This section describes the existing noise environment in the Sheldon/99 GPA and Rezone project vicinity and identifies potential noise impacts associated with the proposed project. Project impacts are evaluated relative to applicable noise level criteria and to the existing ambient noise environment. Mitigation measures have been identified for significant noise-related impacts. This section is based on information provided in the "Environmental Noise Impact Analysis for Sheldon Road/State Route 99 GPA/Rezone Project" by AMBIENT Air Quality & Noise Consulting (2008) (**Appendix B**).

4.6.1 EXISTING SETTING

ACOUSTIC FUNDAMENTALS

Noise is generally defined as sound that is loud, disagreeable, or unexpected. Sound is mechanical energy transmitted in the form of a wave because of a disturbance or vibration. Sound levels are described in terms of both amplitude and frequency. Amplitude is defined as the difference between ambient air pressure and the peak pressure of the sound wave. Amplitude is measured in decibels (dB) on a logarithmic scale. For example, a 65 dB source of sound, such as a truck, when joined by another 65 dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). Amplitude is interpreted by the ear as corresponding to different degrees of loudness. Laboratory measurements correlate a 10 dB increase in amplitude with a perceived doubling of loudness and establish a 3 dB change in amplitude as the minimum audible difference perceptible to the average person.

The frequency of a sound represents the pitch, measured in Hertz, and is defined as the number of fluctuations of the pressure wave per second. Noise events may contain multiple frequency components, which can be used to further classify noise events. For instance, noise which does not exhibit a relatively constant discrete frequency level over a period of time are classified as "broadband" noise. Noise exhibiting discrete frequency characteristics are generally referred to as "pure" or "tonal" noise. The human ear is not equally sensitive to sound of different frequencies. In general, the human ear is capable of detecting sounds within a frequency range of 16 Hz to 20,000 Hz. The human ear is more sensitive to sound in the higher portion of this range than in the lower range.

To account for the human sensitivity to noise within this frequency range, various frequency-weighted scales have been developed. The scale used to approximate the sensitivity of the human ear is referred to as the "A-weighted" scale. The "A-weighted" scale provides a single unit of measure representative of noise occurring within this frequency spectrum, referred to as decibels, abbreviated "dBA." On this scale, the normal range of human hearing extends from about 10 dBA to about 140 dBA (U.S. EPA 1971). Common community noise sources and associated noise levels, in dBA, are depicted in **Figure 4.6-1**.

Sound levels can be reduced by placing barriers between the noise source and the receiver. In general, barriers contribute to decreasing noise levels only when the structure breaks the "line of sight" between the source and the receiver. Buildings, concrete walls, and berms can all act as effective noise barriers. Wooden fences or broad areas of dense foliage can also reduce noise, but are less effective than solid barriers.

Noise Descriptors

The intensity of environmental noise fluctuates over time, and several descriptors of time-averaged noise levels are used. The three most commonly used descriptors are L_{eq}, L_{dn}, and

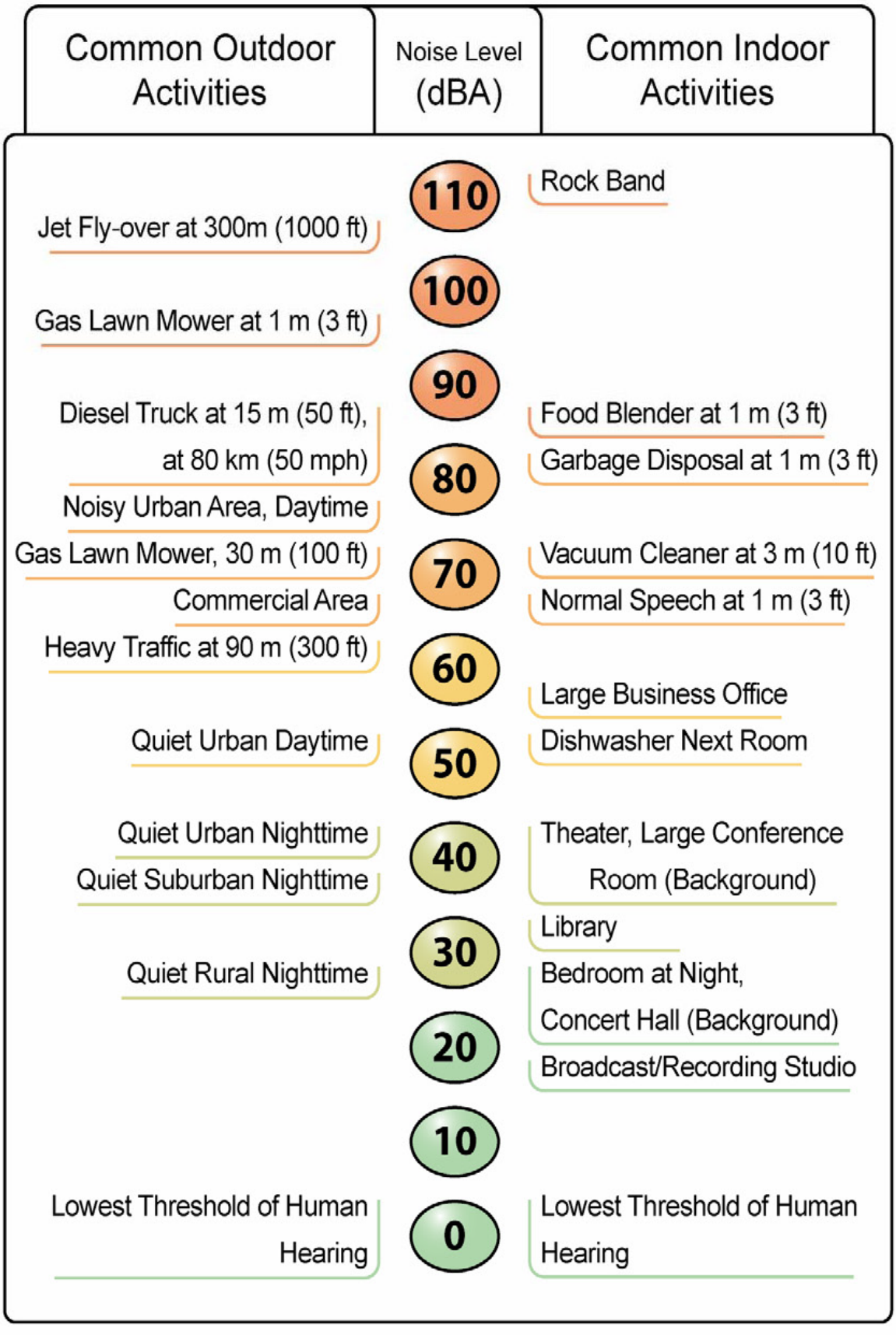
CNEL. The energy-equivalent noise level, L_{eq}, is a measure of the average energy content (intensity) of noise over any given period. Many communities use 24-hour descriptors of noise levels to regulate noise. The day-night average noise level, L_{dn}, is the 24-hour average of the noise intensity, with a 10-dBA "penalty" added for nighttime noise (10 p.m. to 7 a.m.) to account for the greater sensitivity to noise during this period. CNEL, the community equivalent noise level, is similar to L_{dn} but adds an additional 5-dBA penalty for evening noise (7 p.m. to 10 p.m.). Another descriptor that is commonly discussed is the single-event noise exposure level (SENEL), also referred to as the sound exposure level (SEL). The SENEL/SEL describes a receiver's cumulative noise exposure from a single noise event, which is defined as an acoustical event of short duration (0.5 second), such as a backup beeper, the sound of an airplane traveling overhead, or a train whistle, and involves a change in sound pressure above a defined reference value (usually approximately 40 dBA). Noise analyses may also depend on measurements of L_{max}, the maximum instantaneous noise level during a specific period of time, and L_{min}, the minimum instantaneous noise level during a specific period. Common noise level descriptors are summarized in **Table 4.6-1**.

