B LGA.

- Grade Separation at Poplar Avenue
- Grade Separation at Riverside Street
- Interchange at SR 99/7th Standard Road
- Interchange at SR 204/F Street
- Intersection Modification at Tulare Avenue and Shafter Avenue
- Intersection Modification at Chester Avenue and 34th Street
- Intersection Modification at E Los Angeles Street and Beech Avenue
- Edison Highway between Mount Vernon Avenue and south of Oswell Street
- Central Avenue
- Coffee Road
- Fresno Avenue
- State Road (North and South)

Construction crew commutes and the transport of construction equipment and materials to each roadway improvement site would incrementally raise noise levels on local roads leading to the site. The pieces of construction equipment would be moved on-site, where they would remain for the duration of the construction phase, and therefore would not add to the daily traffic volumes in the project vicinity. Projected construction traffic volumes would be minimal when compared to existing traffic volumes on affected local streets and therefore would not result in a perceptible change in noise. Therefore, potential noise impacts from short-term construction-related worker commutes and equipment transport would be less than significant under CEQA.

Roadway construction activity would be similar to typical noise levels from construction activities for public works projects described in the *Fresno to Bakersfield Section Noise and Vibration Technical Report* (Authority and FRA 2014a: page 8-1). As shown in Table 8-1 in the Fresno to Bakersfield Section Noise and Vibration Technical Report (Authority and FRA 2014a), construction activities would generate noise levels up to 89 dBA L_{eq} at a distance of 50 feet. Table 3.4-11 shows that residences and schools within 143 feet of the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 80 dBA L_{eq} during daytime hours. There are 108 residences and two schools located within 143 feet from the footprint of roadway improvements. Residences within 454 feet of the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 70 dBA L_{eq} during nighttime hours. There are 1,057 residences located within 454 feet from the footprint of roadway improvements. Schools would not be impacted during nighttime hours because they would not be in operation. Residences and schools within these distances would be exposed to noise generated from construction activities that is greater than the recommended detailed FRA construction noise criteria. If pile driving is required for the grade separation projects, and if it is conducted simultaneously with operation of other pieces of construction equipment, noise levels would reach up to 96 dBA L_{eq} at a distance of 50 feet. Table 3.4-11 shows that residences and schools within 316 feet of the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 80 dBA L_{eq} during daytime hours. There are 624 residences and three schools located within 316 feet from the footprint of roadway improvements. Residences within 998 feet of the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 70 dBA L_{eq} during nighttime hours. There are 3,470 residences located within 998 feet from the footprint of roadway improvements. As mentioned above, no noise impacts would occur at schools during nighttime hours. Residences and schools within these distances would be exposed to noise generated from construction activities that is greater than the recommended FRA construction noise criteria. Even though these impacts are temporary during construction, potential noise impacts would be significant under CEQA. If pile driving is required, the potential noise impacts would be significant under CEQA. The implementation of mitigation measures N&V-MM#1 would reduce potential noise impacts to less than significant under CEQA.

Table 3.4-11 Distances to Federal Railroad Administration Noise Impact Contours from Roadway Construction Activities

Construction Activity	Daytime[1] 80 dBA L_{eq} (feet)	Nighttime[2] 70 dBA L_{eq} (feet)
Roadway Construction	143	454
Roadway Construction (with pile driving)	316	998

Source: Authority and FRA, 2017
[1] Daytime hours are 7:00 a.m. to 10:00 p.m.
[2] Nighttime hours are 10:00 p.m. to 7:00 a.m.
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level

F Street Station

Construction of the F-Street Station is anticipated to take 21 months to complete. The list of construction equipment for the F-Street Station is provided in Table 3.4-A-4 in Appendix 3.4-A, Noise and Vibration. Construction crew commutes and the transport of construction equipment and materials to the project site would incrementally raise noise levels on local roads leading to the site. The pieces of construction equipment would be moved on-site, where they would remain for the duration of each construction phase, and would not add to the daily traffic volumes in the project vicinity. However, the projected construction traffic volume would be minimal when compared to existing traffic volumes on affected local streets and the change in noise would not be perceptible. Therefore, potential noise impacts from short-term construction-related worker commutes and equipment transport would be less than significant under CEQA.

Assuming a small set of construction equipment that would operate simultaneously as a worst-case scenario, the worst-case composite noise level during this phase of construction would be 87 dBA L_{eq} at a distance of 50 feet from the construction boundary. Table 3.4-12 shows that residences and schools within a distance of 112 feet from the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 80 dBA L_{eq} during daytime hours. There are no residences and schools located within 112 feet from the F Street Station footprint. Residences within a distance of 353 feet from the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 70 dBA L_{eq} during nighttime hours. There are 58 residences located within 353 feet from the F Street Station footprint. Schools would not be impacted during nighttime hours because they would not be in operation. Residences and schools within these distances from the construction boundary would be impacted by noise generated from construction-related activities that is greater than the recommended detailed FRA construction noise criteria. Even though these impacts are temporary during construction potential noise impacts would be significant under CEQA. However, the implementation of mitigation measure N&V-MM#1 would reduce potential noise impacts to less than significant under CEQA.

Table 3.4-12 Distances to Federal Railroad Administration Noise Impact Contours from Station Construction Activities

Construction Activity	Daytime[1] 80 dBA L_{eq} (feet)	Nighttime[2] 70 dBA L_{eq} (feet)
F Street Station Construction	112	353

Source: Authority and FRA, 2017
[1] Daytime hours are 7:00 a.m. to 10:00 p.m.
[2] Nighttime hours are 10:00 p.m. to 7:00 a.m.
dBA = A-weighted decibels L_{eq} = equivalent continuous sound level

Maintenance of Infrastructure Facility

Construction of the proposed MOIF is anticipated to take nine months to complete. The list of construction equipment for the proposed MOIF is provided in Table 3.4-A-4 in Appendix 3.4-A, Noise and Vibration. Construction crew commutes and the transport of construction equipment and materials to the project site would incrementally raise noise levels on local roads leading to the site. The pieces of construction equipment would be moved on-site, where they would remain for the duration of each construction phase, and would not add to the daily traffic volumes in the project vicinity. However, the projected construction traffic volume would be minimal when compared to existing traffic volumes on affected local streets and therefore would not result in a perceptible change in noise. Therefore, potential noise impacts from short-term construction-related worker commutes and equipment transport would be less than significant under CEQA.

Assuming a small set of construction equipment that would operate simultaneously as a worst-case scenario, the worst-case composite noise level during this phase of construction would be 88 dBA L_{eq} at a distance of 50 feet from the construction boundary. Table 3.4-13 shows that residences and schools within a distance of 122 feet from the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 80 dBA L_{eq} during daytime hours. There are no residences and schools located within 122 feet from the MOIF footprint. Residences within a distance of 385 feet from the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 70 dBA L_{eq} during nighttime hours. There are nine residences located within 385 feet from the MOIF footprint. Schools would not be impacted during nighttime hours because they would not be in operation. Residences and schools within these distances from the construction boundary would be impacted by noise generated from construction-related activities that is greater than the recommended detailed FRA construction noise criteria. Even though these impacts are temporary during construction, potential noise impacts would be significant under CEQA. However, the implementation of mitigation measure N&V-MM#1 would reduce potential noise impacts to less than significant under CEQA.

Table 3.4-13 Distances to Federal Railroad Administration Noise Impact Contours from MOIF Construction Activities

Construction Activity	Daytime[1] 80 dBA L_{eq} (feet)	Nighttime[2] 70 dBA L_{eq} (feet)
MOIF Construction	122	385

Source: Authority and FRA, 2017
[1] Daytime hours are 7:00 a.m. to 10:00 p.m.
[2] Nighttime hours are 10:00 p.m. to 7:00 a.m.
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level

Traction Power Supply Station

Construction of the traction power supply station (TPSS) is anticipated to take 19 months to complete. TPSS are located along the F-B LGA at approximately 5-mile intervals beginning near E Los Angeles Avenue and continuing south. The list of construction equipment for the TPSS is provided in Table 3.4-A-4 in Appendix 3.4-A, Noise and Vibration. Construction crew commutes and the transport of construction equipment and materials to the project site would incrementally raise noise levels on local roads leading to the site. The pieces of construction equipment would be moved on-site, where they would remain for the duration of each construction phase, and would not add to the daily traffic volumes in the project vicinity. However, the projected construction traffic volume would be minimal when compared to existing traffic volumes on affected local streets and therefore would not result in a perceptible change in noise. Therefore, potential noise impacts from short-term construction-related worker commutes and equipment transport would be less than significant under CEQA.

Assuming a small set of construction equipment that would operate simultaneously as a worst-case scenario, the worst-case composite noise level during this phase of construction would be 90 dBA L_{eq} at a distance of 50 feet from the construction boundary. Table 3.4-14 shows that residences and schools within a distance of 178 feet from the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 80 dBA L_{eq} during daytime hours. There are 18 residences and no schools located within 178 feet from the TPSS footprint. Residences within a distance of 562 feet from the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 70 dBA L_{eq} during nighttime hours. There are 165 residences and no schools located within 562 feet from the TPSS footprint. Schools would not be impacted during nighttime hours because they would not be in operation. Residences and schools within these distances from the construction boundary would be impacted by noise generated from construction-related activities that is greater than the recommended detailed FRA construction noise criteria. Even though these impacts are temporary during construction, potential noise impacts would be significant under CEQA. However, the implementation of mitigation measure N&V-MM#1 would reduce potential noise impacts to less than significant under CEQA.

Table 3.4-14 Distances to Federal Railroad Administration Noise Impact Contours from TPSS Construction Activities

Construction Activity	Daytime[1] 80 dBA L_{eq} (feet)	Nighttime[2] 70 dBA L_{eq} (feet)
TPSS Construction	178	562

Source: Authority and FRA, 2017
[1] Daytime hours are 7:00 a.m. to 10:00 p.m.
[2] Nighttime hours are 10:00 p.m. to 7:00 a.m.
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level

Electric Power Utility Improvements

Construction crew commutes and the transport of construction equipment and materials to the project site would incrementally increase noise levels on local roads leading to the site. The pieces of construction equipment would be moved on-site, where they would remain for the duration of each construction phase, and would not add to the daily traffic volumes in the project vicinity. However, the projected construction traffic volume would be minimal when compared to existing traffic volumes on affected local streets and therefore would not result in a perceptible change in noise. Therefore, potential noise impacts from short-term construction-related worker commutes and equipment transport would be less than significant under CEQA

Assuming a dozer, drill rig, flatbed truck, crane, and a concrete mixer truck would be used to perform electric power utility improvements and would operate simultaneously as a worst-case scenario, the worst-case composite noise level during this phase of construction would be 87 dBA L_{eq} at a distance of 50 feet from the construction boundary. Table 3.4-15 shows that residences and schools within a distance of 108 feet from the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 80 dBA L_{eq} during daytime hours. There are 33 residences and no schools located within 108 feet from the electric power utility improvements footprint. Residences within a distance of 342 feet from the construction boundary would be exposed to noise levels greater than the detailed FRA construction noise criteria of 70 dBA L_{eq} during nighttime hours. There are 250 residences located within 108 feet from the electric power utility improvements footprint. Schools would not be impacted during nighttime hours because they would not be in operation. Residences and schools within these distances from the construction boundary would be impacted by noise generated from construction-related activities that is greater than the recommended detailed FRA construction noise criteria. Even though these impacts would be temporary during construction, potential noise impacts would be significant under CEQA. However, the implementation of mitigation measure N&V-MM#1 would reduce potential noise impacts to less than significant under CEQA.

Table 3.4-15 Distances to Federal Railroad Administration Noise Impact Contours from Electric Power Utility Improvements

Construction Activity	Daytime[1] 80 dBA L_{eq} (feet)	Nighttime[2] 70 dBA L_{eq} (feet)
Electric Power Utility Improvements	108	342

Source: Authority and FRA, 2017
[1] Daytime hours are 7:00 a.m. to 10:00 p.m.
[2] Nighttime hours are 10:00 p.m. to 7:00 a.m.
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level

Impact N&V #2 – Construction Vibration

Rail Corridor Construction

The FRA construction vibration damage criteria shown in Table 3.4-2 were used to evaluate potential vibration impacts from the construction of the proposed project. During construction of the HSR project, construction equipment has the potential to increase ground-borne vibration levels near sensitive receivers. For construction-related vibration, the FRA manual provides some vibration source levels for various pieces of construction equipment, which are listed in Table 3.4-16. Table 3.4-16 shows the peak particle velocity (PPV) in inches per second (in/sec) and the corresponding root-mean-square velocity level (L_v) in vibration velocity decibels (VdB) at a distance of 25 feet for each type of construction equipment.

