4.4 NOISE

4.4.1 INTRODUCTION

This section includes a description of ambient noise conditions, a summary of applicable regulations related to noise and vibration, and an analysis of the potential impacts resulting from the implementation of the Live Oak 2030 General Plan update (2030 General Plan). Mitigation measures are recommended, as necessary, to reduce significant noise impacts. This section relies, in part, on information compiled by Bollard Acoustical Consultants (BAC) in 2005 and 2006. Please refer to the Live Oak General Plan Noise Background Report, under separate cover, on file with the City, for maps and other noise information.

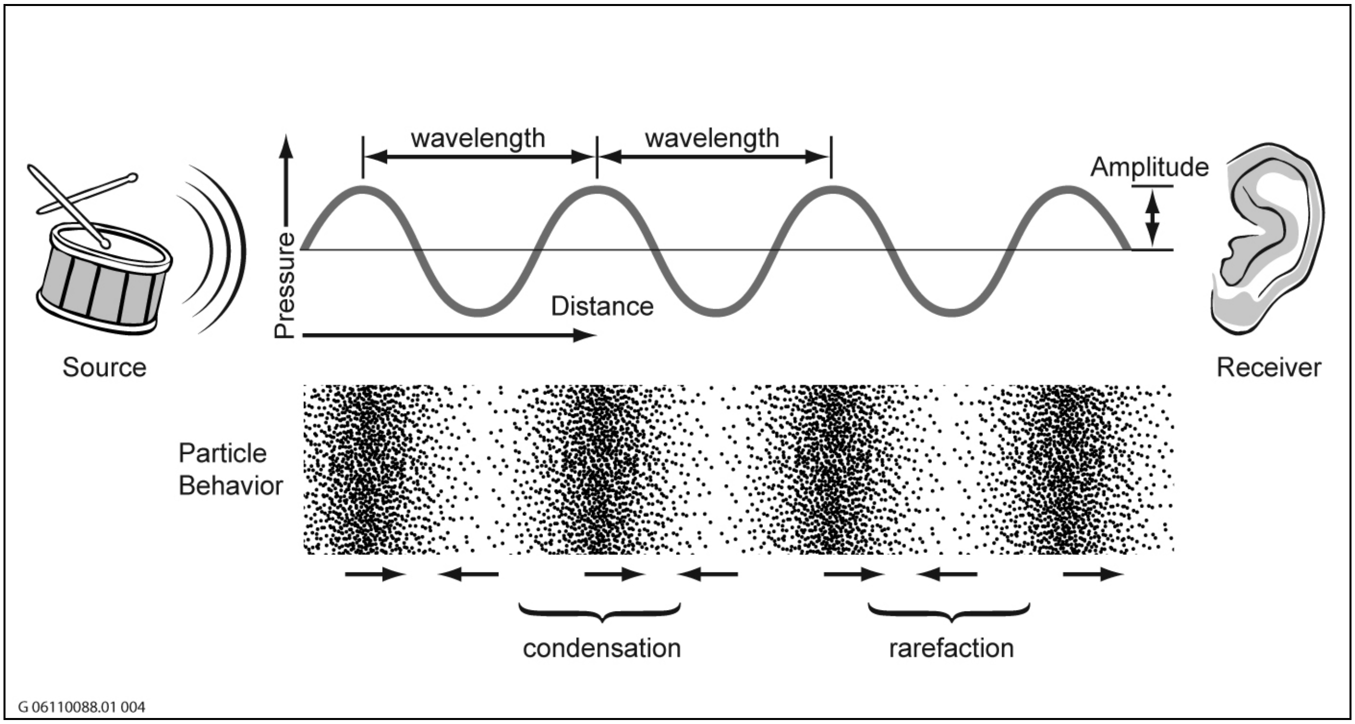
SOUND FUNDAMENTALS

Noise is generally defined as sound that is loud, disagreeable, unexpected, or unwanted. Sound, as described in more detail below, is mechanical energy transmitted in the form of a wave by a disturbance or vibration that causes pressure variation in air that the human ear can detect.

SOUND PROPERTIES

A sound wave is introduced into a medium (air) by a vibrating object. The vibrating object (e.g., vocal chords, the string of a guitar or the diaphragm of a radio speaker) is the source of the disturbance that moves through the medium. Regardless of the type of source creating the sound wave, the particles of the medium through which the sound moves are vibrating in a back and forth motion at a given rate (frequency). The frequency of a wave refers to how often the particles vibrate when a wave passes through the medium. The frequency of a wave is measured as the number of complete back-and-forth vibrations of a particle per unit of time. One complete back-and-forth vibration is called a cycle. If a particle of air undergoes 1,000 cycles in 2 seconds, then the frequency of the wave would be 500 cycles per second. The common unit used for frequency is in cycles per second, called Hertz (Hz). Each particle vibrates as a result of the motion of its nearest neighbor. For example, the first particle of the medium begins vibrating at 500 Hz and sets the second particle of the medium into motion at the same frequency (500 Hz). The second particle begins vibrating at 500 Hz and thus sets the third particle into motion at 500 Hz. The process continues throughout the medium; hence each particle vibrates at the same frequency, which is the frequency of the original source. For example, a guitar string vibrating at 500 Hz will set the air particles in the room vibrating at the same frequency (500 Hz), which carries a sound signal to the ear of a listener that is detected as a 500 Hz sound wave. See Exhibit 4.4-1.