TABLE 4.6-1
COMMON ACOUSTICAL DESCRIPTORS

Descriptor	Definition
Energy Equivalent Noise Level (Leq)	The energy mean (average) noise level. The instantaneous noise levels during a specific period of time in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value (in dBA) is calculated.
Minimum Noise Level (Lmin)	The minimum instantaneous noise level during a specific period of time.
Maximum Noise Level (Lmax)	The maximum instantaneous noise level during a specific period of time.
Day-Night Average Noise Level (DNL or Ldn)	The 24-hour Leq with a 10 dBA "penalty" for noise events that occur during the noise-sensitive hours between 10:00 p.m. and 7:00 a.m. In other words, 10 dBA is "added" to noise events that occur in the nighttime hours to account for increases sensitivity to noise during these hours.
Community Noise Equivalent Level (CNEL)	The CNEL is similar to the Ldn described above, but with an additional 5 dBA "penalty" added to noise events that occur between the hours of 7:00 p.m. to 10:00 p.m. The calculated CNEL is typically approximately 0.5 dBA higher than the calculated Ldn.
Single Event Level (SEL)	The level of sound accumulated over a given time interval or event. Technically, the sound exposure level is the level of the time-integrated mean square A-weighted sound for a stated time interval or event, with a reference time of one second.

Human Response to Noise

The human response to environmental noise is subjective and varies considerably from individual to individual. Noise in the community has often been cited as a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from interference with human activities, including sleep, speech, recreation, and tasks that demand concentration or coordination. Hearing loss can occur at the highest noise intensity levels. When community noise interferes with human activities or contributes to stress, public annoyance with the noise source increases. The acceptability of noise and the threat to public well-being are the basis for land use planning policies preventing exposure to excessive community noise levels.



Source: Caltrans, 2008

City of Elk Grove
Development Services

FIGURE 4.6-1
Typical Noise Levels

Unfortunately, there is no completely satisfactory way to measure the subjective effects of noise or of the corresponding reactions of annoyance and dissatisfaction. This is primarily because of the wide variation in individual thresholds of annoyance and habituation to noise over differing individual experiences with noise. Thus, an important way of determining a person's subjective reaction to a new noise is the comparison of it to the existing environment to which one has adapted: the so-called "ambient" environment. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged. Regarding increases in A-weighted noise levels, knowledge of the following relationships will be helpful in understanding this analysis:

- Except in carefully controlled laboratory experiments, a change of 1 dB cannot be perceived by humans;
- Outside of the laboratory, a 3-dB change is considered a just-perceivable difference;
- A change in level of at least 5 dB is required before any noticeable change in community response would be expected. An increase of 5 dB is typically considered substantial;
- A 10-dB change is subjectively heard as an approximate doubling in loudness and would almost certainly cause an adverse change in community response.

A limitation of using a single noise-level increase value to evaluate noise impacts, as discussed above, is that it fails to account for pre-project-noise conditions. With this in mind, the Federal Interagency Committee on Noise (FICON) developed guidance to be used for the assessment of project-generated increases in noise levels that take into account the ambient noise level. The FICON recommendations are based upon studies that relate aircraft noise levels to the percentage of persons highly annoyed by aircraft noise. Although the FICON recommendations were specifically developed to assess aircraft noise impacts, it has been asserted that they are applicable to all sources of noise described in terms of cumulative noise exposure metrics, such as the average-daily noise level (i.e., CNEL, L_{dn}). FICON-recommended noise evaluation criteria are summarized in **Table 4.6-2** (FICON, 2000).

TABLE 4.6-2
FEDERAL INTERAGENCY COMMITTEE ON NOISE
RECOMMENDED CRITERIA FOR EVALUATION OF INCREASES IN AMBIENT NOISE LEVELS

Ambient Noise Level Without Project	Increase Required for Significant Impact
< 60 dB	5.0 dB, or greater
60-65 dB	3.0 dB, or greater
> 65 dB	1.5 dB, or greater

Source: FICON, 2000.

As depicted in **Table 4.6-2**, an increase in the traffic noise level of 5.0, or greater, would typically be considered to result in increased levels of annoyance where existing ambient noise levels are less than 60 dB. Within areas where the ambient noise level ranges from 60 to 65 dB, increased levels of annoyance would be anticipated at increases of 3 dB, or greater. Increases of 1.5 dB, or greater, could result in increased levels of annoyance in areas where the ambient noise level exceeds 65 dB. The rationale for the FICON-recommended criteria is that as ambient noise levels increase, a smaller increase in noise resulting from a project is sufficient to cause significant increases in annoyance (FICON, 2000).

Existing Noise Environment

Noise-Sensitive Land Uses

Noise-sensitive land uses generally include those uses where exposure to noise would result in adverse effects, as well as uses 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. Other noise-sensitive land uses include hospitals, convalescent facilities, parks, hotels, churches, libraries, and other uses where low interior noise levels are essential.

Noise-sensitive land uses located near the project site consist of residential land uses. The nearest existing residential uses are located adjacent to the eastern, northern, and southern boundaries of the project site.