Table 3.4-16 Vibration Source Levels for Construction Equipment

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

Source: FRA, 2012
[1] RMS VdB re 1 micro in/sec.
in/sec = inches per second
Lv = RMS velocity level
PPV = peak particle velocity
RMS = root-mean-square
VdB = vibration velocity decibels

Based on the equations provided below, the distances within which annoyance or interference would occur with vibration-sensitive activities were calculated for each of the three-land use categories defined in Table 3.4-4 and are shown in Table 3.4-17. In addition, the distances within which the damage criteria of 0.12 PPV (in/sec) for buildings that are extremely susceptible to vibration damage and the damage criteria of 0.20 PPV (in/sec) for buildings constructed of non-engineered timber and masonry were calculated and are shown in Table 3.4-18. Fragile or historic structures are extremely susceptible to vibration damage. Wood-frame structures are buildings constructed of non-engineered timber and masonry, such as residential structures.

$$PPV_{equip} = PPV_{ref} \times \left(\frac{25}{D}\right)^{1.5}$$

and

$$L_v(D) = L_v(25\,ft) - 30\log\left(\frac{D}{25}\right)$$

Table 3.4-17 Distances to Construction Vibration Annoyance Criteria

Construction Equipment	Vibration Source Level (approximate L_v at 25 feet)	Approximate Vibration Impact Distance to 65 VdB for Category 1[1] Land Use (feet)	Approximate Vibration Impact Distance to 72 VdB for Category 2[2] Land Use (feet)	Approximate Vibration Impact Distance to 75 VdB for Category 3[3] Land Use (feet)
Pile Driver (impact)	104	499	291	232
Caisson Drilling	87	135	79	63
Large Bulldozer	87	135	79	63

Source: Authority and FRA, 2017
[1] Category 1 comprises buildings where vibration would interfere with interior operations. The distances are from the location of construction activity for the specific construction equipment.
[2] Category 2 comprises residences and buildings where people normally sleep. The distances are from the location of construction activity for the specific construction equipment.
[3] Category 3 comprises institutional land uses with primarily daytime use. The distances are from the location of construction activity for the specific construction equipment.
Lv = root-mean-square vibration level VdB = vibration velocity decibels

Table 3.4-18 Distances to Construction Vibration Damage Criteria

Source	Vibration Source Level PPV at 25 feet (in/sec)	Approximate Vibration Impact Distance to 0.12 PPV (feet)[1]	Approximate Vibration Impact Distance to 0.2 PPV (feet)[2]
Pile Driver (impact)	0.644	77	55
Caisson Drilling	0.089	20	15
Large Bulldozer	0.089	20	15

Source: Authority and FRA, 2017
[1] Vibration damage threshold for buildings that are extremely susceptible to vibration damage, such as fragile or historic structures.
[2] Vibration damage threshold for buildings that are constructed of non-engineered timber and masonry, such as residential structures.
in/sec = inches per second PPV = peak particle velocity

The list of construction equipment for all phases of rail corridor construction is provided in Table 3.4-B-4 in Appendix 3.4-B, Noise and Vibration. Because pile driving, caisson drilling, or bulldozing are not anticipated under the mobilization, demolition, land clearing, earthmoving, and demobilization phase, no vibration impacts would occur under these phases.

Pile driving may be required during the road and canal overcrossing and track construction (at-grade track, elevated track, and elevated structure) phase. Land uses located within the distances of road and canal overcrossing construction activities shown in Table 3.4-17 would experience annoyance or interference with vibration-sensitive activities. In addition, as shown in Table 3.4-18, fragile or historic structures located within 77 feet or residential structures within 55 feet of pile driving would experience vibration levels that exceed the construction damage criteria. Because vibration-sensitive structures are located within the distances mentioned above from rail corridor construction that would exceed the construction damage criteria, potential vibration impacts would be significant under CEQA. However, the implementation of mitigation measure N&V-MM#2, which requires the use of alternative methods to pile driving, such as cast-in-drilled hole, would reduce potential vibration impacts to less than significant under CEQA.

Schools

The construction of the HSR rail corridor anticipates the use of pile driving, caisson drilling, and bulldozing. As all schools within the project area would be located more than 232 feet from the construction of the HSR rail corridor, construction-related vibration levels would not result in annoyance or damage to school structures. No vibration impacts from construction-related activities would occur. Therefore, potential vibration impacts would be less than significant under CEQA.

The following construction vibration analysis is provided due to the availability of project specific information and more detailed construction information. In addition, the construction of the following HSR facilities may or may not coincide with the construction of the rail corridor.

Elevated BNSF Construction

Potential construction vibration impacts for elevating the BNSF railway would be similar to the construction vibration impacts for the high-speed rail corridor construction, as discussed above. Therefore, as vibration-sensitive structures are located within the distances mentioned above from rail corridor construction that would exceed the construction damage criteria, potential vibration impacts would be significant under CEQA. However, the implementation of mitigation measure N&V-MM#2, which requires the use of alternative methods to pile driving, such as cast-in-drilled hole, would reduce potential vibration impacts to less than significant under CEQA.

Roadway Construction

Roadway construction would likely use a bulldozer and may require the use of pile drivers. Land uses located within the distances shown in Table 3.4-17 for bulldozing and pile driving would experience annoyance or interference with vibration-sensitive activities. In addition, bulldozing and pile driving activities within the distances shown in Table 3.4-18 would damage building structures. The location of bulldozing associated with roadway construction would occur near the construction boundary. As schools, residences, and other noise sensitive land uses would be located within 63 feet to 135 feet of bulldozing, vibration levels generated from bulldozing would result in annoyance. However, schools and residences would not be located within 20 feet of bulldozer driving, and fragile or historic structures would not be located within 15 feet of bulldozing activities. Therefore, no vibration impacts would occur from vibration levels generated by bulldozing activities.

In addition, the location of pile driving associated with roadway construction would typically occur at the location of the roadway structure and would not be located near the construction boundary. As schools, residences, and other noise sensitive land uses would be located within 232 feet to 499 feet of pile driving, vibration levels generated from pile driving would result in annoyance. However, schools and residences would not be located within 55 feet of pile driving, and fragile or historic structures would not be located within 77 feet of pile driving. Therefore, no vibration impacts would occur from vibration levels generated by pile driving activities. Therefore, potential vibration impacts would be less than significant under CEQA.

F Street Station

The list of construction equipment for the proposed F Street Station is provided in Table 3.4-A-4 in Appendix 3.4-A, Noise and Vibration. Drilling and pile driving are not anticipated under this phase. However, bulldozing is anticipated, and land uses located within the distances shown in Table 3.4-17 would experience annoyance or interference with vibration-sensitive activities. In addition, as shown in Table 3.4-18, fragile or historic structures located within 20 feet or residential structures within 15 feet of bulldozing activities would experience vibration levels that exceed the construction damage criteria. There are no residential or fragile structures located within the distances shown in Table 3.4-18. Therefore, the construction of the proposed F Street Station would not result in damage to residential or fragile structures, and no vibration impacts from construction-related activities would occur. Therefore, potential vibration impacts from the construction of the proposed F Street Station would be less than significant under CEQA.

The construction of the proposed F Street Station anticipates bulldozing, but not drilling or pile driving. As all schools within the project area would be located more than 63 feet from the construction of the proposed F Street Station, construction-related vibration levels would not result in annoyance or damage to school structures. No vibration impacts from construction-related activities would occur. Potential vibration impacts from the construction of the proposed F Street Station would be less than significant under CEQA.

Maintenance of Infrastructure Facility

The list of construction equipment for the proposed MOIF is provided in Table 3.4-A-4 in Appendix 3.4-A, Noise and Vibration. Because pile driving, caisson drilling, or bulldozing are not anticipated, no vibration impacts would occur. Therefore, potential vibration impacts from the construction of the proposed MOIF would be less than significant under CEQA.

In addition, as the construction of the proposed MOIF would not anticipate pile driving, caisson drilling, or bulldozing, construction-related vibration levels would not result in annoyance or damage to school structures. No vibration impacts from construction-related activities would occur. Potential vibration impacts from the construction of the proposed MOIF would be less than significant under CEQA.

Traction Power Supply Station

The list of construction equipment for the proposed TPSS is provided in Table 3.4-A-4 in Appendix 3.4-A, Noise and Vibration. Because pile driving, caisson drilling, or bulldozing are not anticipated, no vibration impacts would occur. Therefore, potential vibration impacts from the construction of the proposed TPSS would be less than significant under CEQA.

In addition, as the construction of the proposed TPSS would not anticipate pile driving, caisson drilling, or bulldozing, construction-related vibration levels would not result in annoyance or damage to school structures. No vibration impacts from construction-related activities would occur. Potential vibration impacts from the construction of the proposed TPSS would be less than significant under CEQA.

Electric Power Utility Improvements

Electric power utility improvements would require the use of drilling and bulldozing, and land uses located within the distances shown in Table 3.4-17 would experience annoyance or interference with vibration-sensitive activities. In addition, as shown in Table 3.4-18, fragile or historic structures located within 20 feet or residential structures within 15 feet of drilling or bulldozing activities would experience vibration levels that exceed the construction damage criteria. Since the location of proposed electric power utility improvements are currently not available, potential vibration impacts are based on the distance in which damage would occur. Therefore, if land uses are located within the distances shown in Table 3.4-18, potential vibration impacts from the construction of the proposed electric power utility improvements would be significant under CEQA. However, the implementation of mitigation measure N&V-MM#2, which requires the use of alternative methods to pile driving, such as cast-in-drilled hole, would reduce potential vibration impacts to less than significant under CEQA.

The construction of the proposed electric power utility improvements at most anticipates drilling and bulldozing, but not pile driving. As all schools within the project area would be located more than 63 feet from the construction of the proposed electric power utility improvements, construction-related vibration levels would not result in annoyance or damage to school structures. No vibration impacts from construction-related activities would occur and no mitigation measures are required.

Impact N&V #3 – Moderate and Severe Noise Impacts from Project Operation to Sensitive Receivers

Table 3.4-19 summarizes the design speed parameters presented in the Fresno to Bakersfield Section Final EIR/EIS and were the basis of assumptions for modelling model future with project noise levels. This data includes the type of HSR car to be modeled, the number of cars per train, the length of the train, the number of operations expected throughout the day, and the basic track geometries for the at-grade and aerial portions of the project alignment. Note that any change in the number of operations, particularly during nighttime hours, will result in a change in predicted noise levels. The reference noise data used to model the HSR operations were taken from the High-Speed Electric-Multiple-Unit systems for the propulsion and wheel rail sources and the Very-High-Speed Electric systems for the aerodynamic source. A specific speed profile for the entire project alignment was not available. Therefore, in order to conduct the most conservative analysis, the speed of the trains was assumed to be 220 mph along the entire project corridor for all trains (as was done in the Fresno to Bakersfield Section Final EIR/EIS) even though trains would reduce their speed when approaching or departing from stations or may have designated speeds at certain sections of the alignment. For example, the BNSF Bakersfield Alternative between Union Avenue and Mount Vernon under the May 2014 Project would have a reduced speed of 125 to 150 mph. Any changes to the speeds of the modeled operations would result in a change in the corresponding noise impacts. It is assumed that the HSR track would be constructed of ballast and slab track with continuous welded rail, which is consistent with the assumptions in the FRA Guidance Manual (FRA 2012). If slab construction would be used for structures exceeding 1,000 feet in length and where operating speeds are planned for 220 mph operations, noise emanating from trains operating on a slab-track system would be approximately 3 dBA louder than noise from trains operating on a ballast-and-tie track system because of the decreased acoustic absorption compared to that provided by the ballast and changes to the track stiffness.

Table 3.4-19 HSR Operational and Geometric Assumptions

Parameter	Value
Number of Cars per Train	8
Number of Powered Cars per Train	8
Car Length	82.5 feet
Train Length	660 feet
Number of Daytime Operations	188
Number of Nighttime Operations	37
Number of Peak-Hour Trains	24
Maximum Speed	220 mph
Track Geometry	Two-track; 16.5 feet on center
Geometric Cross-Sections	Two types: at-grade and aerial
Near Track to Noise Barrier – At-Grade	21.5 feet
Near Track to Noise Barrier – Aerial	15.5 feet

Source: Authority and FRA, 2017
HSR = high-speed rail   mph = miles per hour

The projected HSR noise levels were calculated at each noise measurement location along the project alignment using the operational assumptions listed above. The calculated noise levels were then compared to the measured noise levels at each location, and the moderate impact and severe impact distances were determined under the FRA noise impact criteria shown in Figure 3.4-1. Noise modeling projections do not include the effects of atmospheric absorption. However, using atmospheric absorption of sound based on the International Organization for

Standardization's ISO 9613-2 would result in an additional 1 dBA drop in noise level per 1,000 feet from the F-B LGA alignment.

A detailed noise impact analysis was conducted for the proposed project using FRA methodology as discussed in Section 3.2.1.3 of the Fresno to Bakersfield Noise and Vibration Technical Report (page 3-6). Noise impacts using the FRA methodology are determined by the increase in noise exposure levels attributed to the proposed project based on the existing noise environment.