The back-and-forth vibration motion of the particles of the medium would not be the only observable phenomenon occurring at a given frequency. Because a sound wave is a pressure wave, a detector could be used to detect oscillations in pressure from high to low and back to high pressure. As the compression (high-pressure) and rarefaction (low-pressure) disturbances move through the medium, they would reach the detector at a given frequency. For example, a compression would reach the detector 500 times per second if the frequency of the wave were 500 Hz. Similarly, a rarefaction would reach the detector 500 times per second if the frequency of the wave were 500 Hz. Thus, the frequency of a sound wave refers not only to the number of back-and-forth vibrations of the particles per unit of time but also to the number of compression or rarefaction disturbances that pass a given point per unit of time. A detector could be used to detect the frequency of these pressure oscillations over a given period of time. The period of the sound wave can be found by measuring the time between successive high-pressure points (corresponding to the compressions) or the time between successive low-pressure points (corresponding to the rarefactions). The frequency is simply the reciprocal of the period; thus, an inverse relationship exists so that as frequency increases, the period decreases, and vice versa.



Source: EDAW 2007

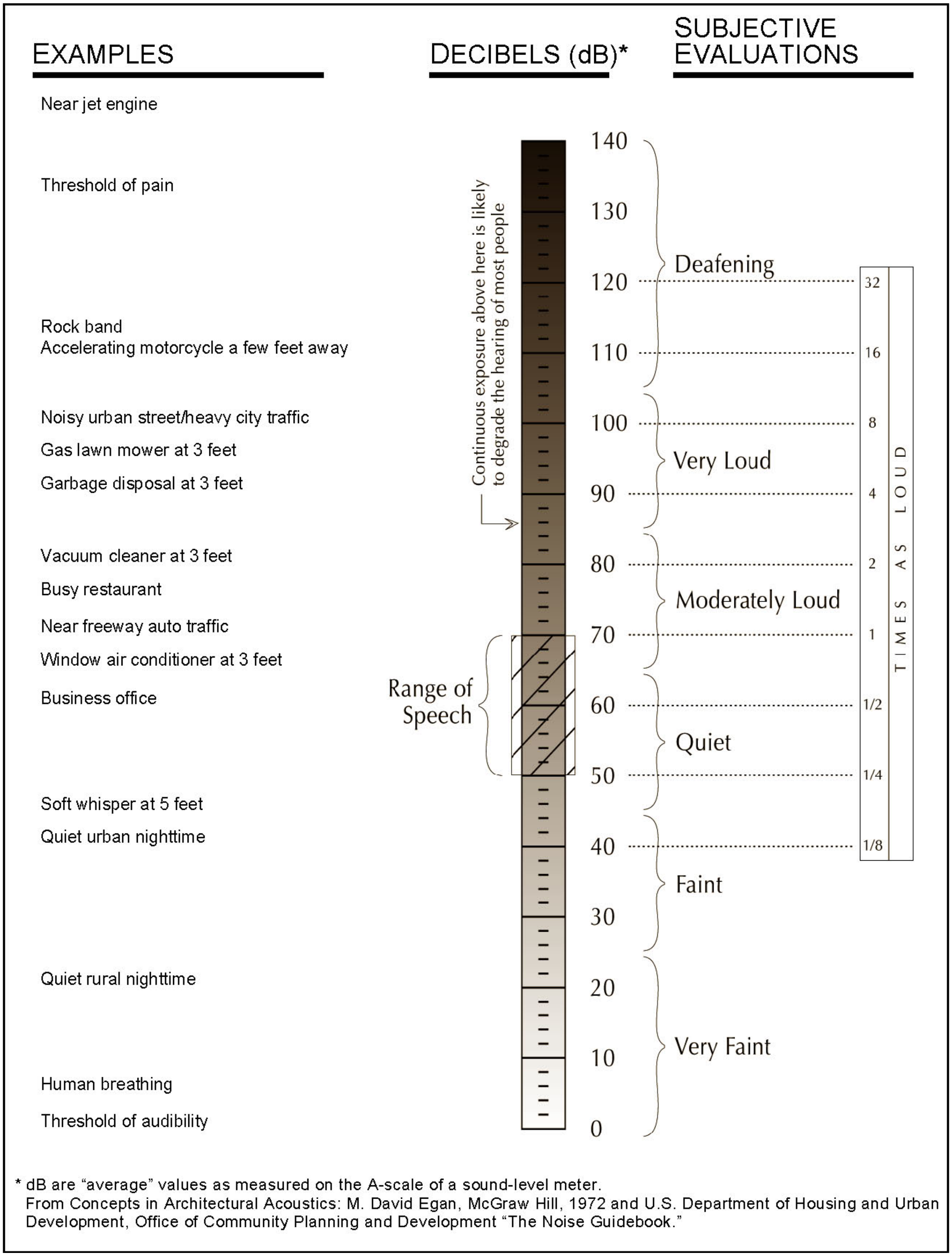
Sound Wave Properties **Exhibit 4.4-1**

A wave is an energy transport phenomenon that transports energy along a medium. The amount of energy carried by a wave is related to the amplitude (loudness) of the wave. A high-energy wave is characterized by large amplitude; a low-energy wave is characterized by small amplitude. The amplitude of a wave refers to the maximum amount of displacement of a particle from its rest position. The energy transported by a wave is directly proportional to the square of the amplitude of the wave. This means that a doubling of the amplitude of a wave is indicative of a quadrupling of the energy transported by the wave.

SOUND AND THE HUMAN EAR

Because of the ability of the human ear to detect a wide range of sound-pressure fluctuations, sound-pressure levels are expressed in logarithmic units called decibels (dB) to avoid a very large and awkward range in numbers. The sound-pressure level in decibels is calculated by taking the log of the ratio between the actual sound pressure and the reference sound pressure and then multiplied by 20. The reference sound pressure is considered the absolute hearing threshold (Caltrans 1998). Use of this logarithmic scale reveals that the total sound from two individual 65-dB sources is 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB).

