

3.10 NOISE AND VIBRATION

This section presents definitions of common noise descriptors; descriptions of applicable noise regulations, acoustic fundamentals, and existing ambient noise conditions; and an analysis of potential short- and long-term noise impacts associated with implementation of the project.

No comments related to noise and vibration were received in response to the Notice of Preparation.

3.10.1 Environmental Setting

ACOUSTIC FUNDAMENTALS

Prior to discussing the environmental and regulatory noise setting for the project, background information on sound, noise, vibration, and common noise descriptors is needed to provide context and a better understanding of the technical terms and regulations referenced throughout this section.

Sound, Noise, and Acoustics

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air) to a human ear. Noise is defined as loud, unexpected, or annoying sound.

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver determines the sound level and characteristics of the noise perceived by the receiver. The field of acoustics deals primarily with the propagation and control of sound.

Frequency

Continuous sound can be described by frequency (pitch) and amplitude (loudness). A low-frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz, or thousands of hertz. The audible frequency range for humans is generally between 20 Hz and 20,000 Hz.

Sound Pressure Levels and Decibels

The amplitude of pressure waves generated by a sound source determines the loudness of that source. Sound pressure amplitude is measured in micro-Pascals (mPa). One mPa is approximately one hundred billionth (0.0000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to 100,000,000 mPa. Because of this large range of values, sound is rarely expressed in terms of mPa. Instead, a logarithmic scale is used to describe sound pressure level (SPL) in terms of decibels (dB).

Addition of Decibels

Because decibels are logarithmic units, SPLs cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3-dB increase. In other words, when two identical sources are each producing sound of the same loudness at the same time, the resulting sound level at a given distance would be 3 dB higher than if only one of the sound sources was producing sound under the same conditions. For example, if one automobile produces an SPL of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB; rather, they would combine to produce 73 dB. Under the decibel scale, three sources of equal loudness together produce a sound level 5 dB louder than one source.

A-Weighted Decibels

The decibel scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the SPL in that range. In general, people are most sensitive to the frequency range of 1,000–8,000 Hz, and perceive sounds within that range better than sounds of the same amplitude in higher or lower frequencies. To approximate the response of the human ear, sound levels of individual frequency bands are weighted, depending on the human sensitivity to those frequencies. Then, an “A-weighted” sound level (expressed in units of A-weighted decibels) can be computed based on this information.

The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgment correlates well with the A-scale sound levels of those sounds. Thus, noise levels are typically reported in terms of A-weighted decibels or dBA. All sound levels discussed in this section are A-weighted decibels. Table 3.10-1 describes typical A-weighted noise levels for various noise sources.

Table 3.10-1 Typical Noise Levels

| Common Outdoor Activities | Noise Level (dBA) | Common Indoor Activities |
|---|-------------------|--|
| | – 110 – | Rock band |
| Jet fly-over at 1,000 feet | – 100 – | |
| Gas lawn mower at 3 feet | – 90 – | |
| Diesel truck at 50 feet at 50 miles per hour | – 80 – | Food blender at 3 feet, Garbage disposal at 3 feet |
| Noisy urban area, daytime, Gas lawn mower at 100 feet | – 70 – | Vacuum cleaner at 10 feet, Normal speech at 3 feet |
| Commercial area, Heavy traffic at 300 feet | – 60 – | |
| Quiet urban daytime | – 50 – | Large business office, Dishwasher next room |
| Quiet urban nighttime | – 40 – | Theater, large conference room (background) |
| Quiet suburban nighttime | – 30 – | Library, Bedroom at night |
| Quiet rural nighttime | – 20 – | |
| | – 10 – | Broadcast/recording studio |
| Lowest threshold of human hearing | – 0 – | Lowest threshold of human hearing |

Source: Caltrans 2013a: Table 2-5

Human Response to Changes in Noise Levels

As discussed above, the doubling of sound energy results in a 3-dBA increase in the sound level. However, given a sound level change measured with precise instrumentation, the subjective human perception of a doubling of loudness will usually be different from what is measured.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear is able to discern 1-dBA change in sound levels when exposed to steady, single-frequency (“pure-tone”) signals in the mid-frequency (1,000–8,000 Hz) range. In typical noisy environments, changes in noise of 1–2 dBA are generally not perceptible. However, it is widely accepted that people can begin to detect sound level increases of 3 dBA in typical noisy environments. Further, a 5-dBA increase is generally perceived as a distinctly noticeable increase, and a 10-dBA increase is generally perceived as a doubling of loudness. Therefore, a doubling of sound energy (e.g., doubling the volume of traffic on a highway) that would result in a 3-dBA increase in sound would generally be perceived as barely detectable.

Vibration

Vibration is the periodic oscillation of a medium or object with respect to a given reference point. Sources of vibration include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) and those introduced by human activity (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous, (e.g., operating factory machinery) or transient in nature (e.g., explosions). Vibration levels can be depicted in terms of amplitude and frequency, relative to displacement, velocity, or acceleration.

Vibration amplitudes are commonly expressed in peak particle velocity (PPV) or root-mean-square (RMS) vibration velocity. PPV and RMS vibration velocity are normally described in inches per second (in/sec) or in millimeters per second (mm/s). PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is typically used in the monitoring of transient and impact vibration and has been found to correlate well to the stresses experienced by buildings (FTA 2006:7-5, Caltrans 2013b:6).

Although PPV is appropriate for evaluating the potential for building damage, it is not always suitable for evaluating human response. It takes some time for the human body to respond to vibration signals. In a sense, the human body responds to average vibration amplitude. The RMS of a signal is the average of the squared amplitude of the signal, typically calculated over a 1-second period. As with airborne sound, the RMS velocity is often expressed in decibel notation as vibration decibels (VdB), which serves to compress the range of numbers required to describe vibration (FTA 2006:7-5). This is based on a reference value of 1 micro inch per second.

The typical background vibration-velocity level in residential areas is approximately 50 VdB. Ground vibration is normally perceptible to humans at approximately 65 VdB. For most people, a vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels (FTA 2006:7-7).

Typical outdoor sources of perceptible ground vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground vibration is rarely perceptible. The range of interest is from approximately 50 VdB, which is the typical background vibration-velocity level, to 100 VdB, which is the general threshold where minor damage can occur in fragile buildings. Construction activities can generate sufficient ground vibrations to pose a risk to nearby structures. Constant or transient vibrations can weaken structures, crack facades, and disturb occupants (FTA 2006:7-5).

Vibrations generated by construction activity can be transient, random, or continuous. Transient construction vibrations are generated by blasting, impact pile driving, and wrecking balls. Continuous vibrations result from vibratory pile drivers, large pumps, and compressors. Random vibration can result from jackhammers, pavement breakers, and heavy construction equipment.

Table 3.10-2 describes the general human response to different ground vibration-velocity levels.

| Vibration-Velocity Level | Human Reaction |
|--------------------------|--|
| 65 VdB | Approximate threshold of perception. |
| 75 VdB | Approximate dividing line between barely perceptible and distinctly perceptible. Many people find that transportation-related vibration at this level is unacceptable. |
| 85 VdB | Vibration acceptable only if there are an infrequent number of events per day. |

Notes: VdB = vibration decibels referenced to 1 μ inch/second and based on the root mean square (RMS) velocity amplitude.
Source: FTA 2006:7-8

Common Noise Descriptors

Noise in our daily environment fluctuates over time. Various noise descriptors have been developed to describe time-varying noise levels. The following are the noise descriptors used in this section.

Equivalent Continuous Sound Level (L_{eq}): L_{eq} represents an average of the sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level containing the same acoustical energy as the time-varying sound that simultaneously occurs during the same period. The 1-hour A-weighted equivalent sound level ($L_{eq[h]}$) is the energy average of A-weighted sound levels occurring during a 1-hour period and is the basis for noise abatement criteria used by the California Department of Transportation (Caltrans) and the Federal Highway Administration (FHWA).

Percentile-Exceeded Sound Level (L_{xx}): L_{xx} represents the sound level exceeded for a given percentage of a specified period (e.g., L_{10} is the sound level exceeded 10 percent of the time, and L_{90} is the sound level exceeded 90 percent of the time).

Maximum Sound Level (L_{max}): L_{max} is the highest instantaneous sound level measured during a specified period.

Day-Night Sound Level (L_{dn}): L_{dn} is the energy average of A-weighted sound levels occurring over a 24-hour period, with a 10-dBA “penalty” applied to A-weighted sound levels occurring during nighttime hours between 10 p.m. and 7 a.m.

Community Noise Equivalent Level (CNEL): Similar to L_{dn} , CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10-dBA penalty applied to A-weighted sound levels occurring during the nighttime hours between 10 p.m. and 7 a.m. and a 5-dBA penalty applied to the A-weighted sound levels occurring during evening hours between 7 p.m. and 10 p.m.

Sound Propagation

When sound propagates over a distance, it changes in level and frequency content. The manner that noise reduces with distance depends on the following factors.

Geometric Spreading

Sound from a localized source (i.e., a point source) propagates uniformly outward in a spherical pattern. The sound level attenuates (or decreases) at a rate of 6 dBA for each doubling of distance from a point source. Roads and highways consist of several localized noise sources on a defined path and hence can be treated as a line source, which approximates the effect of several point sources, thus propagating at a slower rate in comparison to a point source. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels generated by a line source attenuate at a rate of 3 dBA for each doubling of distance from the line source.

Ground Absorption

The propagation path of noise from a source to a receiver is usually very close to the ground. Noise attenuation from ground absorption and reflective-wave canceling adds to the attenuation associated with geometric spreading. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is usually sufficiently accurate for distances of less than 200 feet. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receiver, such as a parking lot or body of water), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between the source and the receiver, such as soft dirt, grass, or scattered bushes and trees), an excess ground-attenuation value of 1.5 dBA per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dBA per doubling of distance. This would hold true for point sources, resulting in an overall drop-off rate of up to 7.5 dBA per doubling of distance.

Atmospheric Effects

Receivers located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels, as wind can carry sound. Sound levels can be increased at large distances (e.g., more than 500 feet) from the source because of atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors such as air temperature, humidity, and turbulence can also have significant effects.

Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receiver specifically to reduce noise. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dBA of noise reduction. Taller barriers provide increased noise reduction. Vegetation between the source and receiver is rarely effective in reducing noise because it does not create a solid barrier.

EXISTING NOISE ENVIRONMENT

Existing Noise- and Vibration-Sensitive Land Uses

Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Additional land uses such as parks, schools, historic sites, cemeteries, and recreation areas are also generally considered sensitive to increases in exterior noise levels. Places of worship and transit lodging, and other places where low interior noise levels are essential are also considered noise-sensitive. Those noted above are also considered vibration-sensitive land uses in addition to commercial and industrial buildings where vibration would interfere with operations within the building, including levels that may be well below those associated with human annoyance.

Existing noise- and vibration- sensitive land uses near the SOIA area (or “project site”) include the continuous single family residential development on the northern and western sides of the project site, Henry Backer Senior Park to the north, and a single-family residence along Bruceville Road east of the project site. The nearest sensitive receptors to the SOIA area are the receptors along the northern and eastern sides of the project site (single-family development along Bilby Road, Henry Backer, Sr. Park, and the single-family residence along Bruceville Road), all of which are approximately 75 feet from the project site. The residential receptors to the west are located approximately 175 feet from the project site. See Exhibit 3.10-1 for locations of all nearby sensitive land uses.

Existing Noise Sources and Ambient Levels

Transportation Noise

The existing noise environment in the project area is primarily influenced by vehicular traffic on the surrounding roadway network (e.g., Bilby Road, Willard Parkway, Bruceville Road). Table 3.10-3 summarizes the modeled existing traffic noise levels at 100 feet from the centerline of each area roadway segments, and lists distances from each roadway centerline to the 70, 65, and 60 L_{dn} traffic noise contours. Exhibit 3.10-2 and Exhibit 3.10-3 show the traffic noise contours for roadways in the vicinity of the SOIA Area. The traffic noise levels presented in Table 3.10-3 were estimated using calculation methods consistent with FHWA Traffic Noise Model (FHWA 2004) and using average daily traffic (ADT) volumes provided in the traffic analysis conducted by Fehr & Peers and summarized in Section 3.13, “Traffic, Transportation, and Circulation,” and detailed in Appendix D of this DEIR.