A preliminary noise impact analysis was conducted for the long-term and short-term measurement locations to show potential noise impacts within the project vicinity. The measured existing noise level and project noise level were used to determine the total noise level and the project-related noise level increase at each measurement location. The results of the impact analysis for the long-term and short-term measurement locations under the F-B LGA, along with various parameters used to determine the noise impact, are shown in Table 5 in Appendix 3.4-A, Noise and Vibration. These parameters include the track elevation, receiver base elevation, land use, land use category, existing noise level, project noise level unmitigated, total noise level unmitigated, noise level increase, and FRA impact. The noise levels shown in Table 5 in Appendix 3.4-A, Noise and Vibration, are described in either L_{dn} or L_{eq} depending on the land use category. For land use categories 1 and 3, the noise descriptor is L_{eq}; the noise descriptor for land use category 2 is L_{dn}. The existing noise, project noise level (unmitigated), and total noise level (unmitigated) were rounded to the nearest whole number. Also, Table 3.4-A-5 in Appendix 3.4-A, Noise and Vibration, provides the calculated distances to the moderate and severe impacts for each measurement location for generalization purposes.

The existing noise levels at noise-sensitive receivers were established using the representative long-term and short-term measurement results. The existing noise levels for some of the noise-sensitive receivers were averaged from the long-term and short-term noise level measurements to obtain a general background noise level for areas that would have similar noise environments. The project noise levels were calculated at each noise-sensitive receiver location (a total of 13,836 noise-sensitive receivers) to determine the total noise level and the project-related noise level increase. Table 3.4-20 summarizes the results of the noise impact analysis without mitigation by reporting the number of impacted noise-sensitive receivers based on their land use category and their noise impact classification (either moderate or severe impact). Figure 3.4-4 and Figure 3.4-5 show all noise-sensitive receivers that would experience either moderate or severe impacts as a result of the proposed HSR operations. Project noise impacts for many receivers along the F-B LGA before consideration of mitigation would be significant under CEQA. The implementation of mitigation measures N&V-MM#3 would reduce project noise impacts. However, the construction of noise barriers may not be feasible or economically reasonable, sound insulation may not be acoustical feasible or practical for certain structures, and special track work may not reduce noise impacts. Therefore, project noise impacts with the implementation of mitigation measures would still remain significant under CEQA.

Table 3.4-20 Noise Impact Summary Without Mitigation

Level of Impact	Category 1	Category 2			Category 3			
	Recording Studios	Residential	Hospitals	Other[1]	Schools	Churches	Parks	Other[2]
Severe	3	4,697	1	16	4	17	6	8
Moderate	0	7,263	0	4	16	32	4	13
None	0	1,712	0	0	2	30	0	8

Source: Authority and FRA, 2017

[1] Other Category 2 land uses include 16 hotels, 2 homeless shelters, and 2 prisons/correctional facilities.

[2] Other Category 3 land uses include 12 meeting halls, 5 mortuaries, 2 libraries, 3 museums, 2 theaters, 2 day cares, 1 cemetery, 1 disability services, and 1 club.

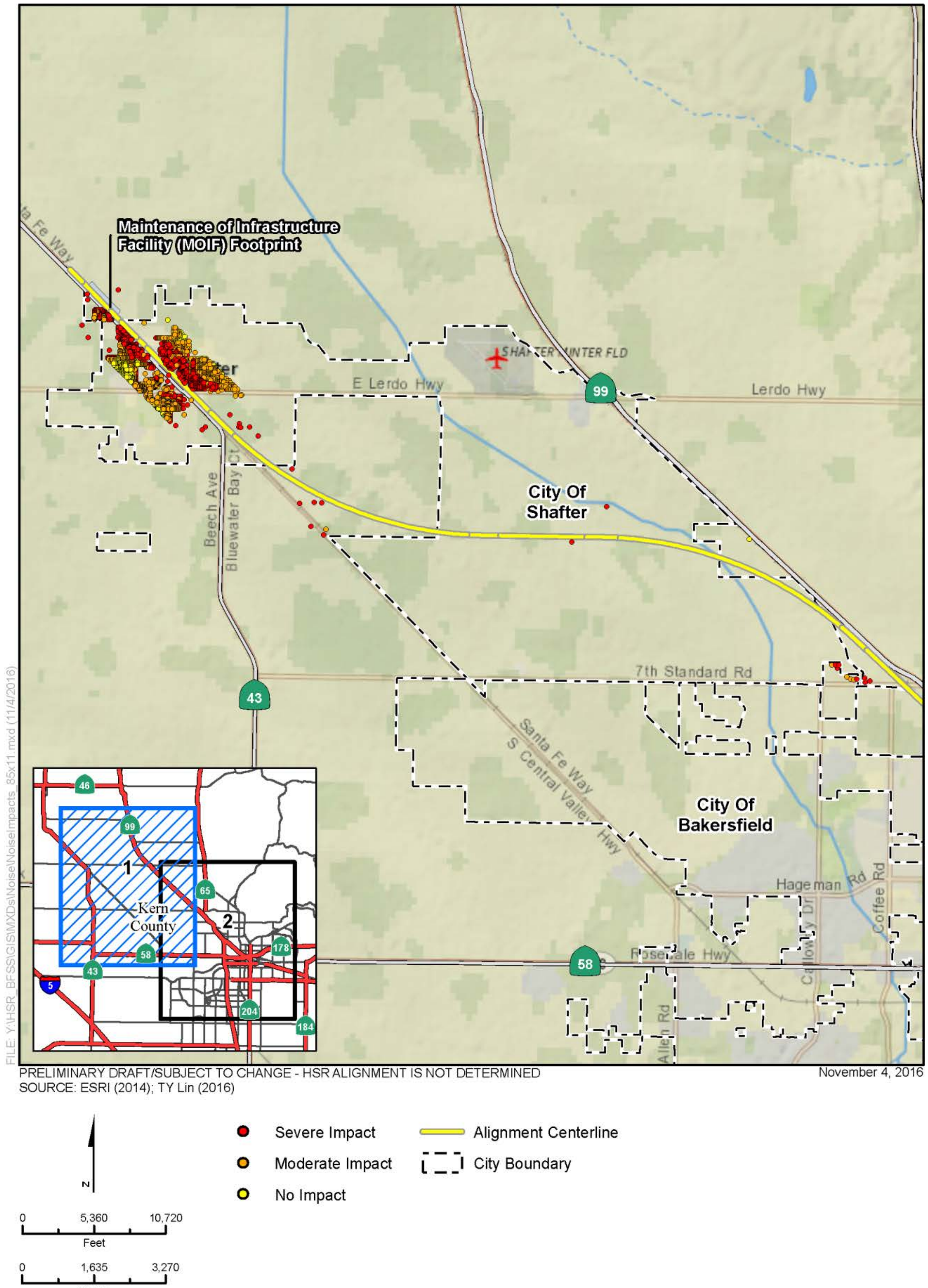
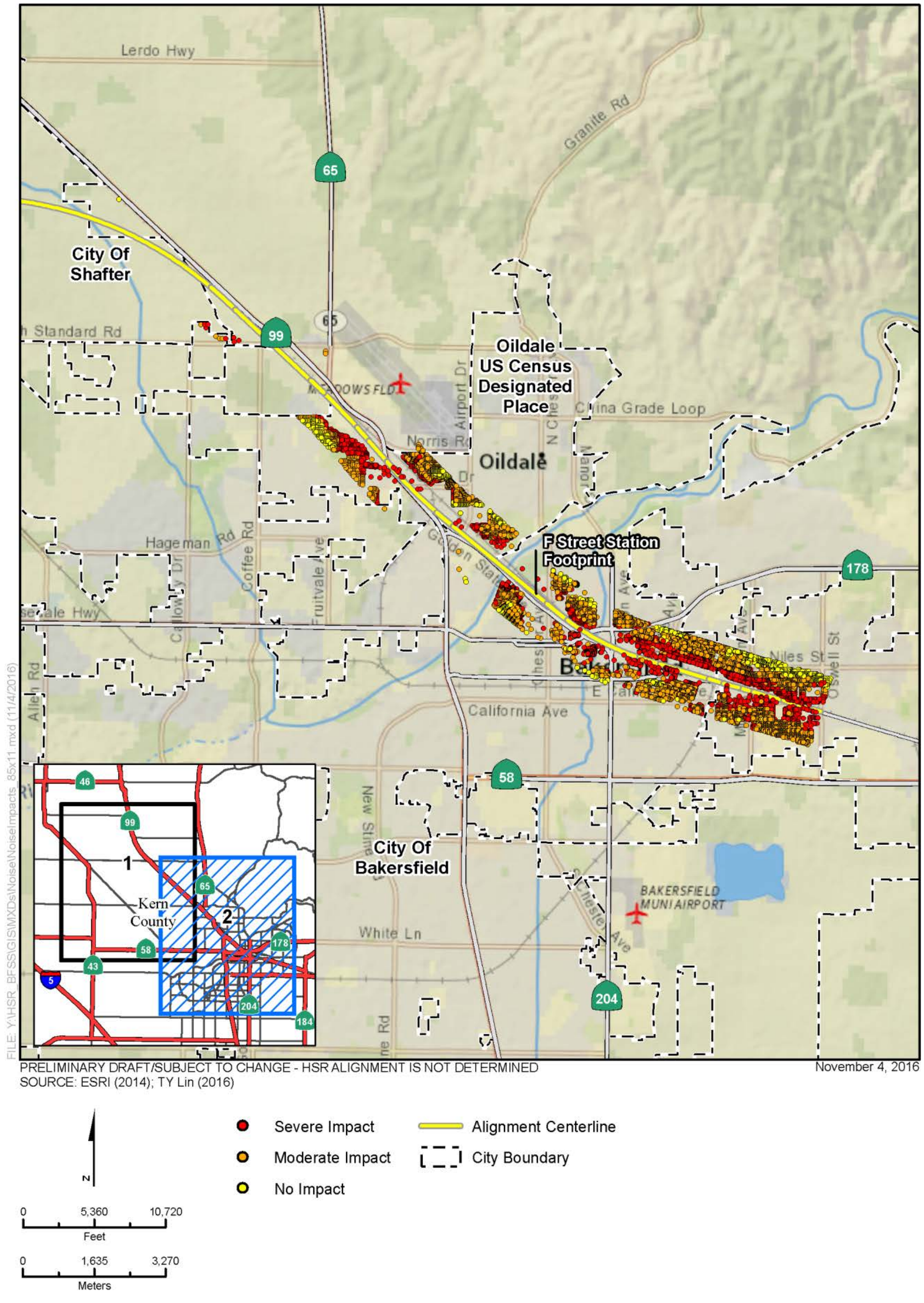


Figure 3.4-4 Noise Impacts



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
SOURCE: ESRI (2014); TY Lin (2016)

November 4, 2016

Figure 3.4-5 Noise Impacts

Schools

A more detailed impact information on schools within 2,500 feet of the HSR rail alignment is shown in Table 3.4-21. As shown in Table 3.4-20 and Table 3.4-21, of the 22 schools within 2,500 feet of the study area, 4 schools would experience a severe noise impact, 16 schools would experience a moderate noise impact, and 2 schools have no impact. The noise impacts from HSR operations would be significant under CEQA. The implementation of mitigation measures N&V-MM#3 would reduce project noise impacts. However, the construction of noise barriers may not feasible or economically reasonable. Therefore, project noise impacts with the implementation of mitigation measures would still remain significant under CEQA.

Table 3.4-21 Impact on Schools

School Name	Existing Noise Exposure (dBA L_{eq})	Total Noise Level Unmitigated (dBA L_{eq})	FRA Manual Impact Rating (No Mitigation)	FRA Manual Impact Rating (Mitigation)
International S. Sikaran Academy	63.8	67.2	Moderate	None
Amerillo College	63.8	68.1	Moderate	None
Lyles College of Beauty	63.8	68.2	Moderate	None
Summit Bible College	61.8	69.1	Moderate	None
University of La Verne	60.2	67.1	Moderate	None
Central Valley High School	50.8	60.0	Moderate	None
Williams Elementary School	54.6	62.4	Moderate	None
Redwood Elementary School	61.6	67.7	Moderate	None
Head Start (Shafter)	61.7	69.7	Severe	None
San Lauren Elementary School	54.2	64.5	Moderate	None
Beardsley School (Elementary/Junior High)	70.9	72.6	None	None
Bakersfield Adult School	63.8	67.4	Moderate	None
Valley Oaks Charter School	55.3	69.9	Severe	Moderate
Stella I. Hills Elementary School	59.2	62.2	None	None
Blanton Academy	57.6	63.1	Moderate	None
Bakersfield Play Center	54.6	69.1	Severe	Moderate
Bessie E. Owens Intermediate School	55.1	65.5	Moderate	None
Mt. Vernon Elementary School	59.6	65.3	Moderate	None
Bethel Christian School	60.2	70.6	Severe	None
Head Start Preschool (Bakersfield)	60.2	68.1	Moderate	None
Sierra Middle School	61.3	68.0	Moderate	None
Ramon Garza Elementary	61.3	67.8	Moderate	None

Source: Authority and FRA, 2017
dBA = A-weighted decibel(s)   FRA = Federal Railroad Administration
L_{eq} = equivalent continuous sound level

Elevated BNSF Railway Operations

The existing noise environment near the BNSF rail line in the city of Shafter includes noise generated from BNSF rail operations and train horns. The BNSF rail line in the city of Shafter would be elevated as part of the proposed HSR project. Noise levels generated from the BNSF rail operations would continue, but would generally be lower due to shielding of the retained fill and elimination of the train horns. Since the background noise level would either be the same or lower, noise impacts from both the elevated BNSF railway and the proposed HSR would remain the same as shown in Table 3.4-20. Therefore, project noise impacts for many receivers along the F-B LGA in the city of Shafter before consideration of mitigation would be significant under CEQA. The implementation of mitigation measures N&V-MM#3 would still remain significant under CEQA.