Because the human ear is not equally sensitive to all audible frequencies, a frequency-dependent rating scale was devised to relate noise to human sensitivity. An A-weighted dB (dBA) scale performs this compensation by discriminating against frequencies that are more sensitive to humans. The basis for compensation is the faintest sound audible to the average ear at the frequency of maximum sensitivity. This dBA scale has been chosen by most public agencies for the purpose of regulating environmental noise. Typical indoor and outdoor noise levels are presented in Exhibit 4.4-2. All dB references in this document are calculated using the dB scale.



Source: EDAW 2006

Typical Noise Levels **Exhibit 4.4-2**

With respect to how humans perceive and react to changes in noise levels, a 1-dB increase is imperceptible, a 3-dB increase is barely perceptible, a 6-dB increase is clearly noticeable, and a 10-dB increase is subjectively perceived as approximately twice as loud (Egan 1988), as presented in Table 4.4-1. Table 4.4-1 was developed on the basis of test subjects' reactions to changes in the levels of steady-state pure tones or broad-band noise and to changes in levels of a given noise source. It is probably most applicable to noise levels in the range of 50 to 70 dB, as this is the usual range of voice and interior noise levels. For these reasons, a noise level increase of 3 dB or more is typically considered substantial in terms of the degradation of the existing noise environment.

Table 4.4-1
Subjective Reaction to Changes in Noise Levels of Similar Sources

Change in Level, dB	Subjective Reaction	Factor Change in Acoustical Energy
1	Imperceptible (Except for Tones)	1.3
3	Just Barely Perceptible	2.0
6	Clearly Noticeable	4.0
10	About Twice (or Half) as Loud	10.0

Note: dB = decibels
Source: Egan 1988

SOUND PROPAGATION AND ATTENUATION

As sound (noise) propagates from the source to the receptor, the attenuation, or manner of noise reduction in relation to distance, is dependent on surface characteristics, atmospheric conditions, and the presence of physical barriers. The inverse-square law describes the attenuation caused by the pattern in which sound travels from the source to receptor. Sound travels uniformly outward from a point source in a spherical pattern with an attenuation rate of 6 dB per doubling of distance (dB/DD). However, from a line source (e.g., a road), sound travels uniformly outward in a cylindrical pattern with an attenuation rate of 3 dB/DD. The surface characteristics between the source and the receptor may result in additional sound absorption and/or reflection. Atmospheric conditions, such as wind speed, temperature, and humidity may affect noise levels. Furthermore, the presence of a barrier between the source and the receptor may also attenuate noise levels. The actual amount of attenuation is dependent upon the size of the barrier and the frequency of the noise. A noise barrier may be any natural or human-made feature such as a hill, tree, building, wall, or berm (Caltrans 1998).

All buildings provide some exterior-to-interior noise reduction. A building constructed with a wood frame and a stucco or wood sheathing exterior typically provides a minimum exterior-to-interior noise reduction of 25 dB with its windows closed, whereas a building constructed of a steel or concrete frame, a curtain wall or masonry exterior wall, and fixed plate glass windows of one-quarter-inch thickness typically provides an exterior-to-interior noise reduction of 30–40 dB with its windows closed (Paul S. Veneklasen & Associates 1973, cited in Caltrans 2002).

NOISE DESCRIPTORS

The selection of a proper noise descriptor for a specific source is dependent upon the spatial and temporal distribution, duration, and fluctuation of the noise. The noise descriptors most often encountered when dealing with traffic, community, and environmental noise are defined below (Caltrans 1998, Lipscomb and Taylor 1978).

- L_{max} (Maximum Noise Level): The maximum instantaneous noise level during a specific period of time. The L_{max} may also be referred to as the peak (noise) level.
- L_{min} (Minimum Noise Level): The minimum instantaneous noise level during a specific period of time.

- L_X (Statistical Descriptor): The noise level exceeded X% of a specific period of time. For example, L_{50} represents the noise level exceeded 50% of the time.

- L_{eq} (Equivalent Noise Level): The energy mean (average) noise level. The instantaneous noise levels during a specific period of time in dB are converted to relative energy values. From the sum of the relative energy values, an average energy value is calculated, which is then converted back to dB to determine the L_{eq}. In noise environments determined by major noise events, such as aircraft overflights, the L_{eq} value is heavily influenced by the magnitude and number of single events that produce the high noise levels.

- L_{dn} (Day-Night Noise Level): The 24-hour L_{eq} with a 10 dB '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 dB is 'added' to noise events that occur in the nighttime hours, and this generates a higher reported noise level when determining compliance with noise standards. The L_{dn} attempts to account for the fact that noise during this specific period of time is a potential source of disturbance with respect to typical sleeping hours.

- CNEL (Community Noise Equivalent Level): The CNEL is similar to the L_{dn} described above, but with an additional 5 dB 'penalty' added to noise events that occur during the noise-sensitive hours between 7:00 p.m. to 10:00 p.m., which are typically reserved for relaxation, conversation, reading, and television. If using the same 24-hour noise data, the reported CNEL is typically approximately 0.5 dB higher than the L_{dn}.

- SENL (Single Event [Impulsive] Noise Level): The SENL describes a receiver's cumulative noise exposure from a single impulsive noise event, which is defined as an acoustical event of short duration and involves a change in sound pressure above some reference value. SENLs typically represent the noise events used to calculate the L_{eq}, L_{dn}, and CNEL.