Ambient Noise Levels

To document the existing noise environment, ambient noise surveys were conducted by AMBIENT Air Quality & Noise Consulting at various locations in the project area. Short-term (15-minute) noise measurements were conducted on April 14, 2008 using a Larson Davis model 820 sound-level meter placed at a height of approximately 5 feet above the ground surface. Based on the measurements conducted, average daytime noise levels (in dBA L_{eq}) in the project area generally range from the mid-60s to upper 70s, dependent primarily on distance from State Route 99 (SR-99). Measurement survey results are summarized in **Table 4.6-3.**

TABLE 4.6-3
AMBIENT DAYTIME NOISE LEVELS

Monitoring Location	Measured Noise Level (dBA)		
	Leq	Lmin	Lmax
Sheldon Road, Eastern Project Boundary	65.5	53.2	74.7
East Stockton Boulevard at Bow Street, Western Project Boundary	76.8	82.6	68.1
Bow Street, Northern Project Boundary	67.0	79.0	58.2

Noise measurements were conducted on April 14, 2008 using a Larson Davis Laboratories Model 820 Type I integrating sound meter positioned at a height of approximately 4.5 feet above ground level.

Source: AMBIENT Air Quality & Noise Consulting, 2008.

As noted above, the dominant noise source in the project area is vehicular traffic on SR-99. To a lesser extent, vehicle traffic on area roadways, including Sheldon Road and E. Stockton Boulevard, also contribute to the existing noise environment in the project area. **Table 4.6-4** summarizes the existing traffic noise levels (in dBA CNEL) for existing roadways located in the project area. Existing roadway traffic noise levels were calculated using the Federal Highway Administration (FHWA) roadway noise prediction model (FHWA-RD-77-108) based on California vehicle reference noise levels and traffic data obtained from the traffic analysis prepared for this project. Additional input data included day/night percentages of autos, medium and heavy trucks, vehicle speeds, ground attenuation factors, and roadway widths. As depicted in **Table 4.6-4**, predicted noise levels at approximately 50 feet from area roadways range from the mid to upper 60's.

TABLE 4.6-4
EXISTING TRAFFIC NOISE LEVELS

Roadway Segment	Predicted Noise Level (dBA L_{dn}/CNEL)		
	50 ft from Centerline of Near Travel Lane	Distance to Contours (feet)	
		60	65
Elk Grove-Florin Road, Calvine Road to Bond Road	66.9	216	104
Sheldon Road, Center Parkway to West Stockton Boulevard	64.9	159	78
Sheldon Road, Elk Grove-Florin Road to Bradshaw Road	63.1	123	63
Bruceville Road, Sheldon Road to Laguna Boulevard	67.8	245	117
Sheldon Road East Stockton Boulevard to Elk Grove-Florin Road	64.5	152	75
Bruceville Road, Jacinto Road to Sheldon Road	66.3	196	95

Traffic noise levels were predicted using the FHWA roadway noise prediction model based on traffic information obtained from the traffic analysis prepared for this project. Modeled traffic noise levels and contour distances assume no natural or man-made shielding (e.g., vegetation, berms, walls, buildings).

Source: AMBIENT Air Quality & Noise Consulting, 2008.

4.6.2 REGULATORY FRAMEWORK

LOCAL

City of Elk Grove General Plan

The Noise Element of the City of Elk Grove General Plan contains policies designed to protect the community from the harmful and annoying effects of exposure to excessive noise. General Plan policies applicable to the proposed project are summarized in **Table 4.6-5**. The City's General Plan also includes maximum allowable noise standards for projects affected by transportation and non-transportation noise sources. Noise compatibility of proposed development is determined in comparison to these standards. The City's noise standards for projects affected by stationary (i.e., non-transportation) and transportation noise sources are summarized in **Tables 4.6-6** and **4.6-7**, respectively.

TABLE 4.6-5
CITY OF ELK GROVE GENERAL PLAN
APPLICABLE NOISE POLICIES

General Plan Policy	Consistency Determination	Analysis
Policy NO-1: New development of the uses listed in Table NO-C 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 in order to achieve compliance with the City's noise standards.	Yes, with mitigation	The proposed project does not include any conceptual site plans or specific uses. Acoustical assessments for subsequent development proposals for the project site would be required to identify noise-reduction measures sufficient to ensure compliance with City noise standards as described by mitigation measure MM 4.6.3.
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 or the performance standards of Table NO-A, an acoustical analysis shall be required as part of the environmental review process so that noise mitigation may be included in the project design.	Yes, with mitigation	Refer to NO-1, above.
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 measured immediately within the property line of lands designated for noise-sensitive uses. *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. *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. *NO-3-Action 3:* The City shall require that stationary	Yes, with mitigation	Construction activities would be limited to between the hours of 7 a.m. and 7 p.m. Equipment staging areas would be located at the furthest possible distance from nearby noise-sensitive land uses consistent with the requirements of mitigation measure MM 4.6.1.

General Plan Policy	Consistency Determination	Analysis
construction equipment and construction staging areas be set back from existing noise-sensitive land uses.		
Policy NO-4: Where proposed non-residential land uses are likely to produce noise levels exceeding the performance standards of Table NO-A at existing or planned noise-sensitive land 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.	Yes, with mitigation	Refer to NO-1, above.
Policy NO-8: Where noise mitigation measures are required to achieve the standards of Tables NO-A and NO-C, 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.	Yes, with mitigation	Refer to NO-1, above.
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.	Yes, with mitigation	Refer to NO-1, above.

Note: Transportation noise sources are defined as traffic on public roadways, railroad line operations and aircraft in flight. Control of noise from these sources is preempted by Federal and State regulations. Other noise sources are presumed to be subject to local regulations, such as a noise control ordinance. Nontransportation noise sources may include industrial operations, outdoor recreation facilities, HVAC units, loading docks, etc.

Source: City of Elk Grove General Plan, Noise Element (Amended January 5, 2005)

TABLE 4.6-6
PERFORMANCE STANDARDS FOR STATIONARY (NON-TRANSPORTATION) NOISE SOURCES

Source	Noise Level (Hourly Leq, dBA)	
	Daytime (7a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Part 1: Typical Sources [1]	55	45
Part 2: Sources Which Are Tonal, Impulsive, Repetitive, or Consist Primarily of Speech or Music [2]	50	40

1. The standards above 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.

2. The standards in Part 2 apply to noises which are tonal in nature, impulsive or repetitive, or which consist primarily of speech or music (e.g., humming sounds, outdoor speaker systems, etc.). Typical noise sources in this category include: pile drivers, drive-through speaker boxes, punch presses, steam valves, and transformer stations.

These noise level standards in Parts 1 and 2 above do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings).

The City may impose noise level standards which are more or less restrictive than those specified above based upon determination of existing low or high ambient noise levels.

Source: Elk Grove General Plan, Noise Element, Table NO-A (Amended January 5, 2005).