Annoyance and Startle Effects from Rapid Onset of HSR Passbys

As discussed in the Fresno to Bakersfield Noise and Vibration Technical Report (Authority and FRA 2014a:page 5-1), an onset rate of 15 decibels per second (dB/sec) at a distance of 90 feet would result in annoyance, and an onset rate of 30 dB/sec at a distance of 45 feet would result in startle effects. Noise-sensitive human receivers located within 90 feet of the track would experience annoyance from onset rates caused by the proposed HSR. In addition, noise-sensitive human receivers located within 45 feet of the track would experience startle effect from onset rates caused by the proposed HSR. Since there are a number of unresolved issues regarding the application of the U.S. Air Force research (Stusnick et al. 1992) to determine the startle effects of HSR and without further direction from research, the FRA manual recommends that sensitive receptors be identified when located in the area where startle effects would occur. As the proposed HSR would be located on viaduct that is more than 50 feet above the ground, people and animals would be located more than 45 feet from the HSR track and would not experience startle effect from onset rates caused by the proposed HSR. Therefore, rapid onset noise events are considered a less than significant impact under CEQA.

Impact N&V #4 – Noise Effects on Wildlife and Domestic Animals

As discussed in the Fresno to Bakersfield Noise and Vibration Technical Report (Authority and FRA 2014a: page 5-3), all wildlife and domestic animals near the HSR project railway corridor may be affected by train passbys if they are subjected to sound exposure level values of 100 dBA or higher. Table 3.4-22 show the screening distance from the HSR tracks at which the 100 dBA SEL would be exceeded based on an operating speed of 220 mph. As shown in Table 3.4-22, the screening distance for a single train passby SEL of 100 dBA would be approximately 100 feet from the track centerline when the track is at-grade. Also, when the track is located on an elevated structure, the screening distance for a single train passby SEL of 100 dBA would be approximately 15 feet from the track centerline. According to the screening distance information provided in Table 3.4-22, wildlife and domestic animals might be within the screening distance of 100 feet when the HSR track is at-grade or 15 feet when the HSR track is on an elevated structure. At locations adjacent to existing railways and highways and within urban areas where the existing noise is already high, there would be no impacts under CEQA. However, in rural areas there could be impacts. These impacts are discussed in Section 3.7, Biological Resources and Wetlands, and Section 3.14, Agricultural Lands.

Table 3.4-22 Screening Distances for Noise Effects on Wildlife and Domestic Animals

Track Location	Speed (mph)	SEL[1] (dBA)	Distance from Track 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	50	100	75
Freight train, sounding horn at at-grade crossing	50	100	40

Source: Authority and FRA, 2012

[1] The SEL represents a receiver'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 effects 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 (see Chapter 2, Alternatives). 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 decibel(s)
mph = mile(s) per hour SEL = sound exposure level

Impact N&V #5 – Impacts from Project Vibration

Rail Corridor Operation

The FRA Detailed Vibration Assessment (FRA 2012) was used to determine potential vibration impacts on vibration-sensitive land uses in the project vicinity from long-term operation of the F-B LGA. The FRA Detailed Vibration Assessment is utilized to get an in-depth analysis of potential vibration impacts.

A transfer mobility test was conducted in the project vicinity to determine the actual transmission characteristics of vibration through the soils along the project right-of-way. Transfer mobility test results were used to develop a better understanding of how vibrations from HSR operations would propagate through different soil types throughout the length of the project corridor.

Transfer mobility is a measure of the relationship between the exciting force and the velocity response at each measurement position. The transfer mobility measurements were taken between November 10, 2015, and November 12, 2015. A total of four vibration propagation measurements were conducted to estimate the vibration transfer mobility along the proposed F-B LGA. Descriptions of the propagation test equipment and protocol are provided below. The site-specific details of the transfer mobility testing are presented in Appendix F in the *Fresno to Bakersfield Draft Supplemental Environmental Impact Report/Environmental Impact Statement Noise and Vibration Technical Report* (F-B LGA Noise and Vibration Technical Report; Authority and FRA 2017).

The locations of the transfer mobility sites are listed in Table 3.4-23. The details of the transfer of mobility measurements are provided in Section 6.3 in the Fresno to Bakersfield Noise and Vibration Technical Report (Authority and FRA 2016). The vibration levels at each measurement site, corrected for velocity (220 mph) and plotted relative to distance from the source, are presented on Figure 3.4-6.

Table 3.4-23 Location of Transfer Mobility Measurement Sites

Site	Location
1	McMurtrey Avenue and Wishon Drive, Bakersfield
2	Cherry Avenue and Los Angeles Avenue, Shafter
3	McCrumb Lane and Venable Lane, Shafter
4	Pierce Place, Bakersfield

Source: Authority and FRA, 2017

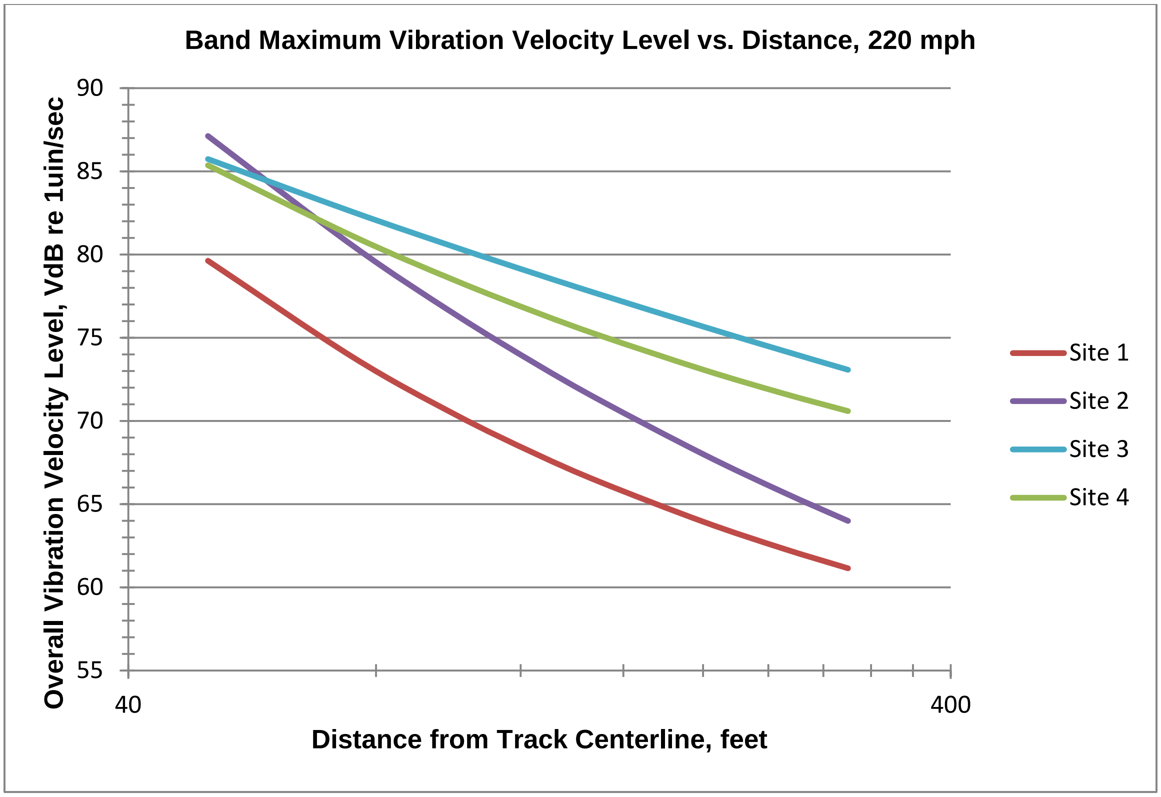


Figure 3.4-6 Ground-Borne Vibration vs. Distance (from 1/3-Octave Band Data)

The fall-off rate for overall vibration levels due to distance has been derived from the curves presented on Figure 3.4-6. Both these curves and the resulting formula have been adjusted to take into account the 220 mph speed associated with the HSR project. The formula for estimating the overall vibration level with distance from the tracks is as follows:

$L_v(d)$ = 84.21 - 19.8 Log(d/50)

where: $L_v(d)$ = RMS vibration velocity level at distance d

d = distance from the tracks

Table 3.4-24 summarizes the distance to the ground-borne vibration impact level for each land use category. The vibration contours are based on the fall-off rate equation determined by the transfer mobility measurements. The distance to the ground-borne vibration impact level for each land use category and the fall-off rate are different than the May 2014 Project because the four transfer of mobility test locations were conducted in Shafter and Bakersfield rather than eighteen transfer of mobility test locations between Fresno and Bakersfield for the May 2014 Project. Table 3.4-24 shows that land use categories 1, 2, and 3, located within a distance of 467 feet, 207 feet, and 146 feet, respectively, from the nearest rail line on at-grade or retained profile, would be impacted by vibration levels above the vibration criterion level generated by the proposed F-B LGA. When the alignment is on viaduct or straddle-bent structure, Table 8-2 (Page 8-6) of the *FRA's High-Speed Ground Transportation Noise and Vibration Impact Assessment* (2012) indicates that an aerial/viaduct structure reduces vibration levels by approximately 10 VdB. Therefore, land use categories 1, 2, and 3, located within a distance of 146 feet, 65 feet, and 46 feet, respectively, from the nearest rail line on structure profiles, would be impacted by vibration levels above the criterion level generated by the proposed F-B LGA.

Table 3.4-24 Distances to Vibration Criterion Level Contours

Land Use	Vibration Criterion Level (VdB)	Distance to Vibration Contour (feet)[1]
Category 1 – At-Grade/Retained Profile	65	467
Category 2 – At-Grade/Retained Profile	72	207
Category 3 – At-Grade/Retained Profile	75	146
Category 1 – Viaduct/Straddle Bents	65	146
Category 2 – Viaduct/Straddle Bents	72	65
Category 3 – Viaduct/Straddle Bents	75	46

Source: Authority and FRA, 2017

[1] The distance to vibration criterion was calculated based on the track centerline and the fall-off rate from the transfer of mobility measurements within the F-B LGA project area. The distance to vibration criterion for the May 2014 project is different than the distance to vibration criterion for the F-B LGA project because the location and the extent of the transfer of mobility measurements were different.

Using the equation developed from the transfer mobility testing, the projected vibration levels were calculated at receivers within 275 feet, as shown in Table 3.4-8 in Section 3.4.2.6, from the nearest HSR rail line. A total of 80 vibration-sensitive receivers are located within 275 feet of the nearest track. Of the 80 vibration-sensitive receivers, 18 receivers would be impacted by the proposed F-B LGA. Vibration impacts would occur under the F-B LGA project due to more detailed property acquisition information whereas all impacted receptors under the May 2014 are located within the project right-of-way and would be acquired when the project is constructed. Table 3.4-25 shows the number of vibration impacts for each land use category. The details of the vibration analysis for the 80 vibration-sensitive receivers are shown in Table 6 in Appendix 3.4-A, Noise and Vibration. Project vibration levels for the 18 receivers along the F-B LGA before consideration of mitigation would be significant under CEQA. However, the implementation of mitigation measures N&V-MM#5, requires special track work and mitigation strategies to reduce operational vibration levels to less than significant under CEQA.

Table 3.4-25 Vibration Impacts

Land Use Category 1	Land Use Category 2				Land Use Category 3		
Vibration-Sensitive Buildings	Residential	Hotel/Motel	Hospital	Shelter	Schools	Churches	Parks
0	14	2	0	2	0	0	0

Source: Authority and FRA, 2017

F Street Station

The long-term operations of the proposed F Street Station would not generate vibration levels as no vibration-generating track equipment would be used. For the operations of the HSR rail corridor, receptors located near the F Street Station were evaluated with trains traveling at the maximum speed of 220 mph. Receptors within 250 feet from the track centerline were evaluated for potential vibration impacts. Schools would not be impacted from long-term operations of the proposed F Street Station because no vibration-generating track equipment would be used. Therefore, no long-term operational vibration impacts would occur, and no mitigation measures are required. There would be no impacts under CEQA.