Community noise is commonly described in terms of the ambient noise level, which is defined as the all-encompassing noise level associated with a given noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level L_{eq}, which corresponds to a steady-state A-weighted sound level containing the same total energy as a time-varying signal over a given time period (usually one hour). The L_{eq} is the foundation of the composite noise descriptors such as L_{dn} and CNEL, as defined above, and shows very good correlation with community response to noise.

NEGATIVE EFFECTS OF NOISE ON HUMANS

Negative effects of noise exposure include physical damage to the human auditory system, interference, and disease. Exposure to noise may result in physical damage to the auditory system, which may lead to gradual or traumatic hearing loss. Gradual hearing loss is caused by sustained exposure to moderately high noise levels over a period of time; traumatic hearing loss is caused by sudden exposure to extremely high noise levels over a short period. Gradual and traumatic hearing loss both may result in permanent hearing damage. In addition, noise may interfere with or interrupt sleep, relaxation, recreation, and communication. Although most interference may be classified as annoying, the inability to hear a warning signal may be considered dangerous. Noise may also be a contributor to diseases associated with stress, such as hypertension, anxiety, and heart disease. The degree to which noise contributes to such diseases depends on the frequency, bandwidth, the level of the noise, and the exposure time (Caltrans 1998).

VIBRATION

Vibration is the periodic oscillation of a medium or object. The rumbling sound caused by the vibration of room surfaces is called structure borne noise. Sources of groundborne vibrations include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) or human-made causes (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous, such as factory machinery, or transient, such as explosions. As is the case with airborne sound, groundborne vibrations may be described by amplitude and frequency.

Vibration amplitudes are usually expressed in peak particle velocity (PPV) or root mean squared (RMS) vibration velocity. The PPV and RMS velocity are normally described in inches per second (in/sec). PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is often used in monitoring of blasting vibration because it is related to the stresses that are experienced by buildings (FHWA 1995, Caltrans 2002, FTA 2006).

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 (FHWA 1995). This is based on a reference value of 1 microinch per second (μin/sec).

The background vibration-velocity level in residential areas is usually approximately 50 VdB. Groundborne 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 (FHWA 1995).

Typical outdoor sources of perceptible groundborne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the groundborne 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 groundborne vibrations, which can pose a risk to nearby structures. Constant or transient vibrations can weaken structures, crack facades, and disturb occupants (FHWA 1995).

Construction vibrations 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, horizontal directional drilling, and compressors. Random vibration can result from jackhammers, pavement breakers, and heavy construction equipment. Table 4.4-2 describes the general human response to different levels of groundborne vibration-velocity levels.

Table 4.4-2
Human Response to Different Levels of Groundborne Noise and Vibration

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.

Note: VdB = vibration decibels referenced to 1 micro inch per second and based on the root mean square velocity amplitude.
Source: FTA 2006

4.4.2 ENVIRONMENTAL SETTING

EXISTING 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 schools, hospitals, convalescent facilities, parks, hotels, places of worship, libraries, and other uses where low interior noise levels are essential.

Noise-Sensitive Areas

The following noise-sensitive areas have been identified within the Planning Area:

- Residential Areas
  - All dwellings, including single-family residences, multi-family units, mobile homes, etc.

- Schools[1]
  - Luther Elementary School
  - Live Oak Middle School
  - Live Oak High School
  - Live Oak Alternative Schools
  - Valley Oak Continuation High School

- Convalescent Hospitals and Care Facilities (7 or more capacity)[2]
  - Live Oak Manor

- Parks and Recreation Areas
  - Oaktree Park
  - Date Street Park
  - Live Oak Memorial Park
  - Live Oak Community Center
  - Pennington Ranch Park
  - Live Oak Park and Recreation Area

- Hotels and Transient Lodging
  - Feather River Motel

- Places of Worship
  - Church of Christ
  - Church of the Nazarene
  - Victory Chapel Pentacostal Church of God
  - Landmark Missionary Baptist Church
  - First Baptist Like Oak
  - The Father's House
  - Islamic Center of Live Oak
  - Fuente De Vide Eterna

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[1] Encinal Elementary School is located just south and outside the Planning Area along Larkin Road.

[2] Under State law, care facilities with capacity of six or fewer are considered residential uses and may be located in zones that allow for residential uses. For the purposes of this report, such facilities are considered dwellings in residential areas.

- Libraries
  - Sutter County Library

EXISTING NOISE SOURCES

In addition to SR 99, the ambient noise environment in Live Oak is defined by local traffic on City streets, activities at commercial and industrial properties, active recreation areas of parks and outdoor play areas of schools, and railroad operations along the Union Pacific Railroad (UPRR) tracks. Each of these noise sources is discussed individually below. There are no airports in the immediate vicinity of the City of Live Oak, although occasional commercial, military, and general aviation aircraft overflights occur at higher altitudes. Major noise sources in the Planning Area include:

- Highways and Major Local Streets:
  - State Route 99
  - Riviera Road
  - Township Road
  - Pennington Road
  - Luther Road
  - Metteer Road
  - Richards Road
  - Larkin Road
  - N Street
  - Sinnard Avenue
  - Bishop Avenue
  - Sheldon Road
  - Larkin Road
  - Paseo Avenue
  - Kent Avenue
  - Archer Avenue

- Railroad Operations:
  - UPRR

- Industrial/Stationary Sources:
  - Sunsweet Dryers
  - Sunset Molding
  - Alpha Plastering
  - General service commercial & light industrial uses
  - Parks and playing fields

HIGHWAYS AND MAJOR LOCAL STREETS

Existing traffic noise levels were calculated for roadway segments in the project vicinity using the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWA-RD-77-108) (FHWA 1978), and traffic data provided in the traffic impact study prepared for the project (KDAnderson 2009). The FHWA model is based on the California vehicle noise (CALVENO) reference noise emission factors for automobiles, medium trucks, and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and ground attenuation factors. Truck usage and vehicle speeds on Planning Area roadways were taken from modeling conducted for the noise background report (BAC 2006).