As depicted in **Table 4.6-6**, the City's maximum acceptable exterior noise standard for residential land uses affected by non-transportation noise sources is 55 dBA L_{eq} during the

daytime hours (i.e., 7 a.m. to 10 p.m.) and 45 dBA during the nighttime hours (i.e., 10 p.m. to 7 a.m.) To account for increased annoyance potential, non-transportation sources with tonal, impulsive, or repetitive noise characteristics are reduce by 5 dBA. The City's maximum acceptable exterior noise standard for residential land uses affected by transportation noise sources is 60 dBA L_{dn}/CNEL (**Table 4.6-7**). Exterior noise levels of up to 65 dBA L_{dn}/CNEL may be allowed provided that available exterior noise level reduction measures have been incorporated into the project and interior noise levels do not exceed the City's interior noise standard of 45 dBA L_{dn}/CNEL. This interior noise standard is consistent with State of California Title 24 building insulation requirements, which establishes an interior noise standard of 45 dBA L_{dn}/CNEL for multi-family residential dwellings.

TABLE 4.6-7
NOISE STANDARDS FOR NEW USES AFFECTED BY TRANSPORTATION NOISE

New Land Use	Outdoor Activity Areas [1] (dBA L_{dn}/CNEL)	Interior Spaces (dBA)	
		L_{dn}/CNEL	L_{eq}[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[3]	--	40
Office Buildings	--	--	45
Schools, Libraries, Museums	--	--	45
Playgrounds, Neighborhood Parks	70	--	--

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 designated as the outdoor activity area.

2. As determined for a typical worst-case hour during periods of use.

3. Where it is not possible to reduce noise in outdoor activity areas to 60 dBA L_{dn}/CNEL or less using a practical application of the best-available noise reduction measures, an exterior noise level of up to 65 dBA 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 disturbance for residences located near railroad tracks.

Source: City of Elk Grove General Plan Noise Element, Table NO-C (Amended January 5, 2005).

City of Elk Grove Noise Ordinance

The City of Elk Grove noise control ordinance regulates noise generated by non-transportation sources. Section 6.68.090 of the Ordinance restricts construction activities to the less noise-sensitive daytime hours. In accordance with the City's noise control ordinance, construction

activities are typically limited to between the hours of 6 a.m. and 8 p.m., Monday through Friday, and between the hours of 7 a.m. and 8 p.m. on Saturday and Sunday.

City of Elk Grove Zoning Code

The City of Elk Grove Zoning Code includes certain performance standards (Title III, Use Regulations and Development Standards) that could have the effect of reducing noise levels. For example, Chapter I, Article 5, Section 301-61 requires that a masonry wall be provided along the exterior property lines for all industrial and commercial projects when located adjacent to residential (and other specified) zones, and that where a sound wall is required, a masonry wall of up to eight feet in height may be provided. Chapter 5, Article 2, Section 305-13.3 requires that a solid wood fence or masonry wall with a minimum height of six feet be built along the exterior property lines of any multi-family residential project. Chapter 15, Article 6, Section 315-43(f) requires that loading docks adjacent to residentially zoned property have a setback of at least 75 feet from that zoning boundary. Section 315-45(b) of the same Article requires that, for commercial development adjacent to residential and other specified zones, a six-foot high perimeter masonry wall be installed along the property lines of those zones.

Ground-Borne Vibration

There are no federal, state, or local regulatory standards for ground-borne vibration. However, various criteria have been established to assist in the evaluation of vibration impacts. For instance, the California Department of Transportation (Caltrans) has developed vibration criteria based on potential structural damage risks and human annoyance. Caltrans-recommended criteria for the evaluation of groundborne vibration levels, with regard to structural damage and human annoyance, are summarized in **Table 4.6-8** and **Table 4.6-9**, respectively. The criteria differentiate between transient and continuous/frequent sources. Transient sources of ground-borne vibration include intermittent events, such as blasting; whereas, continuous and frequent events would include the operations of equipment, including construction equipment, and vehicle traffic on roadways (Caltrans 2002, 2004).

TABLE 4.6-8
DAMAGE POTENTIAL TO BUILDINGS AT VARIOUS GROUNDBORNE VIBRATION LEVELS

Structure and Condition	Vibration Level (in/sec ppv)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely Fragile Historic Buildings, Ruins, Ancient Monuments	0.12	0.08
Fragile Buildings	0.2	0.1
Historic and Some Old Buildings	0.5	0.25
Older Residential Structures	0.5	0.3
New Residential Structures	1.0	0.5
Modern Industrial/Commercial Buildings	2.0	0.5

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Source: Caltrans 2004

TABLE 4.6-9
ANNOYANCE POTENTIAL TO PEOPLE AT VARIOUS GROUNDBORNE VIBRATION LEVELS

Human Response	Vibration Level (in/sec ppv)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Barely Perceptible	0.04	0.01
Distinctly Perceptible	0.25	0.04
Strongly Perceptible	0.9	0.10
Severe	2.0	0.4

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Source: Caltrans 2004

The ground-borne vibration criteria recommended by Caltrans for evaluation of potential structural damage is based on building classifications, which take into account the age and condition of the building. For residential structures and newer buildings, Caltrans considers a minimum peak-particle velocity (ppv) threshold of 0.25 inches per second (in/sec) for transient sources and 0.04 in/sec for continuous/frequent sources to be sufficient to protect against building damage. Continuous ground-borne vibration levels below approximately 0.02 in/sec ppv are unlikely to cause damage to any structure. In terms of human annoyance, continuous vibrations in excess of 0.04 in/sec ppv and transient sources in excess of 0.25 in/sec ppv are identified by Caltrans as the minimum perceptible level for ground vibration. Short periods of ground vibration in excess of 2.0 in/sec ppv can be expected to result in severe annoyance to people. Short periods of ground vibration in excess of 0.1 in/sec ppv (0.2 in/sec ppv within buildings) can be expected to result in increased levels of annoyance (Caltrans 2002, 2004).

4.6.3 IMPACTS AND MITIGATION MEASURES

STANDARDS OF SIGNIFICANCE

Criteria for determining the significance of noise impacts were developed based on information contained in the California Environmental Quality Act Guidelines (CEQA Guidelines, Appendix G). According to those guidelines, a project may have a significant effect on the environment if it would result in the following conditions:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance or of applicable standards of other agencies.

b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

e) For a project located within an airport land use plan area or, where such a plan has not been adopted, within two miles of a public airport or a public use airport, would the project expose people residing or working in the project area to excessive noise levels.

f) 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.

The nearest airport/airstrip is the Sunset Skyranch Airport, which is located approximately four miles southeast of the project site. Implementation of the proposed project would not affect airport operations, nor would implementation of the proposed project result in the development or relocation of any noise-sensitive land uses in proximity to any airport or airstrip. As a result, implementation of the proposed project would not result in increased exposure of individuals to excessive aircraft noise levels. There are no private airstrips within the vicinity of the project area. For these reasons, noise impacts from airports and airstrips were identified as being less than significant or having no impact and will not be further discussed in this document.