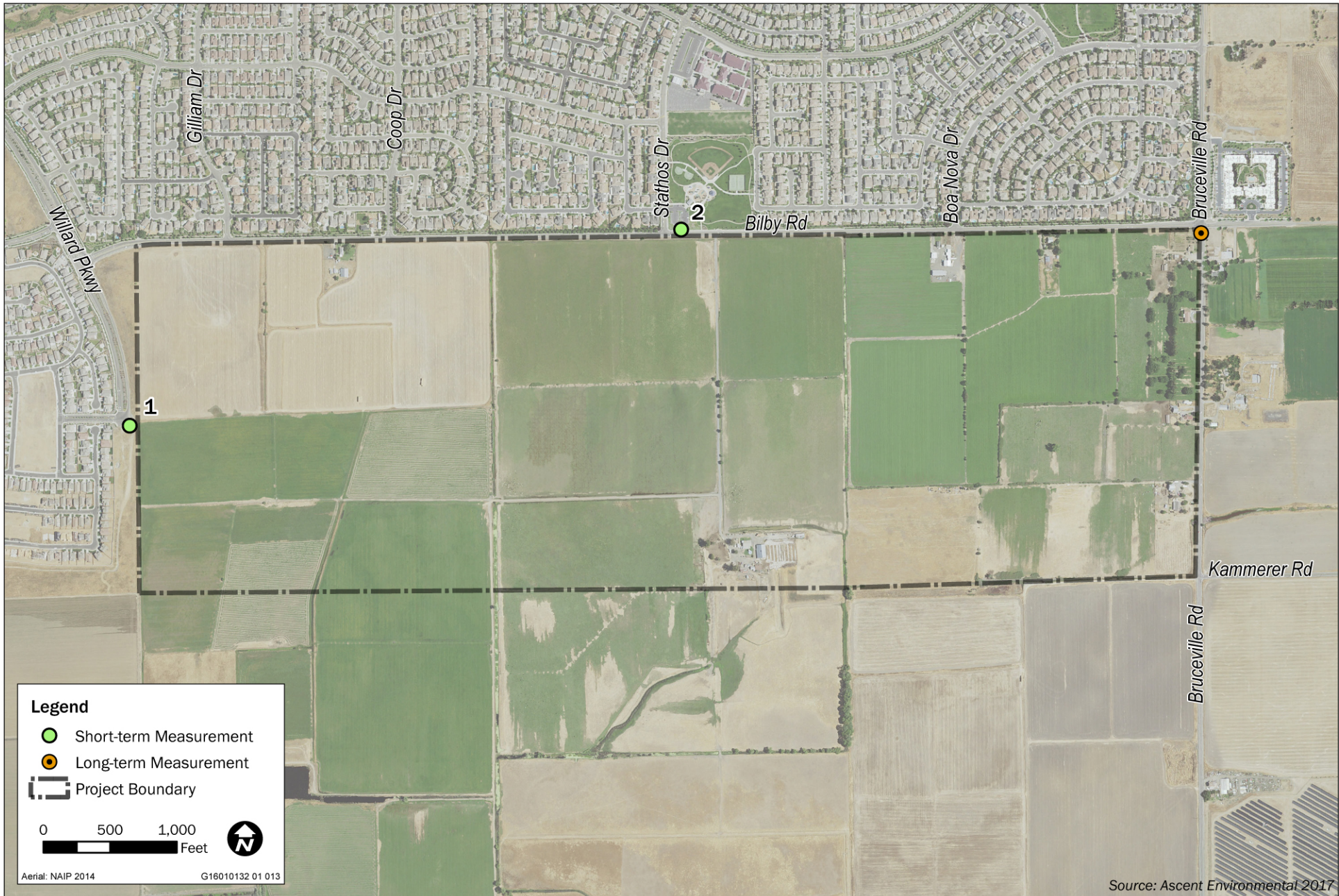


Exhibit 3.10-1

Noise Measurement Locations



Table 3.10-3 Summary of Modeled Existing Traffic Noise Levels

| Roadway Segment/Segment Description | L _{dn} at 100 feet from Roadway Centerline | Distance (feet) from Roadway Centerline to L _{dn} Contour | | |
|---|---|--|-----|------|
| | | 70 | 65 | 60 |
| Hood Franklin Road (I-5 NB Off-Ramp to Kammerer Road) | 64.9 | 31 | 98 | 310 |
| Kammerer Road (Bruceville Road to McMillan Road) | NA | NA | NA | NA |
| Kammerer Road (McMillan Road to Driveway) | NA | NA | NA | NA |
| Kammerer Road (Driveway to Lent Ranch Parkway) | 65.0 | 32 | 100 | 317 |
| Kammerer Road (Lent Ranch Parkway to Promenade Parkway) | 65.0 | 32 | 100 | 317 |
| Kammerer Road (Promenade Parkway to SR 99 SB Ramps) | 65.0 | 32 | 100 | 317 |
| Grant Line Road (SR 99 SB Ramps to SR 99 NB Ramps) | 65.0 | 32 | 100 | 317 |
| Grant Line Road (SR 99 NB Ramps to E Stockton Boulevard) | 69.0 | 80 | 252 | 797 |
| Grant Line Road (E Stockton Boulevard to Waterman Road) | 69.0 | 80 | 252 | 797 |
| Grant Line Road (Waterman Road to Mosher Road) | 69.0 | 80 | 252 | 797 |
| Grant Line Road (Mosher Road to Bradshaw Road) | 69.9 | 99 | 312 | 986 |
| Grant Line Road (Bradshaw Road to Elk Grove Boulevard) | 68.5 | 71 | 224 | 709 |
| Willard Parkway (Bilby Road to Future Roadway Segment 2) | 68.5 | 71 | 224 | 709 |
| Bilby Road (Willard Parkway to Coop Drive) | 68.5 | 71 | 224 | 709 |
| Bilby Road (Coop Drive to Bruceville Road) | 54.6 | 3 | 9 | 29 |
| Bruceville Road (Bilby Road to Whitelock Parkway) | 63.2 | 21 | 66 | 210 |
| Bruceville Road (Whitelock Parkway to Civic Center Drive) | 63.2 | 21 | 66 | 210 |
| Bruceville Road (Civic Center Drive to Elk Grove Boulevard) | 61.7 | 15 | 47 | 149 |
| Willard Parkway (Bilby Road to Whitelock Parkway) | 65.9 | 39 | 123 | 389 |
| Franklin Boulevard (Whitelock Parkway to Elk Grove Boulevard) | 65.9 | 39 | 123 | 389 |
| Bruceville Road (Bilby Road to Kammerer Road) | 64.8 | 30 | 95 | 299 |
| Bruceville Road (Kammerer Road to Eschinger Road) | 66.8 | 48 | 152 | 479 |
| I-5 (Laguna Boulevard On/Off Ramps to Elk Grove Boulevard On/Off Ramps) | 49.9 | 1 | 3 | 10 |
| I-5 (Elk Grove Boulevard On/Off Ramps to Hood Franklin Road On/Off Ramps) | 55.3 | 3 | 11 | 34 |
| I-5 (Hood Franklin Road On/Off Ramps to Twin Cities Road On/Off Ramps) | 69.7 | 93 | 294 | 930 |
| SR 99 (Bond Road On/Off Ramps to Elk Grove Boulevard On/Off Ramps) | 68.7 | 73 | 232 | 734 |
| SR 99 (Elk Grove Boulevard On/Off Ramps to Grant Line Road On/Off Ramps) | 67.9 | 61 | 193 | 612 |
| SR 99 (Grant Line Road On/Off Ramps to W Stockton Boulevard On/Off Ramps) | 71.6 | 146 | 460 | 1456 |
| SR 99 (W Stockton Boulevard On/Off Ramps to Dillard Road On/Off Ramps) | 69.5 | 89 | 282 | 893 |
| SR 99 (Dillard Road On/Off Ramps to Arno Road On/Off Ramps) | 69.4 | 87 | 275 | 869 |

Notes: L_{dn} = Day-Night Level

All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow, and does not account for shielding of any type or finite roadway adjustments. All noise levels are reported as A-weighted noise levels. For additional details, refer to Appendix C for detailed traffic data, and traffic-noise modeling input data and output results.