Distances from the center of the roadway to L_{dn} contour values of 70, 65, 60, and 55 dB are summarized in Table 4.4-3 along with the noise level at 50 feet from the center of the roadway. These contours and distances represent worst-case estimates of traffic noise exposure, as calculations do not take into consideration shielding that may occur from topography or buildings.

Table 4.4-3
Summary of Modeled 2006 Traffic Noise Contours

#	Street	Segment		Daily Volume	Level at 50 ft from Centerline (dB L_{dn})	Distance (feet) from Roadway Centerline to Noise Contour			
		From	To			70 dB L_{dn}	65 dB L_{dn}	60 dB L_{dn}	55 dB L_{dn}
1	Riviera Road	Township Road	State Route 99	1,600	59.3	10	21	45	96
2	Riviera Road	State Route 99	Larkin Road	3,100	62.2	15	32	70	150
3	Township Road	Riviera Road	Pennington Road	1,900	60.0	11	23	50	108
4	Township Road	Pennington Road	Paseo Avenue	2,000	60.3	11	24	52	112
5	Pennington Road	Township Road	Luther Road	1,800	59.8	10	22	48	104
6	Pennington Road	Luther Road	N Street	3,300	62.4	16	34	73	156
7	Pennington Road	N Street	State Route 99	9,100	66.8	31	66	143	307
8	Pennington Road	State Route 99	Sheldon Road	7,900	66.2	28	60	130	280
9	Luther Road	Pennington Road	North of Pennington Road	230	50.9	3	6	12	26
10	Metteer Road	Riviera Road	Pennington Road	3,600	62.8	17	36	77	166
11	Metteer Road	Pennington Road	Cooley Road	370	52.9	4	8	17	36
12	Richards Road	Pennington Road	South of Pennington Road	1,700	59.5	10	22	47	100
13	Larkin Road	Riviera Road	Pennington Road	460	53.9	4	9	20	42
14	Larkin Road	Pennington Road	State Route 99	700	55.7	6	12	26	56
15	Larkin Road	Apricot Road	Paseo Avenue	2,100	60.5	12	25	54	116
16	N Street	Pennington Road	Deanne Street	1,400	58.7	9	19	41	88
17	N Street	Hampton Road	Pennington Road	2,900	61.9	14	31	67	143
18	State Route 99	Riviera Road	Pennington Road	15,200	69.1	43	93	201	433
19	State Route 99	Pennington Road	Paseo Avenue	18,900	70.0	50	108	232	500
20	Sinnard Avenue	Pennington Road	Archer Avenue	2,400	61.0	13	27	59	126
21	Sinnard Avenue	Archer Avenue	Bishop Avenue	240	51.0	3	6	13	27
22	Bishop Avenue	State Route 99	Sinnard Avenue	180	49.8	2	5	10	22
23	Sheldon Road	Pennington Road	Archer Avenue	400	53.3	4	8	18	38
24	Sheldon Road	Archer Avenue	Bishop Avenue	115	47.8	2	4	8	17
25	Archer Avenue	State Route 99	Sinnard Avenue	790	56.2	6	13	28	60
26	Paseo Avenue	Township Road	State Route 99	1,100	57.7	8	16	35	75
27	Paseo Avenue	State Route 99	Sinnard Avenue	900	56.8	7	14	31	66
28	Paseo Avenue	Sinnard Avenue	Sheldon Avenue	110	47.7	2	3	8	16
29	Kent Avenue	Bishop Avenue	Paseo Avenue	370	52.9	4	8	17	36

Refer to Appendix D for complete FHWA model input and output.
Source: EDAW 2009

As shown, some of Live Oak's roadways carry traffic in a volume and mix that could create noise compatibility issues for adjacent noise sensitive land uses if not properly sited. The previous Noise Element of the General Plan characterizes areas with exterior noise exposure of more than 60 dB L_{dn} as being noise affected, and as areas where future residential or other noise sensitive land uses would not be allowed without mitigation to meet noise standards (City of Live Oak 1994). Noise generation along roadways at more than 60 dB L_{dn} at least 50 feet from the roadway centerline would potentially expose adjacent noise sensitive properties to noise in excess of current standards.

RAILROAD OPERATIONS

Railroad operations within the Planning Area consist of freight and Amtrak passenger service on the UPRR mainline track. This track is located in the central part of Live Oak and oriented north to south. Noise measurements were conducted by BAC in Live Oak to document noise levels generated by train operations in the community.

Based on continuous noise level measurement data, 21 trains per day used these tracks, with approximately 50 percent of the trains operating at night (10:00 p.m. to 7:00 a.m.) and approximately 50 percent of the trains operating during the day (7 a.m. to 10 p.m.). The 24-hour average noise level along the railroad tracks is approximately 79 dB L_{dn} at a distance of 50 feet from the tracks. Based on this noise level, distances to the 60, 65 and 70 dB L_{dn} noise contours were computed using a standard sound level decrease of 4.5 dB/DD from the railroad tracks (BAC 2006). Those noise contour distances are shown numerically in Table 4.4-4.