Exposure of specific land uses to significant traffic noise or stationary noise sources is based on City criteria identified in **Tables 4.6-3** and **4.6-4**. For purposes of this analysis, significant increases in the traffic noise levels were based on FICON-recommended criterion (**Table 4.6-2**). Accordingly, significant increases in ambient noise levels would be defined as an increase of 5 dBA, or greater, where the ambient noise environment is less than 60 dBA; 3.0 dBA, or greater, where the ambient noise environment is between 60 and 65 dBA; and an increase of 1.5 dBA, or greater, where the ambient noise environment exceeds 65 dBA. The rationale for these criteria is that, as ambient noise levels increase, a smaller increase in noise resulting from a project is sufficient to cause significant annoyance (FICON, 2000).

METHODOLOGY

The proposed project includes the redesignation and rezoning of various parcels located within the project area, which would accommodate future development of commercial and residential land uses. The specific land uses to be developed within the project area have not yet been determined.

A combination of existing literature, noise level measurements, and application of accepted noise prediction and sound propagation algorithms were used to predict changes in ambient noise levels resulting from project-related development. Short-term and long-term stationary-source noise impacts associated with future development were analyzed based on typical noise sources and corresponding noise levels commonly associated with the proposed land uses. Stationary-source noise levels at nearby land uses were calculated assuming an average noise attenuation rate of 6 dB per doubling of distance from the source. Predicted noise levels were compared to the City's applicable noise standards for determination of impact significance.

Traffic noise levels were calculated using the Federal Highway Administration (FHWA) roadway noise prediction model (FHWA-RD-77-108) based on California vehicle reference noise levels and traffic data obtained from the traffic analysis prepared for this project. Additional input data included day/night percentages of autos, medium and heavy trucks, vehicle speeds, ground attenuation factors, and roadway widths. Predicted noise levels were calculated at a distance of 50 feet from the near-travel-lane centerline, as well as distances to the predicted 60 and 65 dBA CNEL noise contours. Increases in traffic noise levels attributable to the proposed project were determined based on a comparison of predicted noise levels, with and without project implementation. Stationary-source noise impacts were evaluated in comparison to applicable City noise standards (**Table 4.6-6**). The compatibility of proposed land uses were evaluated

based on a comparison of projected future onsite noise levels with the City's corresponding land use compatibility noise criteria (**Table 4.6-7**).

Short-term and long-term groundborne vibration impacts were qualitatively discussed based on vibration levels commonly associated with stationary and mobile sources and impact criterion derived from existing environmental documentation.

PROJECT IMPACTS AND MITIGATION MEASURES

Exposure to Short-term Construction Noise/Temporary Increase in Ambient Noise Levels

Impact 4.6.1 Short-term construction-generated noise levels could result in a substantial increase in ambient noise levels at nearby noise-sensitive land uses. This impact is considered **potentially significant.**

Construction noise in any one particular area would be temporary and would include noise from activities such as excavations, site preparation, truck hauling of material, pouring of concrete, and use of power hand tools. Construction noise typically occurs intermittently and varies depending on the nature of the construction activities being performed. Noise generated by construction equipment, including excavation equipment, material handlers, and portable generators, can reach high levels for brief periods. The United States Environmental Protection Agency (US EPA) has found that the average noise levels associated with construction activities typically range from approximately 76 dBA to 84 dBA L_{eq}, with intermittent individual equipment noise levels ranging from approximately 74 dBA to more than 88 dBA for brief periods. **Table 4.6-10** lists typical uncontrolled noise levels generated by individual pieces of construction equipment at a distance of 50 feet.

TABLE 4.6-10
TYPICAL CONSTRUCTION EQUIPMENT NOISE LEVELS

Equipment	Typical Noise Level (dBA Lmax) 50 feet from Source
Backhoe	80
Compactor	82
Dozer	85
Grader	85
Loader	85
Truck	88
Air Compressor	81
Concrete Mixer	85
Concrete Pump	82
Crane, Mobile	83

Equipment	Typical Noise Level (dBA Lmax) 50 feet from Source
Generator	81
Impact Wrench	85
Jack Hammer	88
Paver	89
Pneumatic Tool	85
Pump	76
Roller	74
Saw	76

Sources: FTA 2006

Noise from localized point sources (such as construction sites) typically decreases by approximately 6 dBA with each doubling of distance from source to receptor. Given this noise attenuation rate and based on the noise levels presented in **Table 4.6-10**, outdoor receptors within approximately 800 feet of construction sites could experience average-hourly noise levels of greater than 60 dBA when on-site construction-related noise levels exceed approximately 85 dBA at the boundary of the construction site.

When noise levels generated by construction operations are being evaluated, activities occurring during the more noise-sensitive nighttime hours (i.e., 10 p.m. to 7 a.m.) are of increased concern. Because exterior ambient noise levels typically decrease during the nighttime hours as community activities (e.g., commercial activities, vehicle traffic) decrease, construction activities performed during these more noise-sensitive periods of the day can result in increased annoyance and potential sleep disruption for occupants of nearby residential dwellings. The proposed project does not include restrictions on the hours during which construction activities would occur. As a result, construction activities occurring during the more noise-sensitive nighttime hours could result in increased levels of annoyance and potential sleep disruption for occupants of nearby noise-sensitive land uses. For this reason, noise-generating construction activities would be considered to have a **significant** short-term impact.

Mitigation Measures

MM 4.6.1 The following measures shall be implemented to reduce construction-generated noise levels at nearby land uses:

- Construction activities (excluding activities that would result in a safety concern to the public or construction workers) shall be limited to between the hours of 6 a.m. and 8 p.m., Monday through Friday, and between the hours of 7 a.m. and 8 p.m. on Saturday and Sunday, in accordance with the City of Elk Grove Noise Ordinance.
- Construction equipment shall be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturers' recommendations.

- Construction equipment staging areas shall be located at the furthest distance possible from nearby noise-sensitive land uses.

Timing/Implementation: *During construction.*

Enforcement/Monitoring: *City of Elk Grove, Development Services, Planning.*

Implementation of mitigation measure MM 4.6.1 would limit construction activities to the less noise-sensitive periods of the day. Use of mufflers would reduce individual equipment noise levels by approximately 10 dBA. With implementation of the above mitigation measure, this impact would be considered **less than significant**.

Increases in Long-term Operational Traffic Noise/Substantial Permanent Increase in Noise Level

Impact 4.6.2 Implementation of the proposed project would not result in significant increases in near-term traffic noise levels. This would be a **less than significant** impact.