Source: Data modeled by Ascent Environmental in 2017

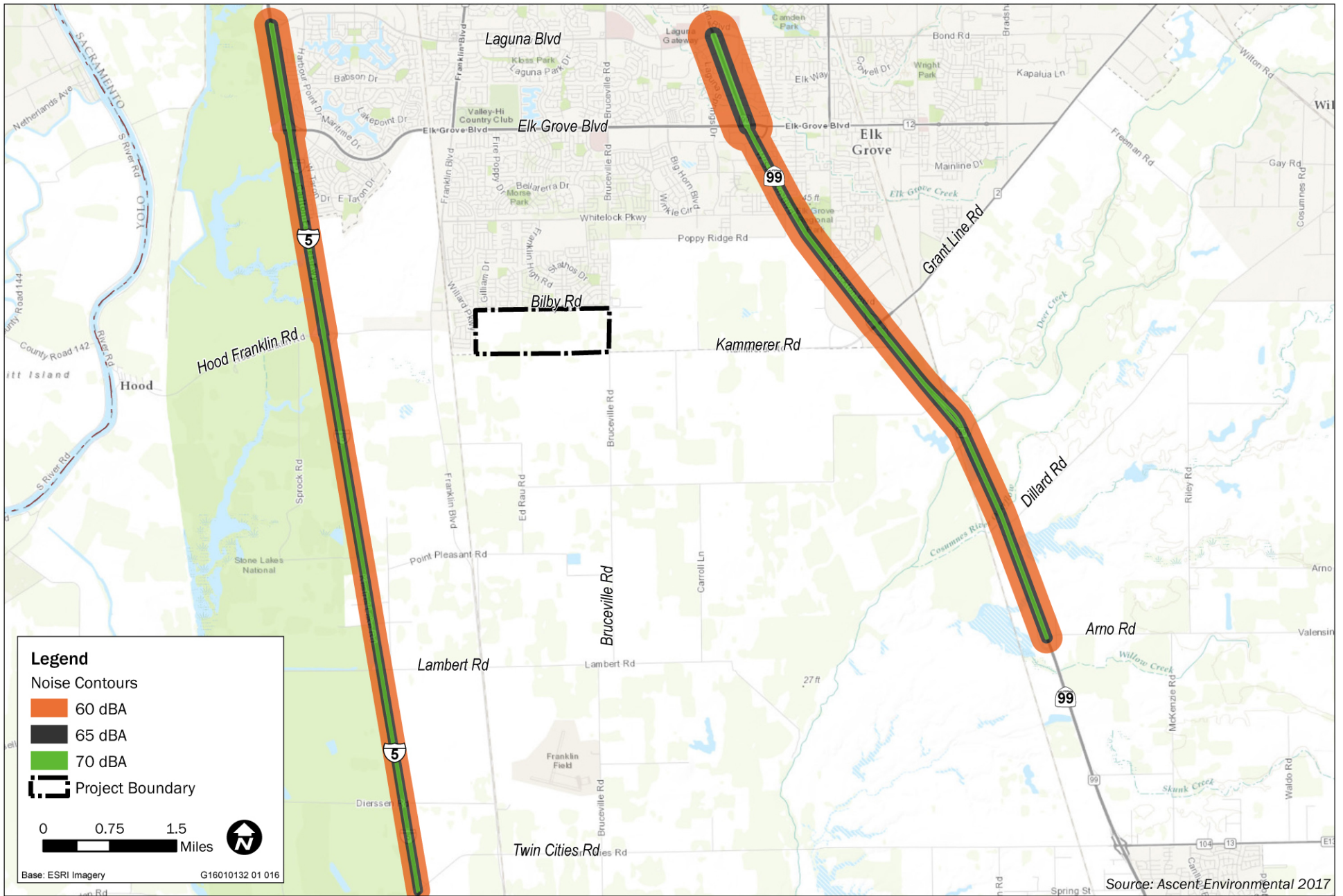


Exhibit 3.10-2

Existing Highway Noise Contours



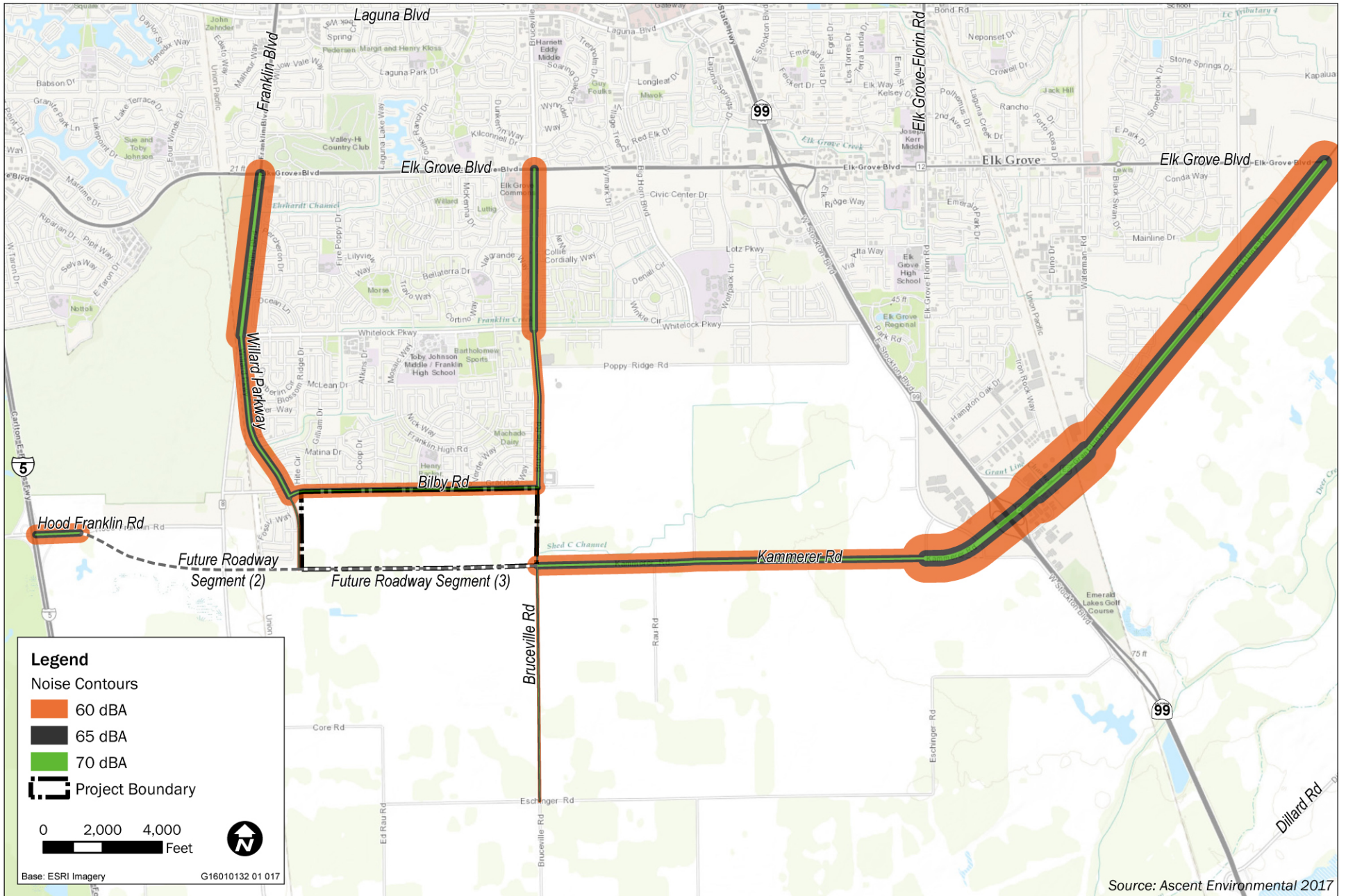


Exhibit 3.10-3

Existing Roadway Noise Contours



Existing Noise Survey

Two short-term noise measurements and one long-term noise measurement were conducted near the project study area to document the existing noise environment within the proposed SOIA area. The predominant noise source near the long-term measurement site is traffic noise emanating from Bilby Road and Bruceville Road, the intersection at which the noise measurement was taken. The noise measurements were collected starting on May 2, 2017 and ending on May 3, 2017. Noise level measurements were conducted in accordance with American National Standards Institute standards using Larson Davis Laboratories (LDL) Model 820 and LxT precision integrating sound level meters. The sound level meters were calibrated before and after use with an LDL Model CAL200 acoustical calibrator.

Meteorological conditions during the measurement period were adequate for reliable noise measurements, with clear skies, temperatures ranging from 65 degrees Fahrenheit (°F) to 91 °F, light winds averaging 1 to 3 miles per hour, and no precipitation. Results of the noise survey are shown in Table 3.10-4.

Table 3.10-4 Noise Measurement Summary

| Measurement | Start Date/Time | Stop Date/Time | Sound Level (dB) | | | | | | |
|--------------------------------|--------------------|--------------------|------------------|---|------|------|---|------|------|
| | | | Leq | Lmax | Lmin | L10 | L50 | L90 | |
| Short-Term Measurements | | | | | | | | | |
| Short-term Measurement 1 | 5/2/17, 10 a.m. | 5/2/17, 10:15 a.m. | 54.4 | 72.2 | 33.7 | 55.5 | 44.3 | 37.1 | |
| Short-term Measurement 2 | 5/2/17, 10:25 a.m. | 5/2/17, 10:40 a.m. | 58.9 | 73.7 | 35.3 | 62.9 | 50.4 | 39.3 | |
| Long-Term Measurement | | | L _{dn} | Daytime (7:00 a.m.-10:00 p.m.) | | | Nighttime (10:00 p.m.-7:00 a.m.) | | |
| | | | | Leq | Lmax | Lmin | Leq | Lmax | Lmin |
| Long-term Measurement | 5/2/17, 11 a.m. | 5/3/17, 11 a.m. | 70.1 | 67.5 | 99.1 | 35.9 | 59.1 | 98.5 | 31.2 |

Refer to Exhibit 3.10-1 for ambient noise level measurement locations.
See Appendix C for detailed noise measurement data.
Source: Measurements conducted by Ascent Environmental in 2017.

3.10.2 Regulatory Framework

FEDERAL

U.S. Environmental Protection Agency Office of Noise Abatement and Control

The U.S. Environmental Protection Agency (EPA) Office of Noise Abatement and Control was originally established to coordinate Federal noise control activities. In 1981, EPA administrators determined that subjective issues such as noise would be better addressed at more local levels of government. Consequently, in 1982 responsibilities for regulating noise control policies were transferred to State and local governments. However, documents and research completed by the EPA Office of Noise Abatement and Control continue to provide value in the analysis of noise effects.

Federal Transit Administration

To address the human response to ground vibration, the Federal Transit Administration (FTA) has set forth guidelines for maximum-acceptable vibration criteria for different types of land uses. These guidelines are presented in Table 3.10-5.

Table 3.10-5 Ground-Borne Vibration Impact Criteria for General Assessment

| Land Use Category | GVB Impact Levels (VdB re 1 micro-inch/second) | | |
|---|--|--------------------------------|--------------------------------|
| | Frequent Events ¹ | Occasional Events ² | Infrequent Events ³ |
| Category 1: Buildings where vibration would interfere with interior operations. | 65 ⁴ | 65 ⁴ | 65 ⁴ |
| Category 2: Residences and buildings where people normally sleep. | 72 | 75 | 80 |
| Category 3: Institutional land uses with primarily daytime uses. | 75 | 78 | 83 |

Notes: VdB = vibration decibels referenced to 1 μ inch/second and based on the root mean square (RMS) velocity amplitude.

- “Frequent Events” is defined as more than 70 vibration events of the same source per day.
- “Occasional Events” is defined as between 30 and 70 vibration events of the same source per day.
- “Infrequent Events” is defined as fewer than 30 vibration events of the same source per day.
- This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research would require detailed evaluation to define the acceptable vibration levels.

Source: FTA 2006

STATE

California Department of Transportation

In 2013, the Caltrans published its Transportation and Construction Vibration Manual (Caltrans 2013b). The manual provides general guidance on vibration issues associated with construction and operation of projects in relation to human perception and structural damage. Table 3.10-6 presents recommendations for levels of vibration that could result in damage to structures exposed to continuous vibration.

Table 3.10-6 Caltrans Recommendations Regarding Vibration Levels

| PPV (in/sec) | Effect on Buildings |
|--------------|---|
| 0.4-0.6 | Architectural damage and possible minor structural damage |
| 0.2 | Risk of architectural damage to normal dwelling houses |
| 0.1 | Virtually no risk of architectural damage to normal buildings |
| 0.08 | Recommended upper limit of vibration to which ruins and ancient monuments should be subjected |
| 0.006-0.019 | Vibration unlikely to cause damage of any type |

Notes: PPV = peak particle velocity, in/sec = inches per second

Source: Caltrans 2013b: 24

LOCAL

City of Elk Grove General Plan

The project site is situated immediately south of and adjacent to residences that are located in the City of Elk Grove and the project site could be annexed into the City if approved by the Sacramento Local Agency Formation Commission in the future. The *Elk Grove General Plan* Noise Element (City of Elk Grove 2016) contains the following policies and standards related to noise. These policies are presented to determine whether the project would have any significant noise impacts based on application of the City’s noise policies.

- Policy NO-1.** New development of the uses listed in Table NO-C [as shown in Table 3.10-7 of this EIR] shall conform with the noise levels contained in that Table. All indoor and outdoor areas shall be located, constructed, and/or shielded from noise sources to achieve compliance with the City’s noise standards.

- ▲ **Policy NO-2.** Where noise-sensitive land uses are proposed in areas exposed to existing or projected exterior noise levels exceeding the levels specified in Table NO-C [as shown in Table 3.10-7 of this EIR] or the performance standards of Table NO-A [as shown in Table 3.10-8 of this EIR], an acoustical analysis shall be required as part of the environmental review process so that noise mitigation may be included in the project design.
- ▲ **Policy NO-3.** Noise created by new proposed non-transportation noise sources shall be mitigated so as not to exceed the noise level standards of Table NO-A [as shown in Table 3.10-8 of this EIR] as measured immediately within the property line of lands designated for noise-sensitive uses.

 - **Policy NO-3 – Action 1.** Limit construction activity to the hours of 7 a.m. to 7 p.m. whenever such activity is adjacent to residential uses.
 - **Policy NO-3 – Action 2.** Consider limiting the hours of operation for loading docks, trash compactors, and other noise-producing uses in commercial areas which are adjacent to residential uses.
 - **Policy NO-3 – Action 3.** The City shall require that stationary construction equipment and construction staging areas be set back from existing noise-sensitive land uses.

Table 3.10-7 Maximum Allowable Noise Exposure from Transportation Noise Sources by Land Use Type

| Land Use | Outdoor Activity Areas ¹ L _{dn} /CNEL, dB | Interior Spaces | |
|---|--|---------------------------|-----------------------------------|
| | | L _{dn} /CNEL, dB | L _{eq} , dB ² |
| Residential | 60 ³ | 45 | - |
| Residential subject to noise from railroad tracks, aircraft overflights, or similar noise sources which produce clearly identifiable, discrete noise events (the passing of a single train, as opposed to relatively steady noise sources such as roadways) | 60 ³ | 40 ⁵ | - |
| Transient Lodging | 60 ⁴ | 45 | - |
| Hospitals, Nursing Homes | 60 ³ | 45 | - |
| Theaters, Auditoriums, Music Halls | - | - | 35 |
| Churches, Meeting Halls | 60 | - | 40 |
| Office Buildings | - | - | 45 |
| Schools, Libraries, Museums | - | - | 45 |
| Playgrounds, Neighborhood Parks | 70 | - | - |

Notes: L_{dn}= day-night average noise level; CNEL= Community Noise Equivalent Level

- ¹ Where the location of outdoor activity areas is unknown, the exterior noise level standard shall be applied to the property line of the receiving land use. Where it is not practical to mitigate exterior noise levels at patio or balconies of apartment complexes, a common area such as a pool or recreation area may be designed as the outdoor activity area.
- ² As determined for a typical worst-case house during periods of use.
- ³ Where it is not possible to reduce noise in outdoor activity areas to 60 dB L_{dn}/CNEL or less using a practical application of the best-available noise reduction measures, an exterior noise level of up to 65 dB L_{dn}/CNEL may be allowed provided that available exterior noise level reduction measures have been implemented and interior noise levels are in compliance with this table.
- ⁴ In the case of hotel/motel facilities or other transient lodging, outdoor activity areas such as pool areas may not be included in the project design. In these cases, only the interior noise level criterion will apply.
- ⁵ The intent of this noise standard is to provide increased protection against sleep disturbances located near railroad tracks.

Source: City of Elk Grove 2016

Table 3.10-8 Performance Standards for Typical Stationary Noise Sources

| Noise Level Descriptor | Daytime (7 a.m. to 10 p.m.) | Nighttime (10 p.m. to 7 a.m.) |
|------------------------|--------------------------------|----------------------------------|
| Hourly L_{eq} , dB | 55 | 45 |

Notes:

- These standards will apply generally to noise sources that are not tonal, impulsive, or repetitive in nature.
- Typical noise sources in this category would include HVAC systems, cooling towers, fans, blowers, etc.

Source: City of Elk Grove 2016

- ▲ **Policy NO-4.** Where proposed non-residential land uses are likely to produce noise levels exceeding the performance standards of Table NO-A [as shown in Table 3.10-8 of this EIR] at existing or planned noise-sensitive uses, an acoustical analysis shall be required as part of the environmental review process so that noise mitigation may be included in the project design. The requirements for the content of an acoustical analysis are as follow:

All acoustical analysis prepared pursuant to this Noise Element shall:

- A. Be the financial responsibility of the applicant.
 - B. Be prepared by a qualified person experienced in the fields of environmental noise assessment and architectural acoustics.
 - C. Include representative noise level measurements with sufficient sampling periods and locations to adequately describe local conditions and the predominant noise sources.
 - D. Estimate existing and projected cumulative (20 years) noise levels in terms of L_{dn} or CNEL and/or the standards of Table NO-A [as shown in Table 3.10-8 of this EIR], and compare those levels to the adopted policies of the Noise Element.
 - E. Recommend appropriate mitigation to achieve compliance with the adopted policies and standards of the Noise Element, giving preference to proper site planning and design over mitigation measures which require the construction of noise barriers or structural modifications to buildings which contain noise-sensitive land uses.
 - F. In cases where a sound wall is proposed, the potential impacts associated with noise reflecting off the wall and toward other properties or sensitive uses shall be evaluated.
 - G. Estimate noise exposure after the prescribed mitigation measures have been implemented.
 - H. Describe a post-project assessment program which could be used to evaluate the effectiveness of the proposed mitigation measures.
- ▲ **Policy NO-5.** Noise created by the construction of new transportation noise sources (such as new roadways or new light rail service) shall be mitigated so as not to exceed the levels specified in Table NO-C [as shown in Table 3.10-7 of this EIR] at outdoor activity areas or interior spaces of existing noise-sensitive land uses. Please see Policy NO-6 for discussion of improvements to existing roadways.
 - ▲ **Policy NO-6.** It is anticipated that roadway improvement projects (such as widening of existing roadways) will be needed to accommodate build-out of the General Plan. Therefore, existing noise-sensitive uses may be exposed to increased noise levels due to roadway improvement projects as a result of increased roadway capacity, increases in travel speeds, etc. It may not be practical to reduce increased traffic noise levels consistent with those contained in Table NO-C [as shown in Table 3.10-7 of this EIR].