Table 4.4-4
Approximate Distances to Existing Railroad Noise Contours

Noise Contour, dB L_{dn}	Distance from Center of Tracks, feet
60	887
65	412
70	191

Note: Noise level contours are based on a measured mean Single Event Noise Level of 108 dB at a distance of 50 feet from the near railroad tracks, and 21 daily operations with approximately 50% of the operations in the daytime and 50% of the operations in the nighttime.
Source: Bollard Acoustical Consultants 2006

INDUSTRIAL AND OTHER STATIONARY NOISE SOURCES

Many processes and activities in cities produce noise, even when the best available noise control technology is used. Noise exposure within industrial facilities is controlled by federal and state employee health and safety regulations. Noise levels outside of industrial and other facilities are subject to local standards. In addition to industry, activities at other commercial, recreational, and public facilities can also produce noise that affects neighbors and the community at-large.

Communities typically approach exposure to noise from two perspectives through land use planning:

- prevent the introduction of new noise-producing land uses in noise-sensitive areas; and,
- prevent encroachment of noise-sensitive uses upon existing noise-producing facilities.

With the exception of City parks, most of the City's stationary noise-producing land uses are located near the railroad line in the center of the City. The ambient noise environment in the immediate vicinity of these uses includes noise from other industries, local traffic, and the railroad. See the Noise Technical Background Report for more detailed information on stationary sources in Live Oak.

COMMUNITY NOISE SURVEY

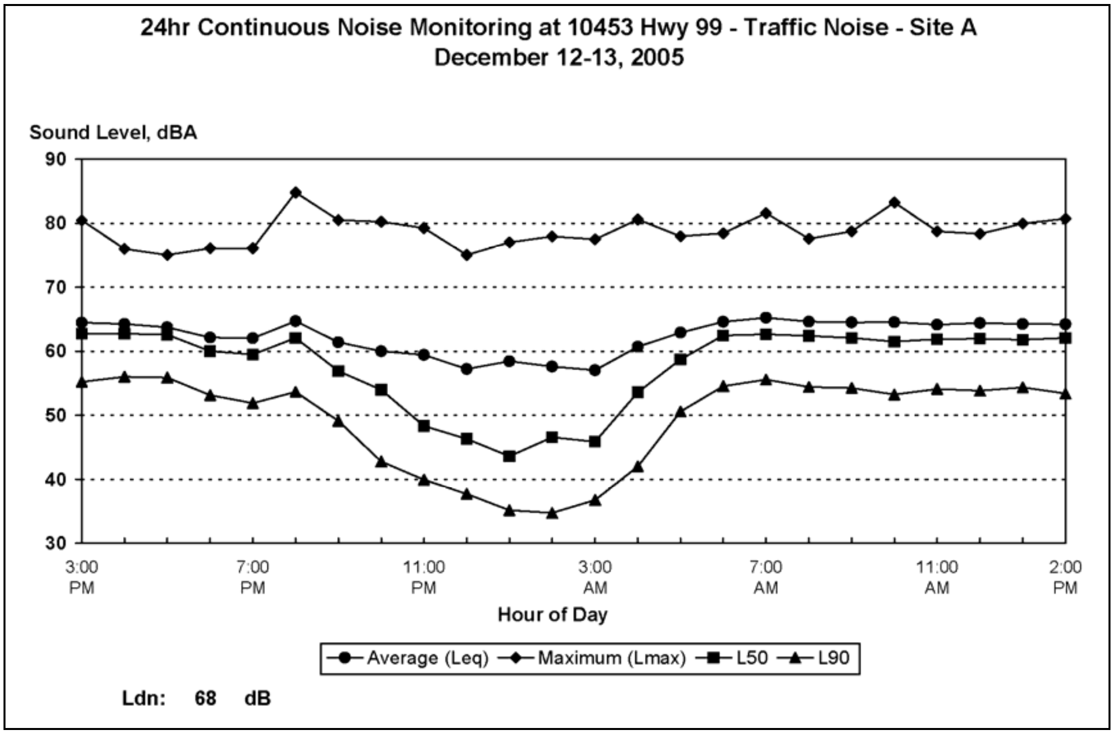
As required by the Government Code and the Office of Noise Control Guidelines, a community noise survey was conducted as a part of the research and analysis supporting the 2030 General Plan. The survey documented noise exposure in areas of the community containing noise-sensitive land uses. Noise monitoring sites were selected to be representative of typical conditions in areas of the community where noise-sensitive uses are located. To quantify existing noise levels in the quieter parts of the City of Live Oak, a community noise survey was performed at 10 locations in the City which are removed from major noise sources. Two of the 10 locations were monitored over a continuous 24-hour period (see Exhibits 4.4-3 and 4.4-4), while the other eight locations were each monitored for short periods during the morning, afternoon, and evening hours. Traffic counts used for the background report were taken in 2005 and would be still be representative of conditions today based on Caltrans data showing that traffic levels and VMT have not increased in the Live Oak area and Sutter County between 2005 and 2008 (Caltrans 2009).

The results of the community noise survey are provided in Table 4.4-5. See the Noise Technical Background Report (under separate cover) for more detailed information on the Live Oak community noise survey.