Implementation of the proposed land uses would result in increased traffic volumes on some area roadways. The increase in traffic volumes resulting from implementation of the proposed project would, therefore, contribute to predicted increases in traffic noise levels. The FHWA roadway noise prediction model was used to predict traffic noise levels along affected roadways for existing traffic conditions, with and without implementation of the proposed project, to determine the level of increase in traffic noise levels attributable to the proposed project. Modeling was conducted for roadways anticipated to be primarily affected by the proposed project, based on predicted traffic volumes obtained from the traffic analysis prepared for this project. The project's contribution to traffic noise levels along area roadways was determined by comparing the predicted noise levels with and without project-generated traffic. Predicted traffic noise levels are summarized in **Table 4.6-11**.

TABLE 4.6-11
PREDICTED INCREASES IN TRAFFIC NOISE LEVELS
BASELINE CONDITIONS

Roadway	Predicted CNEL, 50 Feet from Near-Travel Lane Centerline		Predicted Increase	Significant Increase?
	Baseline Without Project	Baseline With Project		
Elk Grove-Florin Road, Calvine Road to Bond Road	66.92	67.06	0.14	No
Sheldon Road., Center Parkway to West Stockton Boulevard.	65.85	66.68	0.83	No
Sheldon Road, Elk Grove-Florin Road to Bradshaw Road	63.33	63.46	0.13	No
Bruceville Road, Sheldon Road to Laguna Boulevard	68.15	68.33	0.18	No
Sheldon Road, East Stockton Boulevard to Elk Grove-Florin Road	64.63	65.54	0.91	No
Bruceville Road, Jacinto Road to Sheldon Road	66.39	66.63	0.24	No

Traffic noise levels were calculated using the FHWA roadway noise prediction model (FHWA-RD-77-108) based on data obtained from the traffic analysis prepared for this project.

Source: AMBIENT Air Quality & Noise Consulting, 2008.

Based on the traffic noise modeling conducted, implementation of the proposed project would result in predicted increases in traffic noise levels of approximately 1 dB, or less, along primarily affected area roadways. The project's contribution to traffic noise levels would be anticipated to diminish in future years as traffic volumes due to additional development occurring within the City increases. Based on the modeling conducted, implementation of the proposed project would not result in a significant increase in traffic noise levels. As a result, this impact would is considered **less than significant**.

Mitigation Measures

None required.

Exposure of Sensitive Receptors to or Generation of Excessive Stationary-Source Noise Levels

Impact 4.6.3 Exposure to noise levels generated by future on-site stationary sources associated with the proposed project could exceed the City's noise standards at noise-sensitive land uses. This impact would be **potentially significant.**

The proposed project includes redesignation/rezoning of various parcels located within the project area, which would accommodate future development of commercial and residential land uses. As currently proposed, a total of approximately 27.2 acres of the project area would be rezoned for general/shopping center commercial use and approximately 7.7 acres would be retained for residential use. Parcels proposed for residential use would be generally located within the northern portion of the project area, north of Sheldon Road. Commercial uses would be generally located adjacent to Sheldon Road and SR-99. The commercial use designation would allow for future development of medium to high-density uses, including wholesale commercial, entertainment, office, services, professional and regional/local shopping center uses.

Noise from proposed residential land uses would expose other nearby residences (both existing and project-related) to minor increases in ambient noise levels. Noise typically associated with such development includes lawn and garden equipment, voices, and amplified music. Activities associated with these land uses would result in only minor increases in ambient noise levels, primarily during the day and evening hours and less frequently at night. As a result, residential land uses are typically not considered major noise-generating sources. Given the relatively high background noise levels in the area, due to vehicle traffic on area roadways, the proposed residential land uses would not be anticipated to result in a significant increase in ambient noise levels.

Noise sources commonly associated with commercial land such uses can include occasional parking lot activities (e.g., opening and closing of vehicle doors, people talking), loading dock operations (e.g., use of forklifts, hydraulic lifts), trash compactors, and air compressors. Noise commonly associated with commercial land uses, such as idling trucks, vehicle backup alarms, decompression of trailer truck brakes, forklifts, and other material loading and unloading activities, can generate intermittent noise levels of approximately 90 dBA L_{max} at 10 feet. The highest average-hourly noise levels associated with commercial sources, such as loading docks, can vary substantially, but typically range from approximately 60-65 dBA L_{eq} at 50 feet.

The nearest existing noise-sensitive land uses in the vicinity of proposed onsite commercial land uses would include existing residential dwellings located adjacent to the southern and eastern boundaries of the project area, south of Sheldon Road. Proposed residential land uses located

north of Sheldon Road would also be located adjacent to proposed commercial land uses. Predicted noise levels at nearby existing and future residential land uses would be dependent on various factors, including the specific activities conducted, site design, and noise-reduction measures (i.e., enclosures, barriers, etc.) incorporated. Compliance with the City's zoning code requirements, as discussed earlier in this report, would help to reduce noise impacts at nearby noise-sensitive receptors. However, based on the noise levels discussed above, and depending on site design and operational conditions, predicted noise levels associated with the operation of future commercial land uses could still exceed the City's noise standards (**Table 4.6-6**) at nearby receptors. Activities occurring during the more noise-sensitive nighttime hours would be of particular concern, given the potential for increased levels of annoyance and potential sleep disruption to occupants of nearby residential dwellings. For these reasons, noise generated by the proposed commercial land uses would be considered **potentially significant**.

Mitigation Measures

MM 4.6.3 Prior to approval of development plans for any non-residential uses on the project site, an acoustical assessment addressing City noise standards and criteria shall be performed. Where the acoustical analysis determines that stationary source noise levels would exceed applicable City noise standards, the acoustical analysis shall identify noise attenuation measures acceptable to the City that are sufficient to achieve compliance with City noise standards at nearby noise-sensitive land uses. Such measure may include, but are not limited to, the incorporation of setbacks, sound barriers, berms, or equipment enclosures; limits on the hours of operation associated with specific equipment or activity operations; and/or site redesign. 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. The project applicant shall incorporate the noise reduction measures into the development plans to the satisfaction of the City.

Timing/Implementation: *Implemented prior to design review approval for subsequent non-residential development projects.*

Enforcement/Monitoring: *City of Elk Grove, Development Services, Planning.*

Implementation of the above mitigation measure would require that an acoustical assessment be prepared for future development of proposed commercial land uses located within the project area. The acoustical assessment would to identify noise-reduction measures necessary to reduce noise impacts at nearby noise-sensitive land uses to within acceptable levels. Implementation of mitigation measure MM 4.6.3 would reduce exposure to long term stationary noise sources to **less than significant**.