Maintenance of Infrastructure Facility

The long-term operations of the proposed MOIF would not generate vibration levels, as no vibration-generating track equipment would be used. For the operations of the HSR rail corridor, receptors located near the MOIF were evaluated with trains traveling at the maximum speed of

220 mph. Receptors within 250 feet from the track centerline were evaluated for potential vibration impacts. Schools would not be impacted from long-term operations of the proposed MOIF because no vibration-generating track equipment would be used. Therefore, no long-term operational vibration impacts would occur and no mitigation measures are required. There would be no impacts under CEQA.

Traction Power Supply Station

The long-term operations of the TPSS would not generate vibration levels, as no vibration-generating track equipment would be used. For the operations of the HSR rail corridor, receptors located near the TPSS were evaluated with trains traveling at the maximum speed of 220 mph. Receptors within 250 feet from the track centerline were evaluated for potential vibration impacts. Schools would not be impacted from long-term operations of the TPSS because no vibration-generating track equipment would be used. Therefore, no long-term operational vibration impacts would occur and no mitigation measures are required. There would be no impacts under CEQA.

Electric Power Utility Improvements

The long-term operations from proposed electric power utility improvements would not generate vibration levels as no vibration-generating track equipment would be used. In addition, schools would not be impacted from long-term operations of proposed electric power utility improvements because no vibration-generating track equipment would be used. Noise and vibration generated from utility maintenance and repair activities were not considered under this analysis as they are negligible and would not lead to an increase over existing conditions. Therefore, no long-term operational vibration impacts would occur, and no mitigation measures are required. There would be no impacts under CEQA.

Impact N&V #6 – Traffic Noise

As previously discussed in the Section 3.4.2.3, there are three types of noise criteria for traffic noise, which will be discussed separately to address CEQA and NEPA. The first two noise criteria for traffic are related to traffic noise increase. The first noise criterion is the perceptibility of project-related traffic noise increases that are perceptible to the human ear in an outdoor environment. A change in noise level of 3 dBA or less is considered not perceptible to the human ear in an outdoor environment. The second criterion is the substantial (12 dBA) exposure of traffic noise levels from existing without project noise levels to future with project noise levels. The third noise criterion is the Noise Abatement Criteria (NAC) defined by FHWA for project-related roadway modifications that are classified as a Type 1 project.

Traffic in the City of Shafter

Traffic noise in the city of Shafter is characterized by vehicular traffic in the surrounding area. Table 6-11 from the F-B LGA Noise and Vibration Technical Report (Authority and FRA 2017) shows the project-related change in traffic noise levels in the Shafter area under the existing and future with and without project scenarios. The change in traffic noise levels is described as Community Noise Equivalent Level (CNEL) because average daily traffic (ADT) volumes were used to determine the change in noise levels. As shown in Table 6-11 from the F-B LGA Noise and Vibration Technical Report (Authority and FRA 2017), the project-related traffic noise increase would be less than 3 dBA (increase in noise level is not perceptible to the human ear in an outdoor environment), except for Poplar Avenue between Madera Avenue and SR 43 and Fresno Avenue between SR 43 and Shafter Avenue under existing conditions. Since the proposed project would not be completed under the existing conditions and the project-related traffic noise increase under future conditions would be less than 3 dBA, no traffic noise impacts would occur. Therefore, project-related traffic noise increases in the Shafter area would result in a less than significant impact under CEQA.

The proposed F-B LGA would increase traffic noise in areas surrounding the MOIF. Traffic volumes shown in Table 6-11 from the F-B LGA Noise and Vibration Technical Report (Authority and FRA 2017) reflect trips associated with the MOIF. As discussed previously, the project-related traffic noise increase would be less than 3 dBA, except for Poplar Avenue between

Madera Avenue and SR 43 and Fresno Avenue between SR 43 and Shafter Avenue under existing conditions. Since the proposed project would not be completed under the existing conditions and the project-related traffic noise increase under future conditions would be less than 3 dBA, no traffic noise impacts would occur in the Shafter area and the proposed project would result in a less than significant impact under CEQA.

A substantial traffic noise increase from the existing peak-hour traffic volume without the proposed project to the future peak-hour traffic volume with the proposed project is likely the result of roadway improvement projects that are classified as Type 1 projects. Traffic noise increases from these types of roadway improvements are further discussed below. Table 6-12 from the F-B LGA Noise and Vibration Technical Report (Authority and FRA 2017) shows the increase in traffic noise levels from the existing peak-hour traffic volume without the proposed project to future peak-hour traffic volume with the proposed project for roadway intersections in the Shafter area. The change in traffic noise levels is described in L_{eq} because peak-hour traffic volumes were used to determine the change in noise levels. As shown in Table 6-12 from the F-B LGA Noise and Vibration Technical Report (Authority and FRA 2017), the traffic noise increases would not exceed 12 dBA except at one intersection leg. The increase in traffic noise of 12 dBA or more at the north leg of Mettler Avenue/Fresno Avenue intersection is the result of the proposed grade separation at Poplar Avenue along with the Madera Avenue closure at Poplar Avenue. As the increase in traffic noise for the one intersection leg would be associated with roadway improvements that are classified as Type 1 projects, noise abatement measures would be considered, as discussed below.

Traffic in the City of Bakersfield

F Street Station Traffic

Traffic noise in the city of Bakersfield is characterized by vehicular traffic near the F Street Station and the surrounding area of Bakersfield. Tables 6-6 and 6-7 from the F-B LGA Noise and Vibration Technical Report (Authority and FRA 2017) show the project-related traffic noise level change for the F Street Station area under the existing and future conditions with and without the project. The change in traffic noise levels is described in CNEL because ADT volumes were used to determine the change in noise levels. As shown in Tables 6-6 and 6-7 from the F-B LGA Noise and Vibration Technical Report (Authority and FRA 2017), the project-related traffic noise increase would be less than 3 dBA (increase in noise level is not perceptible to the human ear in an outdoor environment) for the F Street Station area, except for the F Street Station area along 30th Street between F Street and H Street. Although noise levels along 30th Street between F Street and H Street would have a project-related noise increase of up to 3.3 dBA, the land uses along this segment of 30th Street are not considered noise-sensitive. Therefore, traffic noise increases surrounding the F Street station would result in a less than significant impact under CEQA.

Table 6-8 from the F-B LGA Noise and Vibration Technical Report (Authority and FRA 2017) show the increase in traffic noise levels from the existing peak-hour traffic volumes without the proposed project to the future peak-hour traffic volume with the proposed project for roadway intersections surrounding the proposed F Street Station. The change in traffic noise levels is described in L_{eq} because peak-hour traffic volumes were used to determine the change in noise levels. As shown in Table 6-8 from the F-B LGA Noise and Vibration Technical Report (Authority and FRA 2017), the traffic noise increase would be less than 12 dBA except for five roadway segments. The north leg of F Street and Golden State Avenue and the north leg of F Street and SR 204 would increase noise levels by 11.4 dBA. The substantial noise increase is associated with the entrance to the proposed F Street Station and the adjacent land uses are not considered to be noise-sensitive. The east leg of the Knudsen Drive and Hageman Road intersection would increase noise levels by 23.7 dBA. However, the increase is not project-related and the adjacent land uses are not considered to be noise-sensitive. The west leg of Q Street and 23rd Street and the west leg of Q Street and 14th Street would increase noise levels by 11.9 (close to 12 dBA) and 12.0 dBA, respectively. However, the increases in noise levels along these two legs are not project-related. Therefore, traffic noise level increases for all five roadway segments would not be considered substantial based on FHWA and California Department of Transportation guidelines.

Bakersfield Area Traffic

Table 6-9 from the F-B LGA Noise and Vibration Technical Report (Authority and FRA 2017) shows the project-related traffic noise level changes in the Bakersfield area under the existing and future with and without project scenarios. The change in traffic noise levels is described in CNEL because ADT volumes were used to determine the change in noise levels. As shown in Table 6-9 from the F-B LGA Noise and Vibration Technical Report (Authority and FRA 2017), the project-related traffic noise increases would be less than 3 dBA under both existing and future conditions. Therefore, project-related traffic noise increases in the Bakersfield area would result in a less than significant impact under CEQA.

The proposed F-B LGA would also increase traffic noise in areas surrounding the TPSS. As traffic volumes are not available in the draft supplemental traffic study for roadways surrounding the proposed TPSS, traffic noise increases were assumed to be less than the traffic noise increases from the proposed heavy maintenance facilities evaluated in the Fresno to Bakersfield Section Noise and Vibration Technical Report (page 6-184). Therefore, traffic noise increases surrounding the proposed TPSS would result in a less than significant impact under CEQA.

A substantial traffic noise increase from the existing peak-hour traffic volume without the proposed project to the future peak-hour traffic volume with the proposed project is likely the result of roadway improvement projects that are classified as Type 1 projects. Traffic noise increases from these types of roadway improvements are further discussed later in this section. Table 6-10 from the F-B LGA Noise and Vibration Technical Report (Authority and FRA 2017) shows the increase in traffic noise levels from the existing peak-hour traffic volume without the proposed project to the future peak-hour traffic volume with the proposed project for roadway intersections in the Bakersfield area. The change in traffic noise levels is described in L_{eq} because peak-hour traffic volumes were used to determine the change in noise levels. As shown in Table 6-10, the traffic noise increase would be less than 12 dBA. Therefore, traffic noise level increases would not be considered substantial based on FHWA and Caltrans guidelines.

Traffic in Kern County

Traffic noise in Kern County is characterized by vehicular traffic in the surrounding area. Table 6-13 from the F-B LGA Noise and Vibration Technical Report (Authority and FRA 2017) shows the project-related change in traffic noise level in the Kern County area under the existing and future with and without project scenarios. The change in traffic noise levels is described in CNEL because ADT volumes were used to determine the change in noise levels. As shown in Table 6-13 from the F-B LGA Noise and Vibration Technical Report (Authority and FRA 2017), the project-related traffic noise increase would be less than 3 dBA (increase in noise level is not perceptible to the human ear in an outdoor environment). Therefore, project-related traffic noise increases in the Kern County area would result in a less than significant impact under CEQA.

A substantial traffic noise increase from the existing peak-hour traffic volume without the proposed project to the future peak-hour traffic volume with the proposed project is likely the result of roadway improvement projects that are classified as Type 1 projects. Traffic noise increases from these types of roadway improvements are further discussed later in this section. Table 6-14 from the F-B LGA Noise and Vibration Technical Report (Authority and FRA 2017) shows the increase in traffic noise levels from the existing peak-hour traffic volume without the proposed project to the future peak-hour traffic volume with the proposed project in the Kern County area. The change in traffic noise levels is described in L_{eq} because peak-hour traffic volumes were used to determine the change in noise levels. As shown in Table 6-14 from the F-B LGA Noise and Vibration Technical Report (Authority and FRA 2017), traffic noise increases would not exceed 12 dBA.

Traffic Noise from Roadway Improvements

Roadway improvements that are not classified as Type 1 projects, such as the intersection modifications at East Los Angeles Street/Beech Avenue, Edison Highway between Mount Vernon Avenue and south of Oswell Street, Central Avenue, Coffee Road, Fresno Avenue, and State Road (north and south), would not have traffic noise impacts because the project-related traffic noise increase would be less than 3 dBA (increase in noise level is not perceptible to the human ear in an outdoor environment), as shown in Tables 6-6, 6-7, 6-9, 6-11, and 6-13 from the F-B LGA Noise and Vibration Technical Report (Authority and FRA 2017). Therefore, project-related traffic noise increases due to roadway improvements that are not classified as Type 1 projects would result in a less than significant impact under CEQA.

Roadway improvements that are classified as Type 1 projects require the preparation of a Noise Study Report (NSR) to identify traffic noise impacts for all land uses within the project study area. Traffic noise impacts occur when predicted noise levels in the design year approach or exceed the Noise Abatement Criteria (NAC) or a predicted noise level substantially exceeds the existing without project noise level by 12 dBA or more. When traffic noise impacts are identified, feasible and reasonable noise abatement measures such as noise barriers must be considered. The NSR evaluates the acoustic feasibility of noise barriers and whether or not they can reduce noise levels by 5 dBA or more for receptors located behind the barriers. If the noise barrier is acoustically feasible (reducing noise levels by 5 dBA or more), the Authority will prepare a Noise Abatement Decision Report (NADR) after the completion of the NSR to evaluate constructability issues and determine whether the barrier is reasonable (cost-effective).

A noise barrier may be considered not feasible for various factors that include not meeting geometric standards, such as the minimum line-of-sight, safety, maintenance, security, geotechnical considerations, and utility relocations. In addition, noise barriers would be considered not feasible when they are located in front of single-family residences or along properties with pedestrian sidewalks because the maintenance of property access would be required. In addition, constructing a noise barrier in front of a single-family residence or including properties with pedestrian sidewalks would result in a non-continuous wall, which would not provide the minimum noise reduction of 5 dBA.