Therefore, the following criteria shall be used as a test of significance for roadway improvement projects which are not directly tied to a development project:

- Where existing traffic noise levels are less than 60 dB L_{dn} at the outdoor activity areas of noise-sensitive uses, a +5 dB L_{dn} increase in noise levels due to roadway improvement projects will be considered significant; and
 - Where existing traffic noise levels range between 60 and 65 dB L_{dn} at the outdoor activity areas of noise-sensitive uses, a +3 dB L_{dn} increase in noise levels due to roadway improvement projects will be considered significant; and
 - Where existing traffic noise levels are greater than 65 dB L_{dn} at the outdoor activity areas of noise-sensitive uses, a +1.5 dB L_{dn} increase in noise levels due to roadway improvement projects will be considered significant.
- ▲ **Policy NO-7.** The City shall not require the installation of sound walls in front yard areas to reduce noise to acceptable levels in residential areas which were originally constructed without sound walls. The City shall emphasize other methods to reduce noise levels in these situations.
 - ▲ **Policy NO-8.** Where noise mitigation measures are required to achieve the standards indicated in Table NO-C [as shown in Table 3.10-7 of this EIR] and Table NO-A [as shown in Table 3.10-8 of this EIR], the emphasis of such measures shall be placed upon site planning and project design. The use of noise barriers shall be considered a means of achieving the noise standards only after all other practical design-related noise mitigation measures—including the use of distance from noise sources—have been integrated into the project.
 - ▲ **Policy NO-9.** Where soundwalls or noise barriers are constructed, the City shall strongly encourage and may require the use of a combination of berms and walls to reduce the apparent height of the wall and produce a more aesthetically appealing streetscape.

City of Elk Grove Municipal Code

Section 6.32.080 Exterior Noise Standards

Section 6.32.080 of the Elk Grove Municipal Code contains exterior noise standards for specific zoning districts (Table 3.10-9).

- A. The following noise standards, unless otherwise specifically indicated in this chapter, shall apply to all properties within a designated noise area.

Table 3.10-9 Exterior Noise Standards

| Noise Area | City Zoning Districts | Time Period | Exterior Noise Standard (L _{eq}) |
|------------|---------------------------|------------------------|--|
| I | Agricultural; Residential | 7:00 a.m. - 10:00 p.m. | 55 dBA |
| | | 10:00 p.m. - 7:00 a.m. | 45 dBA |

Source: City of Elk Grove 2017a

- B. It is unlawful for any person at any location within the City to create any noise which causes the noise levels on an affected property, when measured in the designated noise area, to exceed for the duration of time set forth following the specified exterior noise standards in any one hour by:

| Cumulative Duration of the Intrusive Sound | Allowance Decibels |
|---|--------------------|
| 1. Cumulative of 30 minutes per hour | 0 |
| 2. Cumulative of 15 minutes per hour | +5 |
| 3. Cumulative of 5 minutes per hour | +10 |
| 4. Cumulative of 1 minutes per hour | +15 |
| 5. Level not to be exceeded for any time per hour | +20 |

- C. Each of the noise limits specified in subsection (B) above, shall be reduced by five dBA for impulsive or simple tone noises, or for noises consisting of speech or music.
- D. Boundary between Different Noise Areas. If the measurement location is on a boundary between two different designated noise areas, the lower noise level limit applicable to the two areas shall apply.
- E. If the ambient noise level exceeds that permitted by any of the first four noise-limit categories specified in subsection (B) of this section, the allowable noise limit shall be increased in five dBA increments in each category to encompass the ambient noise level. If the ambient noise level exceeds the fifth noise level category, the maximum ambient noise level shall be the noise limit for that category.

Section 6.32.090 Interior Noise Standards

Section 6.32.090 of the Elk Grove Municipal Code contains the following interior noise standards:

- A. In any apartment, condominium, townhouse, duplex or multiple dwelling unit it is unlawful for any person to create any noise from inside his unit that causes the noise level when measured in a neighboring unit during the periods 10:00 p.m. to 7:00 a.m. to exceed:
 1. 45 dBA for a cumulative period of more than five minutes in any hour;
 2. 50 dBA for a cumulative period of more than one minute in any hour;
 3. 55 dBA for any period of time.
- B. If the ambient noise level exceeds that permitted by any of the noise level categories specified in subsection (A) of this section, the allowable noise limit shall be increased in five dBA increments in each category to encompass the ambient noise level.
- C. Each of the noise limits specified in subsection (B) of this section shall be reduced by five dBA for impulsive or simple tone noises, or for noises consisting of speech or music.
- D. Boundary between Different Noise Areas. If the measurement location is on a boundary between two different designated noise areas, the lower noise level limit applicable to the two areas shall apply.
- E. If the ambient noise level exceeds that permitted by any of the first four noise-limit categories specified in subsection (B) of this section, the allowable noise limit shall be increased in five dBA increments in each category to encompass the ambient noise level. If the ambient noise level exceeds the fifth noise level category, the maximum ambient noise level shall be the noise limit for that category.

Section 6.32.100 Exemptions

- A. School bands, school athletic and school entertainment events;
- B. Outdoor gatherings, public dances, shows and sporting and entertainment events, provided said events are conducted pursuant to a license or permit by the City;

- C. Activities conducted on parks, public playgrounds and school grounds, provided such parks, playgrounds and school grounds are owned and operated by a public entity or private school;
- D. Any mechanical device, apparatus or equipment related to or connected with emergency activities or emergency work; the exemption does not include permanently installed emergency generators;
- E. Noise sources associated with construction, repair, remodeling, demolition, paving or grading of any real property, provided said activities only occur between the hours of 7:00 a.m. and 7:00 p.m. when located adjacent to residential uses. Noise associated with these activities not located adjacent residential uses may occur between the hours of 6:00 a.m. and 8:00 p.m. However, when an unforeseen or unavoidable condition occurs during a construction project and the nature of the project necessitates that work in process be continued until a specific phase is completed, the contractor or owner shall be allowed to continue work after 8:00 p.m. and to operate machinery and equipment necessary until completion of the specific work in progress can be brought to conclusion under conditions which will not jeopardize inspection acceptance or create undue financial hardships for the contractor or owner;
- F. Noise sources associated with agricultural operations, provided such operations do not take place between the hours of 8:00 p.m. and 6:00 a.m.;
- G. All mechanical devices, apparatus or equipment which are utilized for the protection or salvage of agricultural crops during periods of adverse weather conditions or when the use of mobile noise sources is necessary for pest control;
- H. Any activity, to the extent provisions of Chapter 65 of Title 42 of the United States Code, and Articles 3 and 3.5 of Chapter 4 of Division 9 of the Public Utilities Code of the State of California preempt local control of noise regulations and land use regulations related to noise control of airports and their surrounding geographical areas, any noise source associated with the construction, development, manufacture, maintenance, testing or operation of any aircraft engine, or of any weapons system or subsystems which are owned, operated or under the jurisdiction of the United States, or any other activity to the extent regulation thereof has been preempted by State or Federal law or regulation;
- I. Any noise sources associated with the maintenance and operation of aircraft or airports which are owned or operated by the United States;
- J. Railroad Activities. The operation of locomotives, rail cars, and facilities by a railroad that is regulated by the State Public Utilities Commission;
- K. State or Federal Pre-Exempted Activities. Any activity, to the extent the regulation of it has been preempted by State or Federal law;
- L. Public Health and Safety Activities. All transportation, flood control, and utility company maintenance and construction operation at any time on public rights-of-way, and those situations that may occur on private property deemed necessary to serve the best interest of the public and to protect the public's health and well-being, including debris and limb removal, removal of damaged poles and vehicles, removal of downed wires, repairing traffic signals, repair of water hydrants and mains, gas lines, oil lines, and sewers, restoring electrical service, street sweeping, unplugging sewers, vacuuming catch basins, etc. The regular testing of motorized equipment and pumps shall not be exempt;
- M. Solid Waste Collection. Noise sources associated with the authorized collection of solid waste (e.g., refuse and garbage);
- N. Maintenance of Residential Real Property. Noise sources associated with the minor maintenance of residential real property, provided the activities take place between the hours of 7:00 a.m. and 10:00 p.m.

6.32.110 Machinery, equipment, fans and air conditioning.

It is unlawful for any person to operate any mechanical equipment, pump, fan, air conditioning apparatus, stationary pumps, stationary cooling towers, stationary compressors, similar mechanical devices, or any combination thereof in any manner so as to create any noise which would cause the maximum noise level to exceed a maximum limit of 55 dBA at any point at least one foot inside the property line of the affected residential property and three feet to five feet above ground level.

6.32.140 Prohibited activities.

- A. Construction Noise. Operating or causing the operation of tools or equipment on private property used in alteration, construction, demolition, drilling or repair work daily between the hours of 7:00 p.m. and 7:00 a.m. when located adjacent to residential uses, or between the hours of 8:00 p.m. and 6:00 a.m. when not located adjacent to residential uses, so that the sound creates a noise disturbance across a residential property line, except for emergency work of public service utilities. However, when an unforeseen or unavoidable condition occurs during a construction project and the nature of the project necessitates that work in process be continued until a specific phase is completed, the contractor or owner shall be allowed to continue work after 8:00 p.m. and to operate machinery and equipment necessary until completion of the specific work in progress can be brought to conclusion under conditions which will not jeopardize inspection acceptance or create undue financial hardships for the contractor or owner.
- B. Loading and Unloading Activities. Loading, unloading, opening, closing or other handling of boxes, crates, containers, building materials, garbage cans, or similar objects on private property between the hours of 10:00 p.m. and 7:00 a.m. in a manner to cause a noise disturbance.
- C. Sweepers and Associated Equipment. Operating or allowing the operation of sweepers or associated sweeping equipment (e.g., blowers) on private property between the hours of 10:00 p.m. and 7:00 a.m. in, or adjacent to, a residential zoning district.
- D. Places of Public Entertainment. Operating or allowing to be operated any loudspeaker, musical instrument, or other source of sound in any place of public entertainment that exceeds 95 dbA at any point normally occupied by a customer.
- E. Stationary Nonemergency Signaling Devices. Sounding or allowing the sounding of an electronically amplified signal from a stationary bell, chime, siren, whistle, or similar devices intended for nonemergency purposes, from a private property for more than ten consecutive seconds in any hourly period.
- F. Public Nuisance Noise. Public nuisance noise is noise that is generally not associated with a particular land use but creates a nuisance situation by reason of its being disturbing, excessive, or offensive. Examples would include excessively loud noise from alarms, animals and fowl in nonagricultural districts, horns, musical instruments, stereos, music players, televisions, vehicle or motorboat repairs and testing, and similar noise.

Sacramento County General Plan

The Noise Element of the *Sacramento County General Plan* (Sacramento County 2011) contains the following policies and standards related to noise that may be applicable to the project's noise relationship to adjoining areas not in the City of Elk Grove:

Table 3.10-10 Noise Standards for New Uses Affected by Traffic and Railroad Noise

| New Land Use | Sensitive ¹ Outdoor Area (L _{dn}) | Sensitive ² Interior Area (L _{dn}) | Notes |
|-----------------------------|--|---|-------|
| All Residential | 65 | 45 | 5 |
| Transient Lodging | 65 | 45 | 3,5 |
| Hospitals and Nursing Homes | 65 | 45 | 3,4,5 |

Table 3.10-10 Noise Standards for New Uses Affected by Traffic and Railroad Noise

| New Land Use | Sensitive ¹ Outdoor Area (L _{dn}) | Sensitive ² Interior Area (L _{dn}) | Notes |
|---|--|---|-------|
| Theaters and Auditoriums | — | 35 | 3 |
| Churches, Meeting Halls, Schools, Libraries, etc. | 65 | 40 | 3 |
| Office Buildings | 65 | 45 | 3 |
| Commercial Buildings | — | 50 | 3 |
| Playgrounds, Parks, etc. | 70 | — | — |
| Industry | 65 | 50 | 3 |

Notes:

¹ Sensitive areas are defined in acoustic terminology section.