Compatibility of Proposed Land Uses with Projected On-Site Noise Levels

Impact 4.6.4 Projected on-site transportation noise levels at proposed on-site residential development would exceed the City's noise standards for land use compatibility. As a result, this impact would be considered **potentially significant.**

For determination of land use compatibility, predicted traffic noise contours (in dBA L_{dn}/CNEL) for adjacent roadways were modeled for future cumulative conditions, with implementation of the proposed project. Traffic noise levels were modeled using the FHWA traffic noise prediction model. **Table 4.6-12** summarizes predicted distances to the 60 and 65 dBA L_{dn}/CNEL contours, as well as the predicted traffic noise level at a distance of approximately 50 feet from the near travel-lane centerline. Predicted future cumulative traffic noise contours are depicted in **Figure 4.6-2**. The predicted traffic noise contours do not take into account shielding or reflection of noise from existing terrain or existing/future structures.

TABLE 4.6-12
PREDICTED TRAFFIC NOISE LEVELS - FUTURE CUMULATIVE CONDITIONS

Roadway	CNEL (dBA)at 50 feet from Near Travel-Lane Centerline	Distance from Roadway Centerline to Predicted Noise Contour (dBA CNEL)	
		60	65
State Route 99, South of Sheldon Road	79.6	1,651	767
State Route 99, North of Sheldon Road	79.9	1,730	804
Sheldon Road East Stockton Boulevard to Elk Grove-Florin Road	70.2	358	169

Traffic noise levels were calculated using the FHWA roadway noise prediction model (FHWA-RD-77-108) based on data obtained from the traffic analysis prepared for this project.

Source: AMBIENT Air Quality & Noise Consulting, 2008.

Based on the traffic noise modeling conducted, projected future onsite traffic noise levels would range from approximately 60 dBA CNEL at residential uses located near the eastern project boundary to approximately 75 dBA CNEL at residential uses located near the western project boundary, nearest SR-99. By comparison, the City's exterior noise standard for residential land uses affected by transportation noise sources is 60 dBA CNEL. Exterior noise levels of up to 65 dBA CNEL may be allowed provided that available exterior noise level reduction measures have been implemented and interior noise levels are in compliance with the City's noise standards (**Table 4.6-7**). Because predicted noise levels at proposed onsite residential land uses would exceed the City's noise standard of 60 dBA CNEL, this impact would be considered **potentially significant**.

Mitigation Measures

MM 4.6.4 Prior to approval of development plans for any residential uses on the project site, an acoustical assessment addressing City noise standards and criteria shall be performed. Where the acoustical analysis determines that onsite noise levels would exceed applicable noise standards, the analysis shall identify noise-reduction measures sufficient to achieve compliance with applicable noise standards for residential development. Such measure may include, but are not limited to, the incorporation of setbacks, sound barriers, or incorporation of building components with increased exterior-to-interior noise-reduction potential. 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. The project applicant shall

incorporate the noise reduction measures into the residential development plans to the satisfaction of the City.

Timing/Implementation: *Implemented prior to design review approval for subsequent non-residential development projects.*

Enforcement/Monitoring: *City of Elk Grove, Development Services, Planning.*

Implementation of the above mitigation measure would require that an acoustical assessment be prepared for future development of proposed residential land uses located within the project area. The acoustical assessment would be required to identify specific noise-reduction measures necessary to reduce noise impacts at onsite residential land uses to within acceptable levels. Implementation of mitigation measure MM 4.6.4 would reduce potential transportation noise impacts on residential uses to **less than significant**.

Exposure of Sensitive Receptors to Groundborne Vibration

Impact 4.6.5 Exposure to ground-borne vibration levels would not exceed applicable standards at nearby existing or proposed land uses. This impact would be **less than significant.**

Exposure to groundborne vibration levels could potentially occur in association with short-term construction and long-term operation of the proposed land uses. Therefore, impacts associated with exposure of sensitive receptors to groundborne vibration Short-term and long-term exposure to groundborne vibration levels are discussed separately, as follows:

Short-term Exposure to Groundborne Vibration

Construction activities associated with future development would likely require the use of various tractors, trucks, and jackhammers. The use of major groundborne vibration-generating construction equipment/processes (i.e., blasting, pile driving) is not anticipated to be required for construction of future onsite residential and commercial uses. Groundborne vibration levels commonly associated with construction equipment are summarized in **Table 4.6-13**.

TABLE 4.6-13
REPRESENTATIVE VIBRATION SOURCE LEVELS FOR CONSTRUCTION EQUIPMENT

Equipment	Peak Particle Velocity at 25 Feet (In/Sec)
Large Bulldozers	0.089
Loaded Trucks	0.076
Jackhammer	0.035
Small Bulldozers	0.003

Source: FTA 2006, Caltrans 2004.

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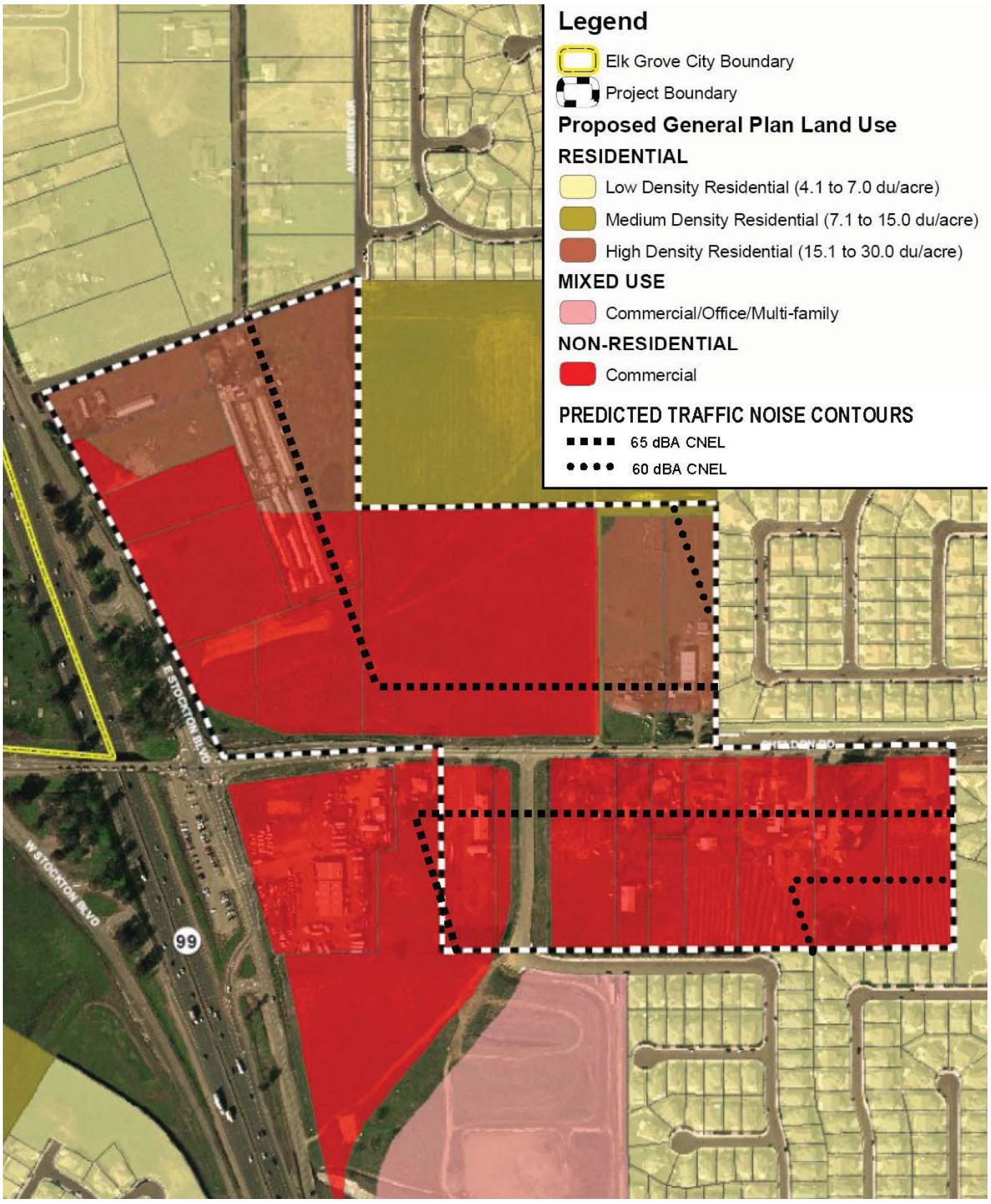