A noise barrier would be considered reasonable when at least one or more benefited receptor achieves a minimum noise reduction of 7 dBA and when the estimated construction cost is within the reasonable allowance. Other reasonableness factors include the viewpoints of the benefited receptors.

Below is a summary of the Type 1 projects within the project vicinity:

- **Poplar Avenue Grade Separation.** Land uses within the project vicinity for the Poplar Avenue Grade Separation include agricultural land and residential uses. The NSR will report the highest expected noise level that is not closer than 100 feet from the edge of the outside traffic lane for the agricultural land and determine if the residential land uses would approach or exceed the NAC.
- **Riverside Street Grade Separation.** Land uses within the project vicinity for the Riverside Street Grade Separation include agricultural land along with facilities associated with agricultural uses. Since there are no land uses within the project vicinity that have a NAC, the NSR will report the highest expected noise level that is not closer than 100 feet from the edge of the outside traffic lane.
- **SR 99/7th Standard Road Interchange.** Land uses within the project vicinity for the SR 99/ 7th Standard Road Interchange include a single-family residence, vacant land, agricultural land, and commercial and industrial uses. The NSR will report the highest expected noise level that is not closer than 100 feet from the edge of the outside traffic lane for vacant land, agricultural land, commercial, and industrial uses. The NSR will also determine if residential land uses would approach or exceed the NAC.
- **SR 204/F Street Interchange.** Land uses within the project vicinity for the SR 204/F Street Interchange include single-family residences and office, commercial, and industrial uses. The NSR will report the highest expected noise level that is not closer than 100 feet from the edge of the outside traffic lane for office, commercial, and industrial uses. The NSR will also determine if residential land uses would approach or exceed the NAC.

- **Tulare Avenue/Shafter Avenue Intersection.** Land uses within the project vicinity for the Tulare Avenue/Shafter Avenue intersection include residences, the Golden Living Center, a baseball field, vacant land, and industrial uses. The NSR will report the highest expected noise level that is not closer than 100 feet from the edge of the outside traffic lane for the baseball field, vacant land, and industrial uses, and determine if residences and the Golden Living Center land uses would approach or exceed the NAC.
- **Chester Avenue/34th Street Intersection.** Land uses within the project vicinity for the Chester Avenue/34th Street intersection include residences, a school, a museum, and commercial and industrial uses. The NSR will report the highest expected noise level that is not closer than 100 feet from the edge of the outside traffic lane for commercial and industrial uses. The NSR will also determine if the school, museum, and residential land uses would approach or exceed the NAC.

Impact N&V #7 – Noise from HSR Stationary Facilities

The following discussion evaluates potential long-term operation noise impacts from stationary noise sources generated by HSR stationary facilities. The potential long-term operation noise impacts from mobile noise sources generated by the HSR are discussed above under Impact N&V #3. Stationary noise sources generated by HSR stationary facilities include PA systems, signal horns, impact tools, human activity, and vehicle activity.

F Street Station

Potential long-term operational noise impacts from the proposed F Street Station were evaluated using a screening distance of 250 feet for commuter rail without horn-blowing from the *FTA Transit Noise and Vibration Impact Assessment* (FTA 2006). There are a total of 150 noise-sensitive receivers within 250 feet of the boundary of the proposed F Street Station. Of these 150 noise-sensitive receivers, 108 receivers would be fully acquired by the proposed HSR project. The remaining receivers include 39 residences, 1 museum, 1 school, and 1 recreational area. The Kern County Museum is located at 3801 Chester Avenue in the city of Bakersfield (Assessor's Parcel Number [APN] 332-200-05). The Valley Oaks Charter School is located at 3501 Chester Avenue in the city of Bakersfield (APN 120-080-15). The Northwest Bakersfield Baseball Complex is located at 40th Street in the city of Bakersfield (APN 332-200-04). Potential noise impacts from long-term operations of the F Street State would be significant under CEQA. However, the implementation of mitigation measures N&V-MM#7, such as noise barriers to reduce long-term operational noise impacts would result in a less than significant impact under CEQA.

As discussed above, the Valley Oaks Charter School is the only school that would be potentially impacted from long-term operations of the proposed F Street Station. Therefore, potential noise impacts from long-term operations of the proposed F Street Station would be significant under CEQA. However, the implementation of mitigation measures N&V-MM#7, such as noise barriers to reduce long-term operational noise impacts would result in a less than significant impact under CEQA.

Maintenance of Infrastructure Facility

Potential long-term operational noise impacts from the proposed MOIF were evaluated using information for yards and shops from the manual using a screening distance of 1,000 feet from the FTA Transit Noise and Vibration Impact Assessment (FTA 2006). Based on a distance of 1,000 feet from the boundary of the proposed MOIF, there are a total of 377 noise-sensitive receivers. Of these 377 noise-sensitive receivers, 374 are residences and 3 are churches (APN 089-051-34, APN 026-080-25, and APN 028-010-29). Potential noise impacts from long-term operations of the proposed MOIF would be significant under CEQA. However, the implementation of mitigation measures N&V-MM#7, such as noise barriers to reduce long-term operational noise impacts would result in a less than significant impact under CEQA.

As schools would not be located within 1,000 feet from the boundary of the proposed MOIF, no noise impacts would occur from long-term operations of the proposed MOIF. Potential noise impacts from long-term operations of the proposed MOIF would be less than significant under CEQA.

Traction Power Supply Station

Potential long-term operational noise impacts from the proposed TPSS were evaluated for power substations using a screening distance of 250 feet from the FTA Transit Noise and Vibration Impact Assessment (FTA 2006). Based on a distance of 250 feet from the boundary of the proposed TPSS, there is a total of one noise-sensitive receiver represented by the Capri Motel at 2020 Union Avenue in the City of Bakersfield (APN 016-140-01). Potential noise impacts from long-term operations of the proposed TPSS would be significant under CEQA. However, the implementation of mitigation measures N&V-MM#7, such as noise barriers to reduce long-term operational noise impacts would result in a less than significant impact under CEQA.

As schools would not be located within 250 feet from the boundary of the proposed TPSS, no noise impacts would occur from long-term operations of the proposed TPSS. Potential noise impacts from long-term operations of the proposed TPSS would be less than significant under CEQA.

Electric Power Utility Improvements

Long-term operational noise impacts from the proposed electric power utility improvements would generate corona noise. Corona noise is noise generated from transmission or subtransmission lines in operation due to the ionization of the air that occurs at the surface of the energized conductor and suspension hardware due to very high electric field strength at the surface of the metal during certain conditions. However, noise generated from corona noise would not exceed noise standards in the cities of Shafter and Bakersfield and the Kern County. No noise impacts would occur from the operation of the proposed electric power utility improvements, and no mitigation measures are required. Potential noise impacts from long-term operations of the proposed electric power utility improvements would be less than significant under CEQA.

Noise generated from corona noise would not exceed noise standards for schools in the cities of Shafter and Bakersfield and the Kern County. No noise impacts would occur from the operation of the proposed electric power utility improvements, and no mitigation measures are required. Potential noise impacts from long-term operations of the proposed electric power utility improvements would be less than significant under CEQA.

3.4.5 Avoidance and Minimization Measures

All of the avoidance and minimization measures (referred to as project design features in Chapter 3.4 of the Fresno to Bakersfield Section Final EIR/EIS [page 3.4-55] are applicable to the F-B LGA. The applicable list is provided in Technical Appendix 2-G: Mitigation Monitoring and Enforcement Plan. Technical Appendix 2-H describes how implementation of these measures reduces adverse effects on noise and vibration. Descriptions of how these measures reduce adverse effects are also included in the individual impact analysis discussed previously in this Section. The following Avoidance and Minimization Measure would be applicable to the May 2014 Project as well as the F-B LGA.

- **NV-AM # 1: General Construction Guidelines-Noise and Vibration.** The FTA and FRA have guidelines for minimizing noise and vibration impacts at sensitive receptors that will be followed during construction.

The Authority and the FRA have incorporated impact avoidance and minimization measures into the project design, consistent with the Statewide and Bay Area to Central Valley Program EIR/EIS commitments.

3.4.6 Mitigation Measures

3.4.6.1 Mitigation Measures Identified in the Fresno to Bakersfield Section Final EIR/EIS

Table 3.4-26 lists the approved mitigation measures under the Fresno to Bakersfield Project Section Mitigation and Monitoring Enforcement Plan (FRA 2014). These measures have been revised for applicability to the F-B LGA (as shown below in underline and strike through) and would be implemented to mitigate for impacts that cannot be rectified, reduced, eliminated or avoided.

Table 3.4-26 Mitigation Measures Applicable to the F-B LGA

Number	Description
N&V-MM#1	Construction Noise Mitigation Measures During construction the contractor will monitor construction noise to verify compliance with the noise limits shown in Table 3.4-1 of the Final EIR/EIS. The contractor would be given the flexibility to meet the FRA construction noise limits in the most efficient and cost-effective manner. This would be done by either prohibiting certain noise-generating activities during nighttime hours or providing additional noise control measures to meet the noise limits. A noise-monitoring program will be developed to meet required noise limits, and the following noise control mitigation measures will be implemented as necessary, for nighttime and daytime: • Install a temporary construction barrier near the noise source • Avoid nighttime construction in residential neighborhoods • Locate stationary construction equipment as far as possible from noise-sensitive sites • Re-route construction truck traffic along roadways that will cause the least disturbance to residents • During nighttime work, use smart backup alarms, which automatically adjust the alarm levels 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 auger 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 Noise impacts would occur during construction activities and would cease after construction is complete. Mitigation Measure N&V-MM#1 would reduce construction noise below the FRA construction noise limits, and this impact would be reduced to a less-than-significant impact under CEQA.

Number	Description
N&V-MM#2	Construction Vibration Mitigation Measures Building damage from construction vibration is only anticipated from impact pile driving at very close distances to buildings. If pile driving occurs more than 77 feet from fragile or historic buildings, 55 feet from residential structures~~25 to 50 feet from buildings~~, or if alternative methods such as push piling, ~~or~~ auger piling, or cast-in-drill-hole (CIDH) can be used, damage from construction vibration is not expected to occur. Other sources of construction vibration do not generate high enough vibration levels for damage to occur. When a construction scenario has been established, preconstruction surveys are conducted at locations within 50 feet of pile driving to document the existing condition of buildings in case damage is reported during or after construction. The Authority will arrange for the repair of damaged buildings or will pay compensation to the property owner. Although vibration impacts would occur during construction activities, the construction activities are considered temporary, as they would cease after completion. The construction vibration impacts would be substantially lessened or avoided, and reduced to a less-than-significant impact under CEQA, with implementation of Mitigation Measure N&V-MM #2.
N&V-MM#3	Implement Proposed California High-Speed Train Project Noise Mitigation Guidelines To determine the appropriate mitigation measure for properties experiencing severe noise impacts, noise mitigation guidelines would be applied as follows: • 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 their 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 receiver, (2) be of an impervious material with a minimum surface density of 4 pounds per square foot, and (3) not have any gaps or holes between the panels or at the bottom. Because many materials meet these requirements, aesthetics, durability, cost, and maintenance considerations usually determine the selection of materials for sound barriers (examples are shown in Figure 3.4-14 of the Final EIR/EIS). Depending on the situation, sound barriers can become visually intrusive. Typically, the sound barriers 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, and made of various colors, materials, and surface treatments. • The minimum number of affected sites should be at least 10, and the length of a sound barrier should be at least 800 feet. 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 to achieve 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 will still be designed to be as low as possible to achieve a substantial noise reduction. Sound barriers on both aerial structures and at-grade structures could consist of solid, semitransparent, or transparent materials. • The Authority will work with the communities to identify how the use and height of sound barriers would be determined using jointly developed performance criteria. Other solutions may result in higher numbers of residual impacts than reported herein. Options may be to reduce the height of sound barriers and combine barriers with sound insulation or to accept higher noise thresholds than the FRA's current noise thresholds. • 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 provided 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