² Interior noise level standards are applied within noise-sensitive area of the various land uses, with windows and doors in the closed position.

³ Where there are no sensitive exterior spaces proposed for these uses, only the interior noise level standard shall apply.

⁴ Hospitals are often noise-generating uses. The exterior noise level standards for hospitals are applicable only at clearly identified areas designated for outdoor relaxation by either hospital staff or patients.

⁵ If this use is affected by railroad noise, a maximum (L_{max}) noise level standard of 70 dBA shall be applied to all sleeping rooms to reduce the potential for sleep disturbance during nighttime train passages.

Source: FTA 2006

- ▲ **Policy NOI-1.** The noise level standards for noise-sensitive areas of new uses affected by traffic or railroad noise sources in Sacramento County are shown by Table 1 [as shown in Table 3.10-10 of this EIR]. Where the noise level standards of Table 1 [as shown in Table 3.10-10 of this EIR] are predicted to be exceeded at new uses proposed within Sacramento County which are affected by traffic or railroad noise, appropriate noise mitigation measures shall be included in the project design to reduce projected noise levels to a state of compliance with the Table 1 [as shown in Table 3.10-10 of this EIR] standards.
- ▲ **Policy NOI-5.** The interior and exterior noise level standards for noise-sensitive areas of new uses affected by existing non-transportation noise sources in Sacramento County are shown by Table 2 [as shown in Table 3.10-11 of this EIR]. Where the noise level standards of Table 2 [as shown in Table 3.10-11 of this EIR] are predicted to be exceeded at a proposed noise-sensitive area due to existing non-transportation noise sources, appropriate noise mitigation measures shall be included in the project design to reduce projected noise levels to a state of compliance with the Table 2 [as shown in Table 3.10-11 of this EIR] standards within sensitive areas.
- ▲ **Policy NOI-6.** Where a project would consist of or include non-transportation noise sources, the noise generation of those sources shall be mitigated so as not exceed the interior and exterior noise level standards of Table 2 [as shown in Table 3.10-11 of this EIR] at existing noise-sensitive areas in the project vicinity.
- ▲ **Policy NOI-7.** The “last use there” shall be responsible for noise mitigation. However, if a noise-generating use is proposed adjacent to lands zoned for uses which may have sensitivity to noise, then the noise-generating use shall be responsible for mitigating its noise generation to a state of compliance with the Table 2 [as shown in Table 3.10-11 of this EIR] standards at the property line of the generating use in anticipation of the future neighboring development.

Table 3.10-11 Non-Transportation Noise Standards

| Receiving Land Use | Outdoor Area ² | | Interior ³ |
|--|---|---|---|
| | Daytime (L ₅₀ /L _{max}) ¹ | Nighttime (L ₅₀ /L _{max}) ¹ | Day/Night (L ₅₀ /L _{max}) ¹ |
| All Residential | 55/75 | 50/70 | 35/55 |
| Transient Lodging ⁴ | 55/75 | – | 35/55 |
| Hospitals & Nursing Homes ^{5, 6} | 55/75 | – | 35/55 |
| Theaters & Auditoriums ⁶ | – | – | 30/50 |
| Churches, Meeting Halls, Schools, Libraries, etc. ⁶ | 55/75 | – | 35/60 |
| Office Buildings ⁶ | 60/75 | – | 45/65 |
| Commercial Buildings ⁶ | – | – | 45/65 |
| Playgrounds, Parks, etc. ⁶ | 65/75 | – | – |
| Industry ⁶ | 60/80 | – | 50/70 |

Notes: L₅₀= noise level that occurs 50% of the time during measurement duration; L_{max}= the maximum instantaneous noise level

- ¹ Standards in this table shall be reduced by 5 dBA for sounds consisting primarily of speech or music, and for recurring impulsive sounds. If the existing ambient noise level exceeds the standards of this table, then the noise level standards shall be increased at 5 dBA increments to encompass the ambient.
- ² The primary outdoor activity area associated with any given land use at which noise-sensitivity exists and the location at which the County's exterior noise level standards are applied.
- ³ The primary outdoor activity area associated with any given land use at which noise-sensitivity exists and the location at which the County's exterior noise level standards are applied.
- ⁴ Outdoor activity areas of transient lodging facilities are not commonly used during nighttime hours.
- ⁵ Hospitals are often noise-generating uses. The exterior noise level standards for hospitals are applicable only at clearly identified areas designated for outdoor relaxation by either hospital staff or patients.
- ⁶ Hospitals are often noise-generating uses. The exterior noise level standards for hospitals are applicable only at clearly identified areas designated for outdoor relaxation by either hospital staff or patients.
- ⁷ Where median (L₅₀) noise level data is not available for a particular noise source, average (L_{eq}) values may be substituted for the standards of this table provided the noise source in question operates for at least 30 minutes of an hour. If the source in question operates less than 30 minutes per hour, then the maximum noise level standards shown would apply.

Source: Sacramento County 2011: 15

- ▲ **Policy NOI-8.** Noise associated with construction activities shall adhere to the County Code requirements. Specifically, Section 6.68.090(e) addresses construction noise within the County.
- ▲ **Policy NOI-13.** Where noise mitigation measures are required to satisfy the noise level standards of this Noise Element, emphasis shall be placed on the use of setbacks and site design to the extent feasible, prior to consideration of the use of noise barriers.
- ▲ **Policy NOI-16.** The following sources of noise shall be exempt from the provisions of this Noise Element:
 - a. Emergency warning devices and equipment operated in conjunction with emergency situations, such as sirens and generators which are activated during power outages. The routine testing of such warning devices and equipment shall also be exempt provided such testing occurs during daytime hours.
 - b. Activities associated with events for which a permit has been obtained from the County.

In addition to the policies listed above, Sacramento County has established noise standards for the significant incremental increase in traffic noise in relation to transportation projects, as shown in Table 3.10-12.

Table 3.10-12 Significant Increase in Transportation Noise

| Pre-Project Noise Environment (L_{dn}) | Significant Increase |
|--|----------------------|
| Less than 60 dBA | 5+ dBA |
| 60-65 dBA | 3+ dBA |
| Greater than 65 dBA | 1.5+ dBA |

Notes: L_{dn} = day-night average noise level

Source: Sacramento County 2011:11

Sacramento County Code

Section 6.68.070 of the Sacramento County Code contains exterior noise standards for specific zoning districts (Table 3.10-13).

Table 3.10-13 Exterior Noise Standards

| Noise Area | County Zoning Districts | Time Period | Exterior Noise Standard |
|------------|---|-------------------|-------------------------|
| 1 | RE-1, RD-1, RE-2, RD-2, RE-3, RD-3, RD-4, R-1-A, RD-5, R-2, RD-10, R-2A, RD-20, R-3, R-D-30, RD-40, RM-1, RM-2, A-1-B, AR-1, A-2, AR-2, A-5, AR-5 | 7 a.m. to 10 p.m. | 55 dBA |
| | | 10 p.m. to 7 a.m. | 50 dBA |

Source: Sacramento County 2017

Section 6.68.080 of the Sacramento County Code contains interior noise standards for specific zoning districts as detailed below.

- a. In any apartment, condominium, townhouse, duplex or multiple dwelling unit it is unlawful for any person to create any noise from inside his unit that causes the noise level when measured in a neighboring unit during the periods 10 p.m. to 7 a.m. to exceed:
 1. 45 dBA for a cumulative period of more than 5 minutes in any hour;
 2. 50 dBA for a cumulative period of more than 1 minute in any hour;
 3. 55 dBA for any period of time.
- b. If the ambient noise level exceeds that permitted by any of the noise level categories specified in subdivision (a) of this section, the allowable noise limit shall be increased in 5-dBA increments in each category to encompass the ambient noise level. (SCC 254 § 1, 1976.)

Section 6.68.090 of the Sacramento County Code provides the following exemption to its exterior noise standards:

Noise sources associated with construction, repair, remodeling, demolition, paving or grading of any real property, provided said activities do not take place between the hours of 8:00 p.m. and 6:00 a.m. on weekdays and Friday commencing at 8:00 p.m. through and including 7:00 a.m. on Saturday; Saturdays commencing at 8:00 p.m. through and including 7:00 a.m. on the next following Sunday and on each Sunday after the hour of 8:00 p.m. Provided, however, when an unforeseen or unavoidable condition occurs during a construction project and the nature of the project necessitates that work in process be continued until a specific phase is completed, the contractor or owner shall be allowed to continue work after 8:00 p.m. and to operate machinery and equipment necessary until completion of the specific work in progress can be brought to conclusion under conditions which will not jeopardize inspection acceptance or create undue financial hardships for the contractor or owner.

3.10.3 Environmental Impacts and Mitigation Measures

ANALYSIS METHODOLOGY

Construction Noise

The potential for construction activities to expose receptors to excessive noise levels was assessed based on the types of construction equipment that would be used, the noise levels typically generated by these types of equipment, the proximity of construction activity to existing receptors, and whether construction noise would be generated during noise-sensitive evening and nighttime hours. Referenced noise levels and usage factors for typical construction equipment are from FTA's *Guide on Transit Noise and Vibration Impact Assessment* methodology (FTA 2006) and FHWA's *Roadway Construction Noise Model User's Guide* (FHWA 2006).

Operational Noise

To assess potential long-term noise impacts because of project-generated increases in traffic, noise levels were estimated in using calculations consistent with the Federal Highway Administration's Traffic Noise Model Version 2.5 (FHWA 2004) and project-specific traffic data (Appendix C). The analysis is based on the reference noise emission levels for automobiles, medium trucks, and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and ground attenuation factors. Vehicle speeds on area roadways were based on existing speed limits. It should be noted that an existing-plus-project scenario was not directly provided by the traffic analysis. The existing-plus-project ADT volumes used as the basis for the traffic noise analysis were derived from the project trip generation and distribution completed for the existing, cumulative-no-project, and cumulative-plus-project scenarios examined in the traffic analysis. The same number of project-generated trips under and distribution and assignment of these trips under the cumulative condition was added to existing conditions. The comparison of the existing and existing-plus-project scenarios provides the most conservative analysis because of the logarithmic nature of sound addition because the increase in project-generated trips accounts for a larger percentage of the total trips along roadway segments in the existing scenario than in the cumulative scenario. The City of Elk Grove has the same incremental increase standards for evaluating traffic noise as the County, which are applied at noise-sensitive receptors located in both the City and the unincorporated area of the County.

The potential for long-term, non-transportation noise sources associated with development of the SOIA area to expose receptors to excessive noise levels was based on reconnaissance data, reference noise emission levels, and measured noise levels for activities and equipment associated with project operation (e.g., commercial loading docks), and standard attenuation rates and modeling techniques recommended by Caltrans (Caltrans 2013a) and the Federal Transit Administration (FTA 2006).

The significance determination of noise impacts were determined based on comparisons to applicable local noise.

THRESHOLDS OF SIGNIFICANCE

Based on the Appendix G of the State CEQA Guidelines, noise policies and standards established by the City of Elk Grove and Sacramento County, the development of the SOIA area would result in a significant impact related to noise if it would result in:

- ▲ construction-generated noise levels exposing noise-sensitive receptors in the City of Elk Grove or the unincorporated portion of Sacramento County to noise levels that exceed the respective applicable Noise Control Ordinance standards, as listed in Table 3.10-9 and Table 3.10-13, during the more noise-sensitive evening, nighttime, and early-morning hours;
- ▲ long-term, traffic-generated noise that results in exposure of noise-sensitive land uses located in the City of Elk Grove to noise levels that exceed the applicable normally acceptable noise standards for land use compatibility established by the City of Elk Grove (as listed in Table 3.10-7), or the exposure of noise-

sensitive land uses in the unincorporated portion of Sacramento County that exceed the applicable normally acceptable noise standards for land use compatibility established by Sacramento County (as listed in Table 3.10-10); or an increase in traffic noise levels at nearby noise-sensitive receptors located in the city or unincorporated part of the county that exceeds the applicable allowable noise increment standards identified in the City of Elk Grove General Plan Policy NO-6 or as listed in Sacramento County Table 3.10-12;

- ▲ long-term noise levels generated by stationary or area sources that exceed City of Elk Grove or County of Sacramento Noise Control Ordinance standards, as listed in Table 3.10-9 and Table 3.10-13;
- ▲ on-site noise levels exceeding the applicable normally acceptable noise standards for land-use compatibility (Table 3.10-7 and Table 3.10-8) as specified in the City of Elk Grove General Plan with respect to the proposed land uses;
- ▲ exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels;
- ▲ for a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels; or
- ▲ for a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels.