Source: AMBIENT Air Quality & Noise Consulting

City of Elk Grove
Development Services

FIGURE 4.6-2
Predicted Future Cumulative Traffic Noise Contours

Based on the vibration levels presented in **Table 4.6-13**, ground vibration generated by construction equipment would not be anticipated to exceed approximately 0.09 inches per second ppv at 25 feet. Predicted vibration levels at the nearest onsite and offsite structures would not be anticipated to exceed the minimum recommended criteria for structural damage (0.2 in/sec ppv as shown in **Table 4.6-8**) and human annoyance (0.1 in/sec ppv as shown in **Table 4.6-9**) at nearby land uses. As a result, short-term groundborne vibration impacts would be considered **less than significant.**

Long-term Exposure to Groundborne Vibration

No major stationary sources of groundborne vibration were identified in the project area that would result in the long-term exposure of proposed onsite land uses to unacceptable levels of ground vibration. The nearest potential source of groundborne vibration would be heavy-duty vehicle traffic on SR-99, which is located approximately 65 feet west of the project site. Heavy-duty trucks can result in detectable levels of groundborne vibration within approximately 50 feet of major roadways, but have not been shown to result in levels that would exceed corresponding thresholds for structural damage and human annoyance (0.2 and 0.1 in/sec ppv, respectively), at this same distance. Based on the highest measured traffic-generated vibration data compiled by the California Department of Transportation, predicted onsite groundborne vibration levels associated with vehicle traffic on SR-99 would be approximately 0.01 in/sec ppv, or less (Caltrans 2002). Predicted onsite groundborne vibration levels associated with heavy-duty vehicle traffic at the nearest onsite land uses would not exceed corresponding thresholds for structural damage and human annoyance of 0.2 and 0.1 in/sec ppv, respectively. In addition, future residential and commercial uses, which could potentially include wholesale commercial, entertainment, office, services, professional and regional/local shopping center uses, would not be anticipated to involve the use of any equipment or processes that would result in potentially significant levels of ground vibration that would exceed these standards. As a result, long-term exposure to groundborne vibration levels would be considered **less than significant**.

Mitigation Measures

None required.

4.6.4 CUMULATIVE SETTING AND IMPACTS

CUMULATIVE SETTING

The geographic extent of the cumulative setting for noise consists of the project area and the surrounding areas within the City. Cumulative development conditions would result in increased cumulative roadway noise levels, and would also result in increased noise associated with future development. As noted earlier in this report, ambient noise levels in the project area are influenced primarily by traffic noise emanating from area roadways. No major stationary sources of noise have been identified in the project area. The primary factor for cumulative noise impact analysis is the consideration of future traffic noise levels.

CUMULATIVE IMPACTS AND MITIGATION MEASURES

Contribution to Cumulative Noise Levels

Impact 4.6.6 Implementation of the proposed project would not result in a significant contribution to cumulative noise levels at nearby land uses. This is a **less than cumulatively considerable** impact.

Future cumulative traffic noise levels were calculated using the FHWA roadway noise prediction model (FHWA-RD-77-108) based on California vehicle reference noise levels and traffic data obtained from the traffic analysis prepared for this project. The project's contribution to the cumulative traffic noise levels along area roadways was determined by comparing the predicted noise levels with and without project-generated traffic under cumulative conditions. Predicted cumulative traffic noise levels and predicted increases in traffic noise levels attributable to the proposed project are summarized in **Table 4.6-14**.

TABLE 4.6-14
PREDICTED INCREASES IN TRAFFIC NOISE LEVELS
FUTURE CUMULATIVE CONDITIONS

Roadway Segment	CNEL (dBA) at 50 feet from Near-Travel-Lane Centerline			
	Cumulative	Cumulative Plus Project	Predicted Increase	Significant?
Elk Grove-Florin Road, Calvine Road to Bond Road	69.87	69.95	0.08	No
Sheldon Road, Center Parkway to West Stockton Boulevard	70.00	70.36	0.36	No
Sheldon Road, Elk Grove-Florin Road to Bradshaw Road	68.53	68.57	0.04	No
Bruceville Road, Sheldon Road to Laguna Boulevard	71.43	71.52	0.09	No
Sheldon Road, East Stockton Boulevard to Elk Grove-Florin Road	70.01	70.24	0.23	No
Bruceville Road, Jacinto Road to Sheldon Road	69.54	69.65	0.11	No

Traffic noise levels were predicted using the FHWA Traffic Noise Model based on data obtained from the traffic analysis prepared for this project.

Source: AMBIENT Air Quality & Noise Consulting, 2008.

Based on the modeling conducted, implementation of the proposed project would not contribute to significant increases in traffic noise levels along primarily affected area roadways. Therefore, the project's contribution to cumulative noise levels is considered **less than cumulatively considerable**.

Mitigation Measures

None required.

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