Number	Description
	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 roadway noise conditions as factors for determining mitigation measures. • If sound walls or sound installation is not effective, the Authority can acquire easements on properties severely affected by noise. Another option for mitigating noise impacts is for the authority to acquire easements on residences likely to be impacted by HSR operations in which the homeowners would accept the future noise conditions. This approach is usually taken only in isolated cases where other mitigation options are infeasible, impractical, or too costly. Table 3.4-27 shows the reasonableness of each feasible noise barrier. Of the six noise barriers evaluated, all noise barriers were determined to be feasible and reasonable because the barrier would provide a noise level reduction of 5 dBA or more and the cost to construct the barriers would not exceed $55,000 per benefited receiver. Table 3.4-27 also shows the height, approximate length, number of benefited receivers, total construction cost, the number of unmitigated severe impacts, and number of residual impacts (with mitigation) for each barrier height. Table 3.4-28 shows the breakdown of residual severe impacts based on each land use in each category. Figure 3.4-7 through Figure 3.4-10 show the noise barrier locations. A total of 31 receivers that would be severely impacted were not evaluated with a noise barrier because they are located in areas that do not meet the minimum number of 10 severely impacted receivers and a minimum barrier length of 800 feet. The 31 receivers consist of 28 residential land uses, 1 park, 1 Category 2 land use, and 1 Category 3 land use. Therefore, these receivers would be eligible for either sound insulation or payment of property for noise easements.
N&V-MM#4	Vehicle Noise Specification In the procurement of an HSR vehicle technology, the Authority will require bidders to meet the federal regulations (40 CFR Part 201.12/13) at the time of procurement for locomotives (currently a 90-dBA-level standard), for cars operating at speeds of greater than 45 mph. Depending on the available technology, this could significantly reduce the number of impacts throughout the corridor.
N&V-MM#5	Special Track Work ~~at Crossovers and Turnouts~~ Because the impacts of HSR wheels over rail gaps at turnouts increases HSR noise by approximately 6 dBA over typical operations, turnouts can be a major source of noise impact. If the turnouts cannot be moved from sensitive areas, the project can use special types of track work that eliminate the gap. Table 3.4-29 provides additional mitigation measures that would reduce operational vibration levels when the train, railway, and railway structures are already in good condition. As shown in Table 3.4-29, mitigation would take place at the source, sensitive receptor, or along the propagation path from the source to the sensitive receptor. If mitigation measures provided in Table 3.4-29 are not feasible, the Authority would attempt to negotiate a vibration easement with property owners or the Authority would negotiate to relocate the property owner outside of the area subject to significant vibration impacts.
N&V-MM#6	Additional Noise and Vibration Analysis Following Final Design If final design or final vehicle specifications result in changes to the assumptions underlying the noise and vibration analysis (including analysis regarding resident and business displacements), reassess noise and vibration impacts and recommendations for mitigation and provide supplemental environmental documentation, as required by law. Traffic Noise Impacts Several single-family homes will be subject to traffic peak-hour noise levels in excess of 66 dBA L_{eq}. These noise levels would exceed the Caltrans Noise Abatement Criteria and potentially require the preparation of Noise Study Reports and noise abatement measures. In determining the reasonableness of abatement, FHWA highway traffic noise regulation requires, among other factors, the feasibility of the noise mitigation measure as well as the consideration of the viewpoints of the affected residents and property owners. Feasibility generally deals with considering whether it is possible to build an abatement measure, given site constraints; and whether the abatement

Number	Description
	measure provides a minimum reduction in noise levels. Feasibility also requires that all of the homes potentially affected face the roadway from which the noise emanates. As a result, noise mitigation measures would be infeasible for any home with a driveway for which access must be maintained. The noise barrier would not be continuous, and subsequently would not provide the minimum 5 dBA of noise reduction. A noise abatement measure is not feasible unless the measure achieves a noise reduction of at least 5 dBA for front-row receivers. Highway noise barriers are designed to protect areas of "frequent human use," which generally do not include the front yards of homes. Also, Caltrans does not generally put noise barriers across the front yards of homes because they are acoustically infeasible and because most homeowners wish to maintain the views from the fronts of their homes.
N&V-MM#7	~~Heavy Maintenance Facilities~~ Station, Maintenance of Infrastructure Facility, and Traction Power Supply Station In order to reduce the noise from the ~~heavy maintenance~~ facilities, the following noise mitigation measures are recommended: • Enclose as many of the ~~maintenance~~ activities within the facility as possible. • Eliminate windows in the ~~maintenance~~ building that would face toward noise sensitive land uses adjacent to the facility. If windows are required to be located on the side of the facility facing noise-sensitive land uses, they should be the fixed type of windows with a sound transmission class (STC) rating of at least 35. If the windows must be operable, they should be closed during nighttime ~~maintenance~~ activities. • Close ~~maintenance~~ facility doors where the rails enter the facility during nighttime ~~maintenance~~ activities. • Locate ~~Maintenance~~ Tracks that cannot be located within the ~~maintenance~~ facility should be located on the far side of the facility from adjacent noise-sensitive receivers. • For ~~maintenance~~ tracks that cannot be installed away from noise-sensitive receivers, install sound barrier along the ~~maintenance~~ tracks in order to protect the adjacent noise-sensitive receivers. • Locate all mechanical equipment (compressors, pumps, generators, etc.) should be located within the ~~maintenance~~ facility structure. • Locate any mechanical equipment located exterior to the ~~maintenance~~ facility (compressors, pumps, generators, etc.) should be located on the far side of the facility from adjacent noise-sensitive receivers. If this is not possible, this equipment should be located within noise enclosures to mitigate the noise during operation. • Point all ventilation ducting for the ~~maintenance~~ facility should be pointed away from the adjacent noise-sensitive receivers.

F-B LGA = Fresno to Bakersfield Locally Generated Alternative
HSR = high-speed rail
MOIF = maintenance of infrastructure facility
TPSS = traction power supply station

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Table 3.4-27 Noise Barrier Analysis

Barrier	Track	Location	Track Type	Total Length (feet)	Height (feet)	Area (square feet)	Total Cost	Benefited Receivers	Cost per Benefited Receiver	Cost Exceed $55,000?	Is Barrier Reasonable?	5 dBA Reduction?	Unmitigated Severe Impacts	Severe Residual Impacts (With Mitigation)
NB No. 1	Southbound Track	South of Madera Avenue to north of E Ash Avenue	Viaduct/Fill (fill = 6,360 feet)	11,930	10	119,300	$6,336,960	79	$80,215	Yes	No	Yes	589	206
					12	143,160	$7,604,352	1,456	$5,223	No	Yes	Yes		32
					14	167,020	$8,871,744	1,456	$6,093	No	Yes	Yes		11
NB No. 2	Northbound Track	North of Venable Lane to south of E Ash Avenue	Viaduct/Fill (fill = 1,660 feet)	8,425	10	84,250	$4,203,360	169	$24,872	No	Yes	Yes	496	169
					12	101,100	$5,044,032	967	$5,216	No	Yes	Yes		136
					14	117,950	$5,884,704	967	$6,086	No	Yes	Yes		45
NB No. 3	Southbound Track	North of Fruitvale Avenue to Olive Drive	Viaduct	9,925	10	99,250	$4,764,000	497	$9,586	No	Yes	Yes	527	127
					12	119,100	$5,716,800	1,160	$4,928	No	Yes	Yes		61
					14	138,950	$6,669,600	1,160	$5,750	No	Yes	Yes		28
NB No. 4	Northbound Track	Norris Road to north of Elm Street	Viaduct	12,460	10	124,600	$5,980,800	104	$57,115	Yes	No	Yes	306	130
					12	149,520	$7,176,960	1,608	$4,433	No	Yes	Yes		22
					14	174,440	$8,373,120	1,608	$5,172	No	Yes	Yes		8
NB No. 5	Southbound Track	North of Elm Street to Oswell Street	Viaduct	26,700	10	262,000	$12,816,000	759	$16,885	No	Yes	Yes	1,060	154
					12	320,400	$15,379,200	3,200	$4,806	No	Yes	Yes		7
					14	373,800	$17,942,400	3,200	$5,607	No	Yes	Yes		0
NB No. 6	Northbound Track	North of H Street to Oswell Street	Viaduct	23,275	10	232,750	$11,172,000	900	$12,413	No	Yes	Yes	1,743	436
					12	279,300	$13,406,400	5,334	$2,513	No	Yes	Yes		87
					14	325,850	$15,640,800	5,334	$2,932	No	Yes	Yes		29

[1] Height above the top of the rail.
dBA = A-weighted decibel(s)
NB = Noise Barrier

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Table 3.4-28 Severe Residual Impacts with Mitigation

Land Use Categories	Residual Severe Noise Impacts	Noise Barrier Height[3]		
		10 feet	12 feet	14 feet
1	Recording Studios	3	3	0
2	Residential	2,874	1,376	121
	Hospitals	1	1	0
	Other[1]	14	7	0
3	Schools	2	1	0
	Churches	9	4	0
	Parks	3	2	0
	Other[2]	5	4	0

Source: Authority and FRA, 2017

[1] Other Category 2 uses include: 16 hotels, 2 homeless shelters, and 2 prisons/correctional facilities.

[2] Other Category 3 uses include: 12 meeting halls, 5 mortuaries, 2 libraries, 3 museums, 2 theaters, 2 day cares, 1 cemetery, 1 disability service, and 1 club.

[3] There are 31 receptors that are not located behind noise barriers with a residual severe noise impact. These 31 receptors include 28 residential land uses, 1 park, 1 Category 2 land use, and 1 Category 3 land use. See Mitigation Measure N&V-MM#9 in Section 3.4.4.3 for a discussion of the residences that are not behind noise barriers.

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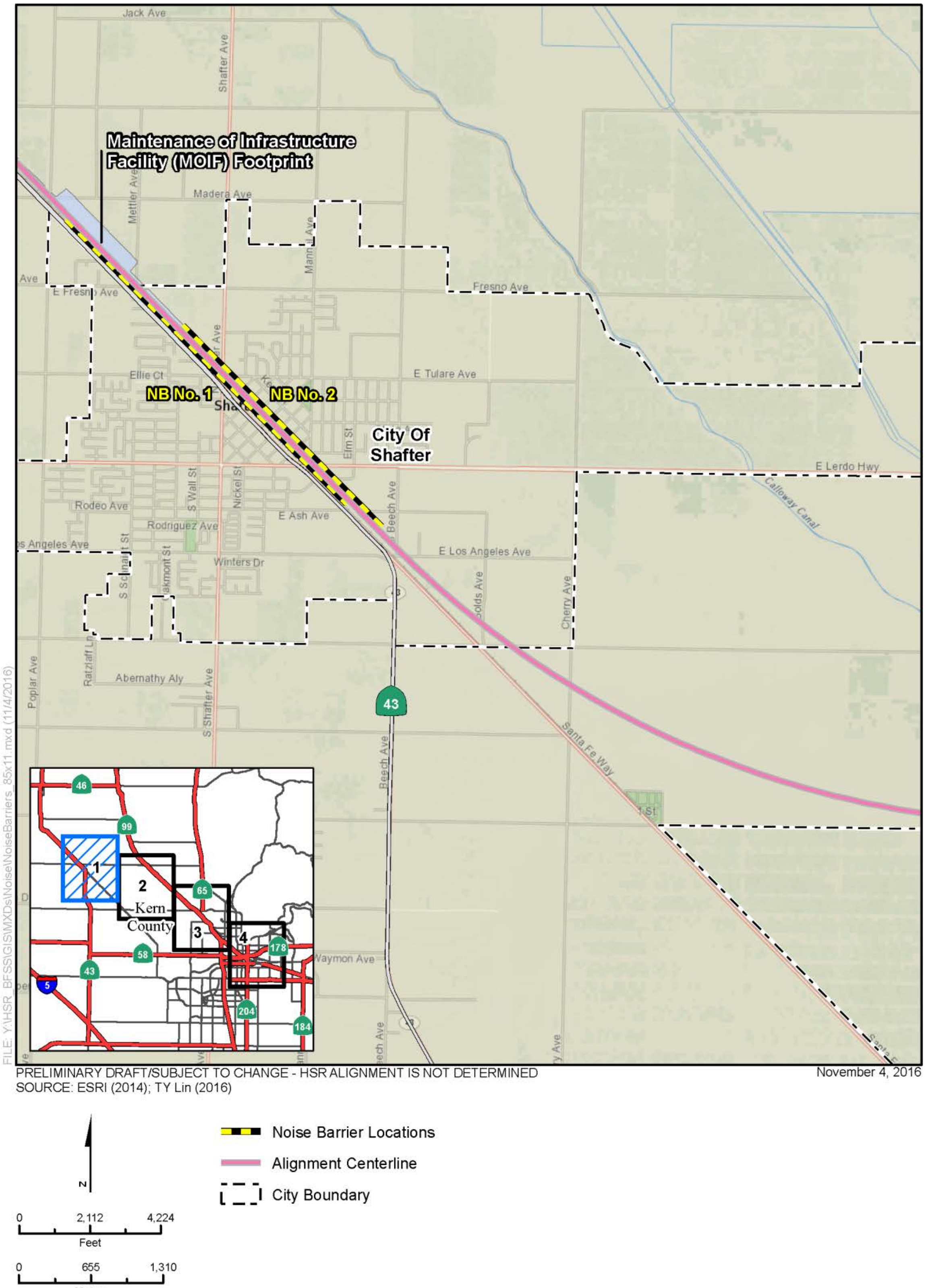