ISSUES NOT EVALUATED FURTHER

No major sources of vibration would be potentially constructed within the SOIA area and construction of any future development would not include vibration-intensive activities such as blasting or pile driving. This is based on the geology of the SOIA area does not require blasting activities for construction, and current suburban commercial land use types in the City of Elk Grove do not typically consist of multi-story structures that require pile-driving activities. This is supported based on the proposed City of Elk Grove General Plan Update's Draft Annexation Strategy identifying that the planning objective for the West Study Area is to create new diverse residential neighborhoods that include walkable parks, public services, and lower-intensity employment opportunities (City of Elk Grove 2017b). Thus, the project would not result in excessive vibration or vibration levels such that any receptors would be adversely affected and vibration-related impacts are not discussed further in this Draft EIR.

The project is not located within an airport land use plan, or within two miles of a public airport or public use airport. Additionally, the project is not located within two miles of a private airstrip; Borges-Clarksburg Airport is the closest airport and is located approximately 5.5 miles northwest of the project site. Thus, the project would not result in noise impacts related to the exposure of people residing or working in the project area to excessive aircraft-related noise levels. This issue is not discussed further.

IMPACT ANALYSIS

Impact 3.10-1: Construction-generated noise

Short-term construction-generated noise levels associated with the future development of the SOIA area upon annexation could expose nearby noise-sensitive receptors to noise levels that exceed applicable local standards. In addition, if construction activity were to occur during more noise-sensitive nighttime hours it could result in annoyance and sleep disruption to occupants of nearby residential land uses and substantial periodic increases in ambient noise levels. This would be a **significant** impact.

If any future annexation request of the SOIA area is approved, construction of future development on the project site would involve noise-generating activities. Short-term construction noise levels on and near the project site would fluctuate depending on the type, number, and duration of usage for the varying heavy-duty equipment. The effects of construction noise largely depend on the type of construction activities being performed, noise levels generated by those activities, distances to noise-sensitive receptors, the relative locations of noise attenuating features such as vegetation and existing structures, and existing ambient noise levels.

Construction noise in any one area would be temporary and would include noise from activities such as excavation, site preparation, truck hauling of material, pouring of concrete, and use of power hand tools. It is not anticipated that pile driving or rock blasting would occur as part of construction. Construction noise typically occurs intermittently and varies depending on the nature of the construction activities being performed. Noise is generated by construction equipment, including excavation equipment, material handlers, and portable generators. Thus, existing and future residences, parks, agricultural uses, and commercial facilities located near areas of potential construction activity could be exposed to future construction noise from construction activity within the SOIA area, or from off-site construction activity associated with infrastructure improvements.

Noise-generating activities occurring during the more noise-sensitive evening and nighttime hours are of increased concern. Because exterior ambient noise levels typically decrease during the late evening and nighttime hours as typical levels of community activities (e.g., industrial activities, vehicle traffic) decrease, construction activities performed during the more noise-sensitive evening and nighttime hours can result in increased annoyance and potential sleep disruption for occupants of nearby residential land uses.

Based on the types of construction activities assumed for the project (e.g., paving, earth moving, trenching, structure erection) it is expected that the primary sources of noise would include backhoes, dozers, graders, excavators, dump trucks, pavers and various trucks (e.g., job trucks, water trucks, fuel trucks). Noise levels generated by common types of construction equipment are shown in Table 3.10-14.

Table 3.10-14 Noise Emission Levels from Construction Equipment

| Equipment Type | Typical Noise Level (dBA) @ 50 feet |
|------------------|-------------------------------------|
| Dump Truck | 76 |
| Drill Rig Truck | 79 |
| Concrete Mixer | 85 |
| Crane | 85 |
| Dozer | 85 |
| Grader | 85 |
| Excavator | 85 |
| Front End Loader | 80 |
| Paver | 89 |
| Roller | 85 |
| Scraper | 89 |

Notes: Assumes all equipment is fitted with a properly maintained and operational noise control device, per manufacturer specifications. Noise levels listed are manufacturer-specified noise levels for each piece of heavy construction equipment.

Source: FTA 2006

Construction phasing and activity is not known at the time of writing this EIR as the project involves the amendment of the City of Elk Grove SOI boundary, and therefore, the construction-noise evaluation conservatively assumed that five of the highest noise-generating pieces of equipment could operate simultaneously near each other near the boundaries of any future project site within the SOIA area.

Based on the reference noise levels listed in Table 3.10-14 and accounting for typical usage factors of individual pieces of equipment, on-site construction-related activities could generate a combined hourly average noise level of approximately 88 L_{eq} and a maximum noise level as high as 92 L_{max} at 50 feet from the project boundary. Detailed inputs and parameters for the estimated construction noise exposure levels are provided in Appendix C.

Nearby existing noise-sensitive receptors that could be adversely affected by construction noise are shown in Table 3.10-15. The Bruceville Road residence is located in the unincorporated area of Sacramento County and the Bilby Ranch and Willard Parkway residences are located in the City of Elk Grove. The distance to, and daytime noise exposure levels at each receptor location were estimated for the closest possible construction activities (at the project boundary) and are also listed in Table 3.10-15. These values represent a conservative assessment because they do not account for any shielding provided by existing buildings and, as stated above, the modeling assumes that five of the highest noise-generating pieces of equipment could operate simultaneously near each other near the boundaries of the project site.

Table 3.10-15 Levels of Noise Exposure at Off-Site Noise-Sensitive Receptors during Typical Daytime Construction Activity

| Sensitive Receptor ¹ | Distance to Project Site (feet) | Daytime Construction Noise Exposure Level at Sensitive Receptor ² | |
|---|---------------------------------|--|-----------------|
| | | L_{eq} (dBA) | L_{max} (dBA) |
| Bruceville Road Residence ⁴ | 60 | 86 | 90 |
| Bilby Ranch Residences ^{3,5} | 60 | 81 | 85 |
| Willard Parkway Residences ^{3,5} | 200 | 71 | 75 |

Notes:

- ¹ See Exhibit 3.10-1 for locations of sensitive land uses relative to the project site.
- ² Assumes all equipment is fitted with a properly maintained and operational noise control device, per manufacturer specifications. Noise levels listed are manufacturer-specified noise levels for each piece of heavy construction equipment.
- ³ Accounts for 5 dBA decrease in noise levels where existing sound walls are located.
- ⁴ Receptor located in Sacramento County.
- ⁵ Receptor located in the City of Elk Grove.

Source: Data modeled by Ascent Environmental in 2017

As shown in Table 3.10-15, daytime construction-generated noise levels could be as high as 86 L_{eq} at the Bruceville Road residence, 81 L_{eq} at the Bilby Ranch residences, and 71 L_{eq} at the Willard Parkway residences. Thus, sensitive receptors located in the City of Elk Grove could experience construction-generated noise levels that exceed the City of Elk Grove daytime and nighttime exterior noise standards of 55 L_{eq} and 45 L_{eq} , respectively (Table 3.10-9). Additionally, the Bruceville Road residence located in the County of Sacramento could experience construction-generated noise levels that exceed the County of Sacramento daytime and nighttime exterior noise standards of 55 L_{eq} and 50 L_{eq} , respectively (Table 3.10-11). The City of Elk Grove Code, *Section 6.32.100 Exemptions*, exempts project construction associated noise adjacent to residential land uses during the timeframe of 7:00 a.m. and 7:00 p.m., Monday through Sunday. However, it is possible that certain construction activities would need to occur during the non-exempt and more noise-sensitive nighttime hours. For example, some foundation designs require that once the pouring of concrete begins, the pour must continue without pauses until complete. Nighttime construction activities are not exempt and would be subject to the City and County nighttime noise standards. Thus, depending on the activities being performed, as well as the duration and hours during

which activities occur, construction generated noise levels at nearby existing or proposed residences could violate applicable noise standards. Additionally, activities occurring during the evening and nighttime hours, when people are more sensitive to noise, could result in increased levels of annoyance and sleep disruption to occupants of nearby residences. This would be a **significant** impact.

Mitigation Measure 3.10-1a: Implement construction-noise reduction measures.

At the time of any application to annex territory within the Bilby Ridge SOIA area, the City of Elk Grove shall require that the applicants to comply with the following construction noise requirements. Evidence of compliance with this mitigation measure shall be provided in the annexation application to LAFCo.

To minimize noise levels during construction activities, the applicant and their construction contractors to comply with the following measures during all construction work:

- ▲ Consistent with Elk Grove General Plan *Policy NO-3-Action 3*, all construction equipment and equipment staging areas shall be located as far as feasible from nearby noise-sensitive land uses.
- ▲ All construction equipment shall be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturer's recommendations. Equipment engine shrouds shall be closed during equipment operation.
- ▲ Individual operations and techniques shall be replaced with quieter procedures (e.g., using welding instead of riveting, mixing concrete off-site instead of on-site) where feasible and consistent with building codes and other applicable laws and regulations.
- ▲ Consistent with Elk Grove General Plan Policy NO-3-Action 1, and to the maximum extent feasible, construction activity shall take place within the City of Elk Grove construction noise exemption timeframes (i.e., 7:00 a.m. and 7:00 p.m., Monday through Sunday). Noise associated with construction activities not located adjacent residential uses may occur between the hours of 6:00 a.m. and 8:00 p.m., Monday through Sunday.

Mitigation Measure 3.10-1b: Implement construction-noise reduction measures during noise-sensitive time periods.

At the time of any application to annex territory within the Bilby Ridge SOIA area, the City of Elk Grove shall require that the applicants to comply with the following construction noise requirements. Evidence of compliance with this mitigation measure shall be provided in the annexation application to LAFCo.

For all construction activity that would take place outside of the City of Elk Grove construction noise exemption timeframe when located adjacent to residential uses (i.e., 7:00 a.m. and 7:00 p.m., Monday through Sunday), and that is anticipated to generate more than 45 L_{eq} , the City shall require the applicant and their construction contractors to comply with the following measures:

- ▲ Implement noticing to adjacent landowners at least one week in advance if construction activity would take place outside of the City of Elk Grove's construction noise exemption timeframe when located adjacent to residential uses (i.e., 7:00 a.m. and 7:00 p.m., Monday through Sunday, as identified in General Plan *Policy NO-3 - Action 1*), and is anticipated to generate more than 45 L_{eq} .
- ▲ Install temporary noise curtains as close as feasible to noise-generating activity and that blocks the direct line of sight between the noise source and the nearest noise-sensitive receptor(s). Temporary noise curtains shall consist of durable, flexible composite material featuring a noise barrier layer bounded to sound-absorptive material on one side. The noise barrier layer shall consist of rugged, impervious, material with a surface weight of at least one pound per square foot.

- ▲ Noise-reducing enclosures and techniques shall be used around stationary noise-generating equipment (e.g., concrete mixers, generators, compressors).
- ▲ Operate heavy-duty construction equipment at the lowest operating power possible.

Significance after Mitigation

Implementation of mitigation measures 3.10-1a and 3.10-1b would provide substantial reductions in daytime and nighttime construction noise levels by ensuring proper equipment use; locating equipment away from sensitive land uses; and requiring the use of enclosures, shields, and noise curtains. However, construction activities could occur immediately adjacent to existing residential uses to the north, west, and east of the project area (within 60 feet), as well as adjacent to on-site residences that are constructed and inhabited before other portions of the on-site future development are complete. Although, noise reduction would be achieved with implementation of mitigation measures 3.10-1a and 3.10-1b, reductions of up to 41 dBA would be required during some of the more intensive nighttime construction (e.g., during the most intense construction periods, and during roadway construction and improvement projects) to comply with the City and County nighttime standards of 45 L_{eq} and 50 L_{eq} , respectively. Reductions of this magnitude may not be achievable under all circumstances with implementation of Mitigation Measures 3.10-1a and 3.10-1b. No other feasible mitigation is available; therefore, this impact would be **significant and unavoidable**.

Impact 3.10-2: Exposure of existing sensitive receptors to excessive traffic noise levels and/or substantial increases in traffic noise.

Future development within the SOIA area upon annexation could generate vehicle trips and result in an increase in ADT volumes on affected roadway segments and an increase in traffic source noise levels. However, existing receptors would not be exposed to traffic noise levels or traffic noise level increases that exceed applicable City of Elk Grove or Sacramento County noise standards. This impact would be **less than significant**.

Future development within the SOIA area upon annexation would generate vehicle trips and result in an increase in ADT volumes on affected roadway segments and an increase in traffic source noise levels. To analyze the impact of operational project-generated transportation noise sources, traffic noise levels under existing, and existing-plus-project conditions were modeled for affected roadway segments. For further details about traffic volumes and conditions, see Section 3.13, "Traffic, Transportation, and Circulation."

Table 3.10-16 summarizes the modeled traffic noise levels at the nearest existing off-site sensitive receptors under existing and existing-plus-project conditions, along with the overall net change in noise level as a result of the added traffic generated by development of the SOIA area. Roadway segments along which no nearby discrete noise-sensitive receptors were identified were modeled at 100 feet from the roadway centerline and analyzed using only the incremental increase standard for transportation noise. The modeling accounts for noise attenuation provided by existing sound walls, where present. The roadway segment of Bruceville Road from Bilby Road to Kammerer Road is not analyzed because of trip distribution changes associated with development of the SOIA area (extension of Kammerer Road from Bruceville Road to Hood Franklin Road) reducing the traffic volume on this roadway.