Table 4.4-5
Summary of Community Noise Survey Results

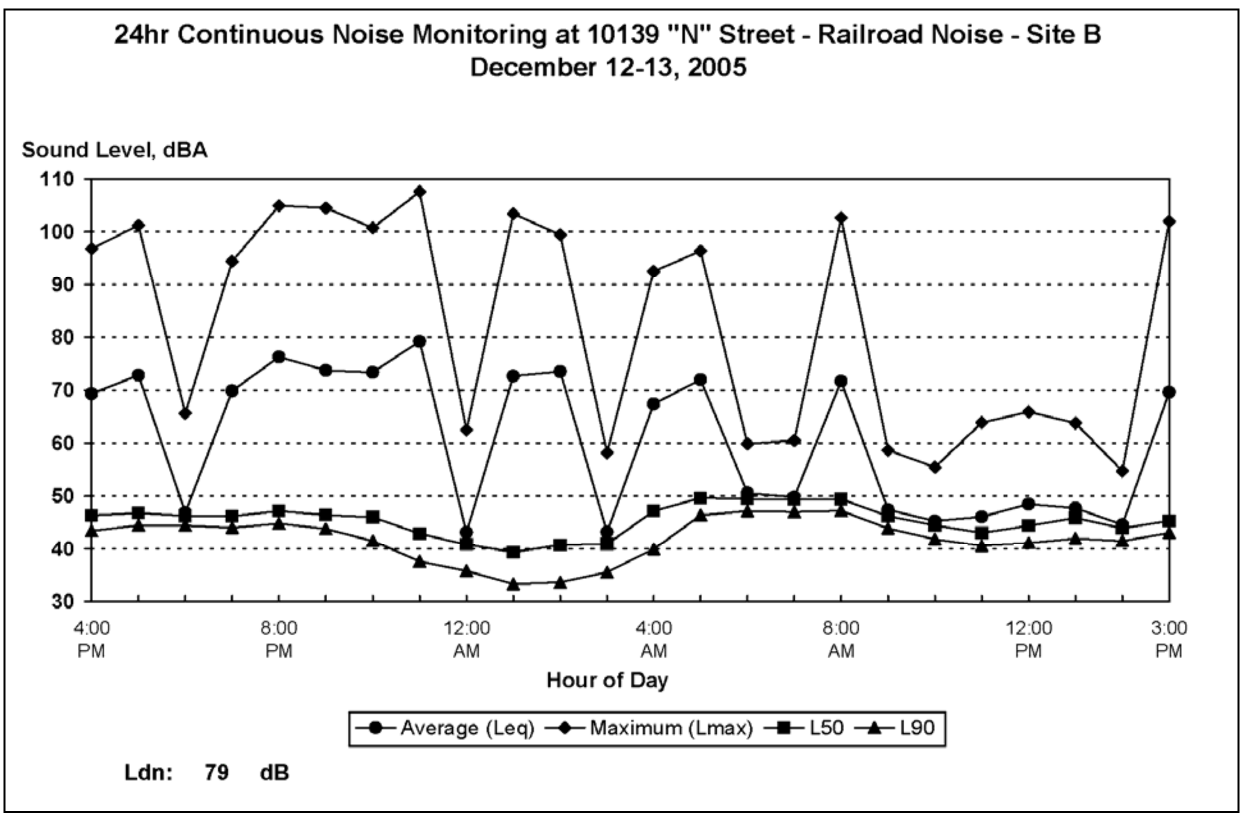
Site	Location	Dates[1]	Time Period	L_{eq}	L_{max}	L_{50}	Sources
1	Northwest portion of Planning Area	12/12/05	Nighttime	54	62	53	State Route 99
		12/13/05	Morning	55	65	53	State Route 99
		12/13/05	Afternoon	55	64	54	State Route 99
2	Northeast portion of Planning Area, north side of Campbell Road	12/12/05	Nighttime	43	60	39	Distant traffic, distant train horn
		12/13/05	Morning	45	63	41	Distant traffic, local traffic
		12/13/05	Afternoon	47	61	42	Distant traffic, distant train horn, local traffic
3	Western portion of Planning Area, north side of Pennington Road	12/12/05	Nighttime	49	67	35	Distant traffic, distant train horn, local traffic
		12/13/05	Morning	58	71	49	Distant traffic, local traffic
		12/13/05	Afternoon	57	69	54	Distant traffic, local traffic
4	Southwestern portion of Planning Area, east side of Township Road	12/12/05	Nighttime	51	69	33	Distant traffic, local traffic
		12/13/05	Morning	57	72	43	Distant traffic, local traffic
		12/13/05	Afternoon	61	76	52	Local traffic, aircraft
5	Southeastern portion of Planning Area, west side of Sheldon Avenue	12/12/05	Nighttime	39	44	39	Distant stationary source, distant traffic
		12/13/05	Morning	45	57	44	Distant traffic, farming activities, distant train horn
		12/13/05	Afternoon	47	59	46	Distant stationary source, distant traffic
6	Eastern portion of Planning Area, north side of Pennington Road	12/12/05	Nighttime	33	43	32	Distant traffic
		12/13/05	Morning	46	53	45	Farm maintenance
		12/13/05	Afternoon	41	57	38	Distant traffic, local traffic
7	Eastern portion of the City, east of L Street	12/12/05	Nighttime	44	54	43	Distant traffic
		12/13/05	Morning	48	62	45	Distant traffic, local traffic
		12/13/05	Afternoon	50	62	49	Distant traffic, local traffic, gunshot
8	Western portion of City, east side of De Ree Road	12/12/05	Nighttime	41	46	41	Distant traffic
		12/13/05	Morning	50	63	46	Distant traffic
		12/13/05	Afternoon	46	61	45	Distant traffic

Notes: L_{eq} = equivalent noise level, L_{max} = maximum noise level, L_{50} = noise level exceeded 50% of measured time period
Source: BAC 2006



Source: BAC 2006

24-hour Measurement Site A Data **Exhibit 4.4-3**



Source: BAC 2006

24-hour Measurement Site B Data **Exhibit 4.4-4**

EXISTING VIBRATION SOURCES

The existing vibration environment is similar to that of the noise environment; the vibration environment is dominated by transportation related vibration from roadways and railroad operations in the project vicinity. Heavy truck traffic on local and regional roadway networks can generate groundborne vibration, which varies considerably depending on vehicle type, weight, and pavement conditions. However, groundborne vibration levels generated from vehicular traffic are not typically perceptible outside of the right-of-way for major roadways and arterials with large capacities of heavy vehicle traffic. According to FTA vibration from the freight locomotives could be perceptible (above 80 VdB) within 80 feet of operations when train speeds reach 50 miles per hour. Trains go much slower through the Planning Area, thus vibration levels would expected to be lower. Residences located on N Street would be located within 80 feet of the rail line, however due to the lower speeds associated with train operations in the Planning Area existing vibration levels would not be expected to exceed 80 VdB at these residences.