Figure 3.4-7 Noise Barrier Locations Inset Area 1

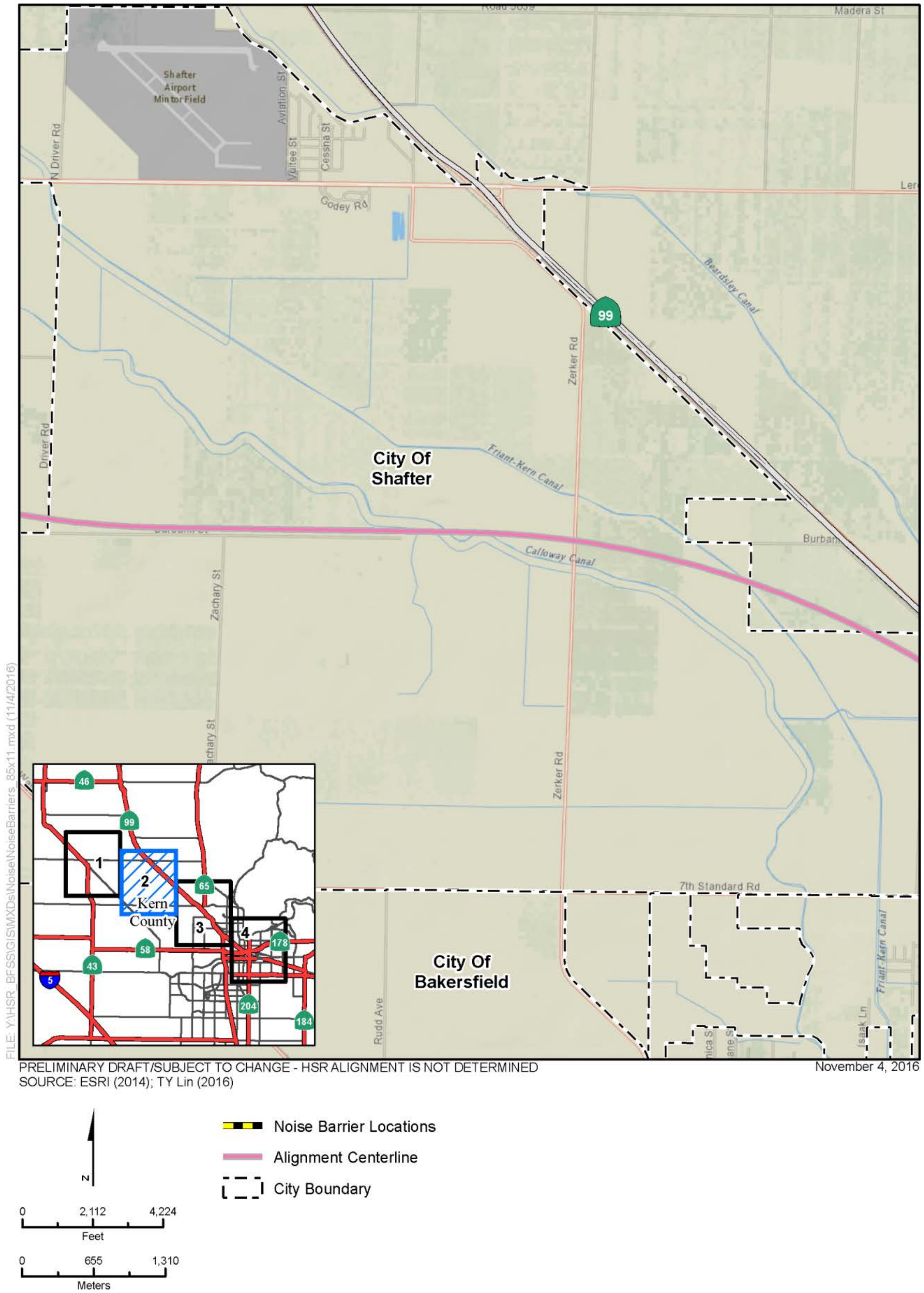

Figure 3.4-8 Noise Barrier Locations Inset Area 2

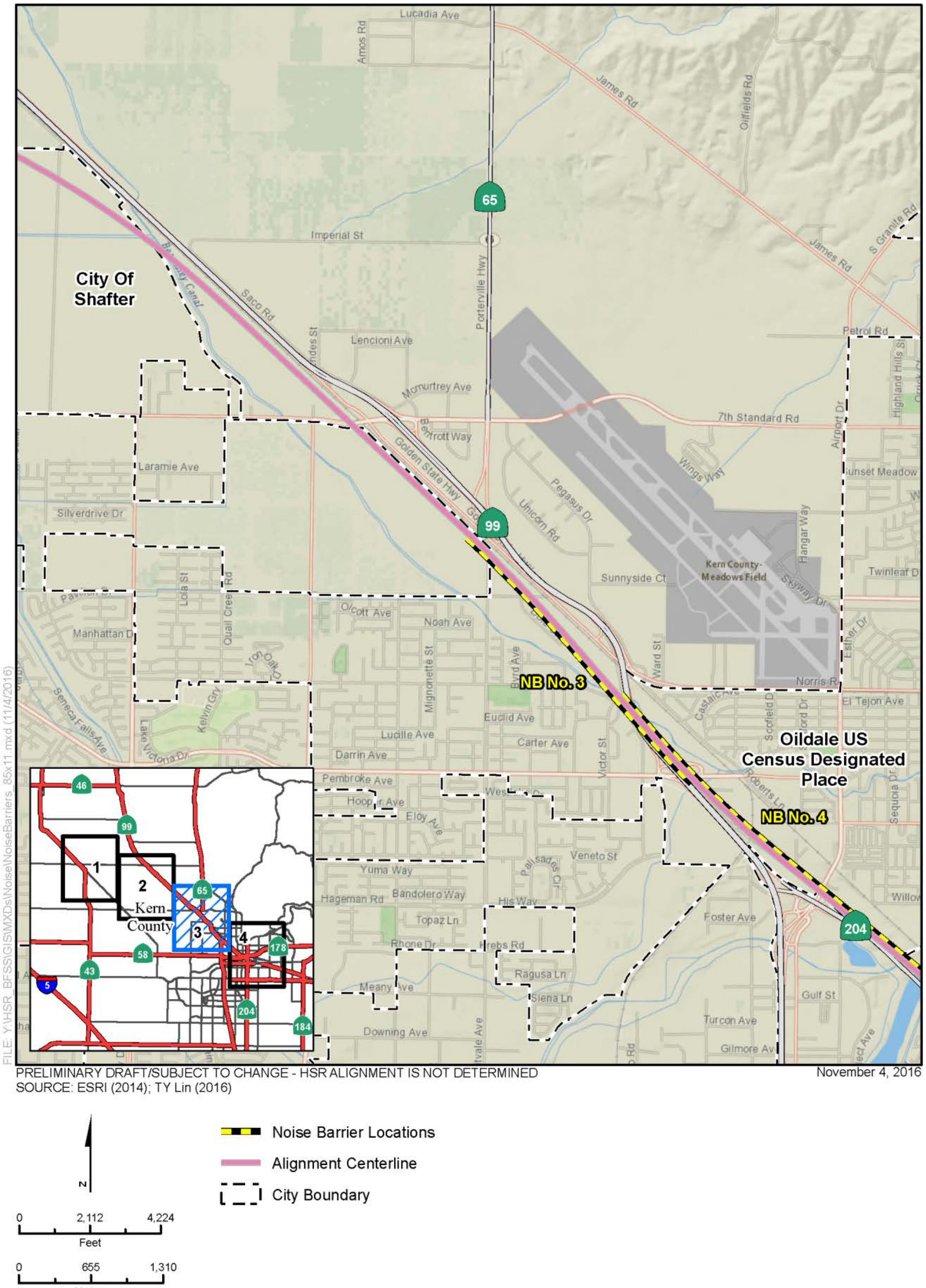

Figure 3.4-9 Noise Barrier Locations Inset Area 3

Figure 3.4-10 Noise Barrier Locations Inset Area 4

Table 3.4-29 Potential Vibration Mitigation Procedures and Descriptions

Mitigation Procedure	Location of Mitigation	Description
Maintenance	Source	Rail condition monitoring systems with rail grinding on a regular basis. Wheel truing to re-contour the wheel, provide a smooth running surface, and remove wheel flats. Reconditioning vehicles. Installing wheel condition monitoring systems.
Location and Design of Special Trackwork	Source	Careful review of crossover and turnout locations during the preliminary engineering stage. When feasible, relocate special trackwork to a less vibration-sensitive area. Installation of spring frogs eliminates gaps at crossovers and helps reduce vibration levels.
Vehicle Suspension	Source	Rail vehicles should have a low unsprung weight, soft primary suspension, minimum metal-on-metal contact between the moving parts of the truck, and smooth wheels that are perfectly round.
Special Track Support Systems	Source	Floating slabs, resiliently supported ties, high-resilience fasteners, resilient subroadbed materials, and ballast mats all help reduce vibration levels from the track support system.
Building Modifications	Receiver	For existing buildings, if vibration-sensitive equipment is affected by train vibration, the floor upon which the vibration-sensitive equipment is located could be stiffened and isolated from the remainder of the building. For new buildings, the building foundation should be supported by elastomer pads that are similar to bridge bearing pads.
Trenches	Along Vibration Propagation Path	A trench can be an effective vibration barrier if it changes the propagation characteristics of the soil. It can be open or solid. Open trenches can be filled with Styrofoam. Solid barriers can be constructed with sheet piling, rows of drilled shafts filled with either concrete or a mixture of soil and lime, or concrete poured into a trench.
Operational Changes	Source	Reduce vehicle speed. Adjust nighttime schedules to minimize train movements during sensitive hours. Operating restrictions require continuous monitoring and may not be practical.
Buffer Zones	Receiver	Negotiate a vibration easement from the affected property owners or expand the rail right-of-way.

- **Mitigation Measure N&V-MM#1** would reduce construction-related noise levels from the construction of the proposed project. Measures to reduce construction-related noise levels would not expand the construction area and the increase in noise would be minimal in comparison to the scope of the project. Therefore, the impacts of mitigation would be less than significant under CEQA.
- **Mitigation Measure N&V-MM#2** would reduce construction-related vibration levels or reduce construction-related vibration impacts. Although pre-construction surveys and repair of damaged buildings would likely be conducted outside of the construction boundary, increases in vibration levels would be minimal to negligible in comparison to the scope of the project. Therefore, the impacts of mitigation would be less than significant under CEQA.
- **Mitigation Measure N&V-MM#3** would reduce operational-related noise from the proposed HSR. The installation of noise barriers along the HSR alignment would be installed on edges of the HSR viaduct and would not obstruct wildlife movement. Installation of noise barriers along the HSR would occur in urbanized areas and would not be located in areas that have been identified as wildlife corridors; expect for a short portion of the HSR that would span the Kern River Corridor, where installation of the noise barrier would occur on the viaduct spanning the corridor, thus not impeding wildlife movement. The installation of noise barriers

has the potential to affect visual and aesthetic qualities. Section 3.16.5, Aesthetics and Visual Resources, addresses potential impacts to visual and aesthetic resources in the project area. Although providing sound insulation would occur beyond the construction boundary, increases in noise would be minimal to negligible in comparison to the scope of the project. Therefore, the impacts of mitigation would be less than significant under CEQA. Final location and design of noise barriers would be determined during the testing and certification phase of the project. Once trainsets are operable (at the outset of the testing and certification phase), noise measurements would be taken at nearby sensitive receptors to acquire baseline noise measurements. Where severe noise impacts would remain with the installation of noise barriers, noise measurements during the testing and certification phase would indicate whether sound insulation would reduce noise impacts in interior spaces to an acceptable level. If noise impacts would remain severe after the installation of sound insulation, then a noise easement would be negotiated with the property owner.

- **Mitigation Measure N&V-MM#4** would require the construction of HSR locomotives to meet federal regulations (40 C.F.R. 201.12/13). This measure would not increase noise and vibrations levels within the project area. Therefore, the impacts of mitigation would be less than significant under CEQA.
- **Mitigation Measure N&V-MM#5** would require special types of track work to eliminate gaps that would reduce noise levels generated from rail turnouts. This measure would be conducted within the HSR rail right-of-way and staging areas. The increase in noise and vibration would be minimal to negligible in comparison to the scope of the project. Therefore, the impacts of mitigation would be less than significant under CEQA.
- **Mitigation Measure N&V-MM#6** would require a reassessment of noise and vibration impacts and recommendations for mitigation if there are changes in assumptions during final design or final design of the locomotive. Additional mitigation measures that may result from changes to the assumptions for the proposed project would be minimal in comparison to the scope of the project. Therefore, the impacts of mitigation would be less than significant under CEQA.
- **Mitigation Measure N&V-MM#7** would reduce noise levels generated from long-term operations of stationary facilities associated with the proposed HSR project. These measures would not expand the project boundary and the increase in noise would be minimal to negligible in comparison to the scope of the project. Therefore, the impacts of mitigation would be less than significant under CEQA.

3.4.6.2 Mitigation Measures Specific to the F-B LGA

There are no additional measures specific to the F-B LGA. All measures identified in the May 2014 Project would be applicable to the F-B LGA and are available to mitigate for impacts that cannot be rectified, reduced, eliminated or avoided.