Table 3.10-16 Summary of Modeled Traffic Noise Levels under Existing and Existing -Plus-Project Conditions

| Roadway Segment | Applicable Exterior L_{dn} Noise Standard for Land Uses along Roadway Segment (dBA) ^{1,2} | Allowable Exterior L_{dn} Noise Standard Increase (dBA) ⁵ | L_{dn} at Nearest Sensitive Receptor | | Change (dBA) |
|--|--|--|--|---------------------------------|--------------|
| | | | Existing-No-Project Condition | Existing-Plus-Project Condition | |
| Hood Franklin Road (I-5 NB Off-Ramp to Kammerer Road) ⁴ | 60 | 3 | 64.9 | 66.0 | 1.1 |
| Kammerer Road (Hood Franklin Road to Willard Parkway) | 60 | NA | NA | 57.1 | NA |

Table 3.10-16 Summary of Modeled Traffic Noise Levels under Existing and Existing -Plus-Project Conditions

| Roadway Segment | Applicable Exterior L _{dn} Noise Standard for Land Uses along Roadway Segment (dBA) ^{1,2} | Allowable Exterior L _{dn} Noise Standard Increase (dBA) ⁵ | L _{dn} at Nearest Sensitive Receptor | | Change (dBA) |
|---|---|---|---|---------------------------------|--------------|
| | | | Existing-No-Project Condition | Existing-Plus-Project Condition | |
| Kammerer Road (Willard Parkway to Bruceville Road) | 60 | NA | NA | 51.2 | NA |
| Kammerer Road (Bruceville Road to McMillan Road) | 60 ³ | 3 | 65.0 | 66.9 | 1.9 |
| Kammerer Road (McMillan Road to Driveway) | 65 | 5 | 58.5 | 59.4 | 0.9 |
| Kammerer Road (Driveway to Lent Ranch Parkway) ⁴ | 60 | 3 | 65.0 | 65.4 | 0.4 |
| Kammerer Road (Lent Ranch Parkway to Promenade Parkway) ⁴ | 60 | 3 | 65.0 | 65.4 | 0.4 |
| Kammerer Road (Promenade Parkway to SR 99 SB Ramps) ⁴ | 60 | 1.5 | 69.1 | 69.2 | 0.1 |
| Grant Line Road (SR 99 SB Ramps to SR 99 NB Ramps) ⁴ | 60 | 1.5 | 69.0 | 69.1 | 0.1 |
| Grant Line Road (SR 99 NB Ramps to E Stockton Boulevard) ⁴ | 60 | 1.5 | 69.0 | 69.0 | 0.0 |
| Grant Line Road (E Stockton Boulevard to Waterman Road) ⁴ | 60 | 1.5 | 69.9 | 70.0 | 0.1 |
| Grant Line Road (Waterman Road to Mosher Road) ⁴ | 60 | 1.5 | 68.5 | 68.5 | 0.0 |
| Grant Line Road (Mosher Road to Bradshaw Road) | 60 | 1.5 | 68.5 | 68.6 | 0.1 |
| Grant Line Road (Bradshaw Road to Elk Grove Boulevard) | 60 ³ | 1.5 | 71.5 | 71.5 | 0.0 |
| Willard Parkway (Bilby Road to Future Roadway Segment 2) | 60 ³ | 5 | 50.6 | 54.3 | 3.7 |
| Bilby Road (Willard Parkway to Coop Drive) | 60 ³ | 3 | 61.2 | 62.1 | 0.9 |
| Bilby Road (Coop Drive to Bruceville Road) | 60 ³ | 3 | 61.2 | 63.4 | 2.2 |
| Bruceville Road (Bilby Road to Whitelock Parkway) | 60 | 3 | 60.6 | 61.8 | 1.2 |
| Bruceville Road (Whitelock Parkway to Civic Center Drive) | 60 ³ | 3 | 61.6 | 62.2 | 0.6 |
| Bruceville Road (Civic Center Drive to Elk Grove Boulevard) | 60 ³ | 3 | 61.9 | 62.3 | 0.4 |
| Willard Parkway (Bilby Road to Whitelock Parkway) | 60 ³ | 3 | 60.7 | 62.0 | 1.3 |
| Franklin Boulevard (Whitelock Parkway to Elk Grove Boulevard) | 60 ³ | 3 | 60.3 | 60.7 | 0.4 |
| Bruceville Road (Kammerer Road to Eschinger Road) | 65 | 5 | 56.5 | 56.5 | 0.0 |
| I-5 (Laguna Boulevard On/Off Ramps to Elk Grove Boulevard On/Off Ramps) | 60 ³ | 3 | 61.1 | 61.1 | 0.0 |

Table 3.10-16 Summary of Modeled Traffic Noise Levels under Existing and Existing -Plus-Project Conditions

| Roadway Segment | Applicable Exterior L _{dn} Noise Standard for Land Uses along Roadway Segment (dBA) ^{1,2} | Allowable Exterior L _{dn} Noise Standard Increase (dBA) ⁵ | L _{dn} at Nearest Sensitive Receptor | | Change (dBA) |
|---|---|---|---|---------------------------------|--------------|
| | | | Existing-No-Project Condition | Existing-Plus-Project Condition | |
| I-5 (Elk Grove Boulevard On/Off Ramps to Hood Franklin Road On/Off Ramps) | 60 ³ | 3 | 60.1 | 60.2 | 0.1 |
| I-5 (Hood Franklin Road On/Off Ramps to Twin Cities Road On/Off Ramps) ⁴ | 65 | 1.5 | 67.9 | 67.9 | 0.0 |
| SR 99 (Bond Road On/Off Ramps to Elk Grove Boulevard On/Off Ramps) | 60 ³ | 3 | 62.7 | 62.7 | 0.0 |
| SR 99 (Elk Grove Boulevard On/Off Ramps to Grant Line Road On/Off Ramps) | 60 ³ | 3 | 63.5 | 63.5 | 0.0 |
| SR 99 (Grant Line Road On/Off Ramps to W Stockton Boulevard On/Off Ramps) | 60 ³ | 3 | 61.2 | 61.2 | 0.0 |
| SR 99 (W Stockton Boulevard On/Off Ramps to Dillard Road On/Off Ramps) | 65 | 3 | 62.0 | 62.0 | 0.0 |
| SR 99 (Dillard Road On/Off Ramps to Arno Road On/Off Ramps) | 65 | 5 | 58.2 | 58.2 | 0.0 |

Notes: L_{dn} = Day-Night Level; dBA = A-weighted decibels;

¹ 60 L_{dn} – Exterior Noise Standard for all residential, transient lodging, hospitals and nursing homes, and churches and meeting halls per the City of Elk Grove General Plan. See Table 3.10-7

² 65 L_{dn} – Exterior Noise Standard for all residential, transient lodging, hospitals and nursing homes, churches, meeting halls, schools, libraries, office buildings and industry per the County of Sacramento General Plan. See Table 3.10-10

³ Accounts for 5-dBA decrease in noise levels where existing sound walls are located.

⁴ Roadway segments along which no nearby noise-sensitive receptors were identified were modeled at 100 feet from the roadway centerline and analyzed using only the incremental increase standard for transportation noise.

⁵ Incremental traffic noise increase standard per the City of Elk Grove General Plan (see Policy NO-6) and County of Sacramento General Plan (see Table 3.10-12).

Refer to Appendix C for detailed traffic data, and traffic-noise modeling input data and output results.

Source: Noise levels modeled by Ascent Environmental in 2017

As shown in Table 3.10-16, project-generated traffic would not result in an exceedance of the City or County exterior noise compatibility standards (see Table 3.10-7 and Table 3.10-10) along any roadway segment that currently complies with City of Elk Grove and County of Sacramento exterior L_{dn} standards.

Additionally, as shown in Table 3.10-16, the addition of project-generated traffic to the surrounding roadway network would not result in any of the roadway study segments experiencing noise increases that exceed the incremental noise standards for noise-sensitive land uses (see Elk Grove General Plan Policy NO-6 and Table 3.10-12).

Therefore, existing receptors would not be exposed to traffic noise levels or traffic noise level increases that exceed applicable local noise standards. This impact would be **less than significant**.

Mitigation Measures

No mitigation is required.

Impact 3.10-3: Long-term operational non-transportation noise levels

The SOIA area could result in the future development of commercial land uses in proximity to existing noise-sensitive land uses. Noise sources generally associated with commercial/retail land uses include vehicular and human activity in parking lots, and loading dock and delivery activities. Existing off-site receptors could experience commercial-related noise levels that exceed the City and County's daytime and nighttime noise levels standards. This impact would be **significant**.

This impact assesses the long-term exposure of existing sensitive receptors to increased operational-source noise levels from the potential land use development scenario within the SOIA area.

The project includes development of commercial land uses as shown in Exhibit 2-4. However, the specific types of commercial uses to be developed are yet been determined. Noise generated at commercial land uses can vary substantially and can include occasional parking lot-related noise (e.g., opening and closing of vehicle doors, people talking) and loading dock operations (e.g., use of forklifts, hydraulic lifts). Noise commonly associated with commercial land uses, such as loading dock activities, including idling trucks, vehicle backup alarms, decompression of truck brakes, forklifts, and material loading and unloading activities can generate noise levels of approximately 71 L_{eq} and 86 L_{max} at a distance of 50 feet and activity at commercial and retail loading docks can occur during noise-sensitive nighttime hours. Based on these reference noise levels, the City and County's daytime exterior noise standard of 55 L_{eq} for residential and agricultural receptors could be exceeded within approximately 205 feet from the loading dock. The County of Sacramento nighttime noise standard of 50 L_{eq} could be exceeded within approximately 325 feet from of a loading dock, and the more stringent City of Elk Grove nighttime exterior noise standard of 45 L_{eq} could be exceeded within approximately 500 feet from of a loading dock.

Additionally, the County's daytime noise standard of 75 L_{max} for residential receptors could be exceeded within approximately 130 feet from the loading dock and the nighttime noise standard of 70 L_{max} could be exceeded within approximately 205 feet from the loading dock.

The off-site noise-sensitive land uses nearest to potential locations of commercial land uses would include the residential dwellings located east of the project site along Bruceville Road, north of Bilby Road (Bilby Ranch), and west of Willard Parkway, and the agricultural land uses adjacent to, and south of the project site.

Based on the reference noise levels identified above, existing off-site residential and agricultural off-site receptors could be exposed to commercial-related noise levels that exceed the City and County's daytime and nighttime L_{eq} noise standards. This would be a **significant** impact.

Mitigation Measure 3.10-3: Reduce noise exposure to existing sensitive receptors from proposed stationary noise sources.

At the time of any application to annex territory within the Bilby Ridge SOIA area, the City of Elk Grove shall require that the applicants to comply with the following noise requirements in the design of the development. Evidence of compliance with this mitigation measure shall be provided in the annexation application to LAFCo.

The applicant shall locate and design loading docks so that noise emissions do not exceed the applicable stationary noise source criteria (i.e., exterior daytime [7:00 a.m. to 10:00 p.m.] standards of 55 L_{eq} for receptors within the City and County, exterior nighttime [10:00 p.m. to 7:00 a.m.] standards of 45 L_{eq} for receptors within the City, and exterior nighttime [10:00 p.m. to 7:00 a.m.] standards of 50 L_{eq} for receptors within the County). At the time of approval of special permits and/or development plan review, the project applicant shall provide to the City a site-specific noise analysis to evaluate design and ensure compliance with City of Elk Grove and Sacramento County noise standards. Reduction of loading dock noise can be achieved by locating loading docks as far away as feasible from noise-sensitive land uses, constructing noise barriers between loading docks and noise-sensitive land uses, or using buildings and topographic features to provide acoustic shielding for noise-sensitive land uses. If needed, loading dock activity shall be prohibited during

nighttime hours (i.e., 10:00 p.m. to 7:00 a.m.). This time-of-day restriction would be consistent with Section 6.32.140 Prohibited Activities of the City of Elk Grove Code, which states, “loading, unloading, opening, closing or other handling of boxes, crates, containers, building materials, garbage cans, or similar objects on private property between the hours of 10:00 p.m. and 7:00 a.m. in a manner to cause a noise disturbance,” is prohibited. Additionally, as stated in City of Elk Grove General Plan, Policy NO-3 – Action 2, limiting the hours of operation for loading docks, trash compactors, and other noise-producing uses in commercial areas which are adjacent to residential uses should be considered. Final design, location, orientation and use restrictions shall be dictated by findings in the noise analysis and approved by City staff.

Significance after Mitigation

Implementation of Mitigation Measure 3.10-3 would require that loading docks are oriented, located, and designed in such a way to ensure that stationary noise sources would comply with City of Elk Grove and Sacramento County noise standards for sensitive receptors. Implementation of Mitigation Measure 3.10-3 would reduce predicted noise levels at proposed land uses consistent with City and County noise standards. With incorporation of available mitigation measures, predicted traffic noise levels at off-site sensitive land uses would not be anticipated to exceed the City and County noise standards. As a result, this impact would be reduced to a **less-than-significant** level.

Impact 3.10-4: Compatibility of project with on-site noise levels

Future annexation of the SOIA area could enable the development of a mix of various land uses, including residential, commercial, office, park, and school uses. Traffic and stationary noise sources near the project could expose newly developed noise-sensitive uses in the SOIA area to noise levels generated by traffic on adjacent roadways and by stationary sources that exceed applicable noise standards established by the City of Elk Grove. This impact would be **significant**.

Noise exposure to traffic noise and non-traffic noise are discussed separately below.

Exposure of New Sensitive Receptors to Traffic Noise

Noise sources associated with agricultural operations, provided such operations do not take place between the hours of 8:00 p.m. and 6:00 a.m. are exempt from City of Elk Grove Noise Control Ordinance standards (City of Elk Grove 2017). Agricultural operations are addressed in detail in Section 3.2, “Agricultural Resources.” The City of Elk General Plan exterior noise standard is 60 L_{dn} for low density residential land uses and 70 L_{dn} for neighborhood parks, as shown in Table 3.10-7. The City of Elk Grove General Plan interior noise standard for low density residential is 45 L_{dn} and the City’s interior noise standards for office buildings and schools is 45 L_{eq}. Land uses developed on the project site would be exposed to noise generated by traffic on adjacent roadways. Predicted traffic noise contours (in L_{dn}) for existing major roadways bordering the project site were modeled for future cumulative-plus-project conditions. The modeling was based on data contained within the project’s traffic analysis found in Appendix C. Table 3.10-17 summarizes predicted distances to the 60, 65, and 70 L_{dn} contours for the major roadway segments, along Bilby Road, Bruceville Road, Willard Parkway, and Kammerer Road that would impact the potential future project land uses.

Table 3.10-17 Summary of Modeled Traffic Noise Contour Distances Under Cumulative-Plus-Project Conditions

| Roadway Segment/Segment Description | Distance (feet) from Roadway Centerline to L _{dn} (feet) | | |
|---|---|-----|-----|
| | 70 | 65 | 60 |
| Existing External Roadways | | | |
| Bruceville Road (Bilby Road to Kammerer Road) | 8 | 24 | 77 |
| Bilby Road (Willard Parkway to Coop Drive) | 21 | 67 | 211 |
| Bilby Road (Coop Drive to Bruceville Road) | 52 | 166 | 524 |
| Willard Parkway (Bilby Road to Kammerer Road) | 18 | 58 | 182 |

Table 3.10-17 Summary of Modeled Traffic Noise Contour Distances Under Cumulative-Plus-Project Conditions

| Roadway Segment/Segment Description | Distance (feet) from Roadway Centerline to L _{dn} (feet) | | |
|--|---|-----|-----|
| | 70 | 65 | 60 |
| Potential New Roadway | | | |
| Kammerer Road (Willard Parkway to Bruceville Road) | 43 | 137 | 433 |
| Notes: L _{dn} = Day-Night Level; dBA = A-weighted decibels; For additional details, refer to Section 3.13, "Traffic, Transportation, and Circulation," and Appendix C for detailed traffic data, and traffic-noise modeling input data and output results. The predicted noise contour distances do not account for shielding or reflection of noise from existing terrain or existing/future structures. Source: Data modeled by Ascent Environmental in 2017 | | | |

As noted in Chapter 2, "Project Description," the conceptual development plan includes a mix of land uses, including commercial, business parks, public parks, an elementary school, and residential development. Potential future residential land uses, could potentially be located within the projected 60 L_{dn} traffic noise contours. As a result, predicted noise levels at proposed residential land uses located near major roadways could exceed the City's exterior noise standard of 60 L_{dn} for residential land uses (see Table 3.10-7). As shown on the conceptual land use plan in Exhibit 2-4, the potential future public parks would not be located within the projected 70 L_{dn} traffic noise contours. However, the location of the park uses have yet to be determined and could be located within the 70 L_{dn} traffic noise contours of surrounding major roadways (Bilby Road, Bruceville Road, Willard Parkway, and the future extension of Kammerer Road).

Based on the modeled traffic noise levels, and given that new commercial buildings typically provide an exterior-to-interior noise reduction of 30 to 35 dBA (Caltrans 2002:7-37), exterior noise levels of the potential commercial, office, and school buildings would need to be at least 75 L_{eq} for office and school land use interior noise standard of 45 L_{eq} to be exceeded. Table 3.10-18 summarizes predicted distances to the 75 L_{eq} contours for the major roadway segments, along Bilby Road, Bruceville Road, Willard Parkway, and Kammerer Road that would adversely affect the potential future project land uses.

Table 3.10-18 Summary of Modeled L_{eq} Traffic Noise Contour Distances Under Cumulative-Plus-Project Conditions

| Roadway Segment/Segment Description | Distance (feet) from Roadway Centerline to L _{eq} (dBA) |
|--|--|
| | 75 |
| Existing External Roadways | |
| Bruceville Road (Bilby Road to Kammerer Road) | 38 |
| Bilby Road (Willard Parkway to Coop Drive) | 3 |
| Bilby Road (Coop Drive to Bruceville Road) | 8 |
| Willard Parkway (Bilby Road to Future Roadway Segment 2) | 13 |
| Potential New Roadways | |
| Kammerer Road (Willard Parkway to Bruceville Road) | 76 |
| Notes: L _{dn} = Day-Night Level; dBA = A-weighted decibels; For additional details, refer to Section 3.13, "Traffic, Transportation, and Circulation," and Appendix C for detailed traffic data, and traffic-noise modeling input data and output results. Source: Data modeled by Ascent Environmental in 2017 | |

As shown in Table 3.10-18, the projected 75 L_{eq} traffic noise contours would extend up to 76 feet into the SOIA area. As a result, predicted noise levels at newly developed commercial and/or school land uses located within these noise contours could potentially exceed the City's interior noise standard of 45 L_{eq} (see Table 3.10-7).

Exposure of New Sensitive Receptors to New Stationary Noise Sources

The City's daytime and nighttime stationary-source noise standards for noise sensitive land uses are based on exterior noise standards of 55 and 45 L_{eq} , respectively.

Proposed Commercial Land Uses

On-site commercial uses, as shown on the proposed land use plan, could be located directly adjacent to residential uses proposed within the SOIA area. Noise generated at commercial land uses can vary substantially and can include occasional parking lot-related noise (e.g., opening and closing of vehicle doors, people talking) and loading dock operations (e.g., use of forklifts, hydraulic lifts). Noise commonly associated with commercial land uses, such as loading dock activities, including idling trucks, vehicle backup alarms, decompression of truck brakes, forklifts, and material loading and unloading activities can generate noise levels of approximately 71 L_{eq} and 86 L_{max} at a distance of 50 feet and activity at commercial and retail loading docks can occur during noise-sensitive nighttime hours. Based on these reference noise levels, the City of Elk Grove daytime exterior noise standard of 55 L_{eq} for residential and agricultural receptors could be exceeded within approximately 205 feet from the loading dock. The City of Elk Grove nighttime exterior noise standard of 45 L_{eq} could be exceeded within approximately 500 feet from of a loading dock.

Thus, the operational noise levels associated with commercial land uses could potentially exceed the City's maximum allowable exterior noise standards at future on-site noise-sensitive receptors, particularly those residences proposed for construction adjacent to and surrounding the proposed commercial land uses, and the proposed nearby elementary school. In addition, increases in single-event noise levels, such as backup alarms from material delivery trucks, occurring during evening and nighttime hours could result in increased levels of disturbance and sleep disruption to occupants of nearby on-site residential dwellings.

Thus, considering the project's close proximity to proposed sensitive receptors, it is possible that new proposed commercial loading docks or new parking lots could exceed the City of Elk Grove's hourly daytime and nighttime allowable noise levels.

Summary

Predicted traffic noise levels at proposed residential, commercial, elementary school, and potential park uses located near Bilby Road, Bruceville Road, Willard Parkway, and Kammerer Road could exceed the City's applicable interior and exterior noise standards. Additionally, the noise generated by any future commercial land uses within the SOIA area could result in the City's noise standards being exceeded sensitive receptors because of the new stationary-source generated noise level on the project site. As a result, this impact would be **significant**.

Mitigation Measure 3.10-4a: Reduce transportation noise exposure to new on-site noise-sensitive receptors

At the time of any application to annex territory within the Bilby Ridge SOIA area, the City of Elk Grove shall require that the applicants to comply with the following noise requirements in the design of the development. Evidence of compliance with this mitigation measure shall be provided in the annexation application to LAFCo.

For new noise-sensitive receptors developed on the SOIA site and located within 77 feet of the centerline of Bruceville Road, within 211 feet of the centerline of Bilby Road between Willard Parkway and Coop Drive, within 524 feet of the centerline of Bilby Road between Coop Drive and Bruceville Road, within 182 feet of the centerline of Willard Parkway, or within 433 feet of the centerline of Kammerer Road between Willard Parkway and Bruceville Road (i.e., the distance from the centerline that is estimated, based on the noise modelling, to result in exceedance of the City of Elk Grove exterior noise compatibility standard of 60 L_{dn} for low density residential), the following design criteria shall be adhered to:

- ▲ Where feasible, locate new sensitive receptors such that the primary outdoor activity area (e.g., backyard, balcony, or porch) is on the opposite side of the structure from major roadways such that the structure itself would provide a barrier between transportation noise and the primary outdoor activity area.

- ▲ Locate new sensitive receptors such that buildings/structures are located between the sensitive land use and nearby major roadways.
- ▲ Setback sensitive receptors from major roadways sufficient distance to ensure they will not be exposed to noise levels that exceed the City of Elk Grove's exterior noise compatibility standard of 60 L_{dn} for low-density residential land uses.

Consistent with City of Elk Grove General Plan, Policy NO-8, if, and only if, implementation of the above measures does not reduce transportation-related noise levels to comply with the City of Elk Grove exterior noise compatibility standard of 60 L_{dn} for low-density residential and 70 L_{dn} school uses, and City of Elk Grove interior noise compatibility standards of 45 L_{eq} for office and school uses, then as part of improvement plans for land uses along Bilby Road, Bruceville Road, Willard Parkway, and Kammerer Road, landscaped noise barriers that demonstrate compliance with City noise standards (interior and exterior) shall be implemented.

Mitigation Measure 3.10-4b: Reduce noise exposure to proposed sensitive receptors from proposed stationary noise sources.

At the time of any application to annex territory within the Bilby Ridge SOIA area, the City of Elk Grove shall require that the applicants to comply with the following noise requirements in the design of the development. Evidence of compliance with this mitigation measure shall be provided in the annexation application to LAFCo.

The applicant shall locate and design loading docks so that noise emissions do not exceed the applicable stationary noise source criteria (i.e., exterior daytime [7:00 a.m. to 10:00 p.m.] standards of 55 L_{eq} for receptors, and exterior nighttime [10:00 p.m. to 7:00 a.m.] standards of 45 L_{eq} for receptors, within the City of Elk Grove). At the time of approval of special permits and/or development plan review, the project applicant shall provide to the City a site-specific noise analysis to evaluate design and ensure compliance with City of Elk Grove and Sacramento County noise standards. Reduction of loading dock noise can be achieved by locating loading docks as far away as feasible from noise-sensitive land uses, constructing noise barriers between loading docks and noise-sensitive land uses, or using buildings and topographic features to provide acoustic shielding for noise-sensitive land uses. If needed, loading dock activity shall be prohibited during nighttime hours (i.e., 10:00 p.m. to 7:00 a.m.). This time-of-day restriction would be consistent with *Section 6.32.140 Prohibited Activities* of the City of Elk Grove Code, which states, "loading, unloading, opening, closing or other handling of boxes, crates, containers, building materials, garbage cans, or similar objects on private property between the hours of 10:00 p.m. and 7:00 a.m. in a manner to cause a noise disturbance," is prohibited. Additionally, as stated in City of Elk Grove General Plan, *Policy NO-3 – Action 2*, limiting the hours of operation for loading docks, trash compactors, and other noise-producing uses in commercial areas which are adjacent to residential uses should be considered. Final design, location, orientation and use restrictions shall be dictated by findings in the noise analysis and approved by City staff.

Significance after Mitigation

Implementation of Mitigation Measure 3.10-4b would require all stationary noise sources to be oriented, located, and designed in such a way that reduces noise exposure to ensure that noise-sensitive receptors developed on the SOIA site would not be exposed to stationary-source noise that exceeds applicable City of Elk Grove noise standards. Implementation of mitigation measures 3.10-4a and 3.10-4b would reduce predicted noise levels at proposed land uses consistent with City noise standards. With incorporation of available mitigation measures, such as noise barriers, landscaped berms, building orientation and noise insulation building measures, predicted traffic noise levels at on-site residential land uses would not be anticipated to exceed the City noise standards. As a result, this impact would be reduced to a **less-than-significant** level.

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