Existing vibration in the Planning Area would be considered subjectively low, and anticipated to be well below FTA and Caltrans guidance on groundborne vibration exposure.

4.4.3 REGULATORY SETTING

FEDERAL PLANS, POLICIES, REGULATIONS, AND LAWS

There are no federal plans, policies, regulations, or laws that directly pertain to the City's consideration or adoption of the 2030 General Plan. However, various federal agencies have published methods and criteria related to noise assessment.

The Federal Noise Control Act (1972) addressed the issue of noise as a threat to human health and welfare. To implement the Federal Noise Control Act, the U.S. Environmental Protection Agency (EPA) undertook a number of studies related to community noise in the 1970s. The results of these studies have been widely published, and discussed and refereed by many professionals in acoustics. Basic conclusions of these studies have been adopted by the Federal Interagency Committee on Noise (FICON), the Department of Housing and Urban Development (HUD), the American National Standards Institute (ANSI), and other organizations. EPA found that 24-hour averaged noise levels less than 70 dB would avoid measurable hearing loss, levels of less than 55 dB outdoors and 45 dB indoors would prevent activity interference and annoyance (EPA 2009). EPA coordinated noise programs through the Office of Noise Abatement and Control until 1981, when the Reagan Administration determined that noise issues should be handled at the state or local government level.

The U.S. Department of Housing and Urban Development (HUD) has developed noise policies, as well, and has published a Noise Guidebook for use in implementing the Department's noise policy. In general, HUD's goal for exterior noise is less than or equal to 55 dB L_{dn}. The goal for interior noise is 45 dB L_{dn}, suggesting that feasible attenuation be employed to achieve this level, where feasible, with a special focus on sensitive areas of homes, such as bedrooms.[3]

The Federal Transit Administration (FTA) has developed an extensive methodology and significance criteria to evaluate noise impacts from surface transportation modes. These methods and criteria are presented in FTA's *Transit Noise Impact and Vibration Assessment* (May 2006).[4] The FTA noise impact criteria are based on findings from studies of annoyance in communities affected by transportation noise.

[3] For more information, please see the HUD Noise Guidebook, available online at: http://www.hud.gov/offices/cpd/environment/training/guidebooks/noise/.
[4] Please see FTA's web site for more information. The Transit Noise Impact and Vibration Assessment is available online at: http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf.

FHWA has established noise assessment procedures and noise abatement criteria, along with development of noise models that are routinely used in impact assessment (as noted earlier).[5]

To address the human response to groundborne vibration, FTA has set forth guidelines for maximum-acceptable vibration criteria for different types of land uses. These guidelines allow 65 VdB), referenced to 1 microinch per second and based on the root-mean-square velocity amplitude, for land uses where low ambient vibration is essential for interior operations (e.g., hospitals, high-tech manufacturing, laboratory facilities); 80 VdB for residential uses and buildings where people normally sleep; and 83 VdB for institutional land uses with primarily daytime operations (e.g., schools, churches, clinics, offices) (FTA 2006).

Standards have also been established to address the potential for groundborne vibration to cause structural damage to buildings. These standards were developed by the Committee of Hearing, Bio Acoustics, and Bio Mechanics (CHABA) at the request of the U.S. Environmental Protection Agency (FTA 2006). For fragile structures, CHABA recommends a maximum limit of 0.25 in/sec PPV (FTA 2006).

STATE PLANS, POLICIES, REGULATIONS, AND LAWS

Title 24 of the California Code of Regulations (CCR) establishes standards governing interior noise levels that apply to all new single-family and multi-family residential units in California. These standards require that acoustical studies be performed before construction at building locations where the existing L_{dn} exceeds 60 dB. Such acoustical studies are required to establish mitigation measures that will limit maximum L_{dn} levels to 45 dB in any habitable room. Although there are no generally applicable interior noise standards pertinent to all uses, many communities in California have adopted an L_{dn} of 45 as an upper limit on interior noise in all residential units.

In addition, the State of California General Plan Guidelines (State of California 2003), published by the state Governor's Office of Planning and Research (OPR), provides guidance for the acceptability of projects within specific L_{dn} contours. Table 4.4-6 summarizes acceptable and unacceptable community noise exposure limits for various land use categories. Generally, residential uses are considered to be acceptable in areas where exterior noise levels do not exceed 60 dB L_{dn}. Residential uses are normally unacceptable in areas exceeding 70 dB and conditionally acceptable within 55 to 70 dB L_{dn}. Schools are normally acceptable in areas up to 60 dB L_{dn} and normally unacceptable in areas exceeding 70 dB L_{dn}. Commercial uses are normally acceptable in areas up to 70 dB L_{dn}. Between 65 and 80 dB L_{dn}, commercial uses are conditionally acceptable, depending on the noise insulation features and the noise reduction requirements. The guidelines also present adjustment factors that may be used to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

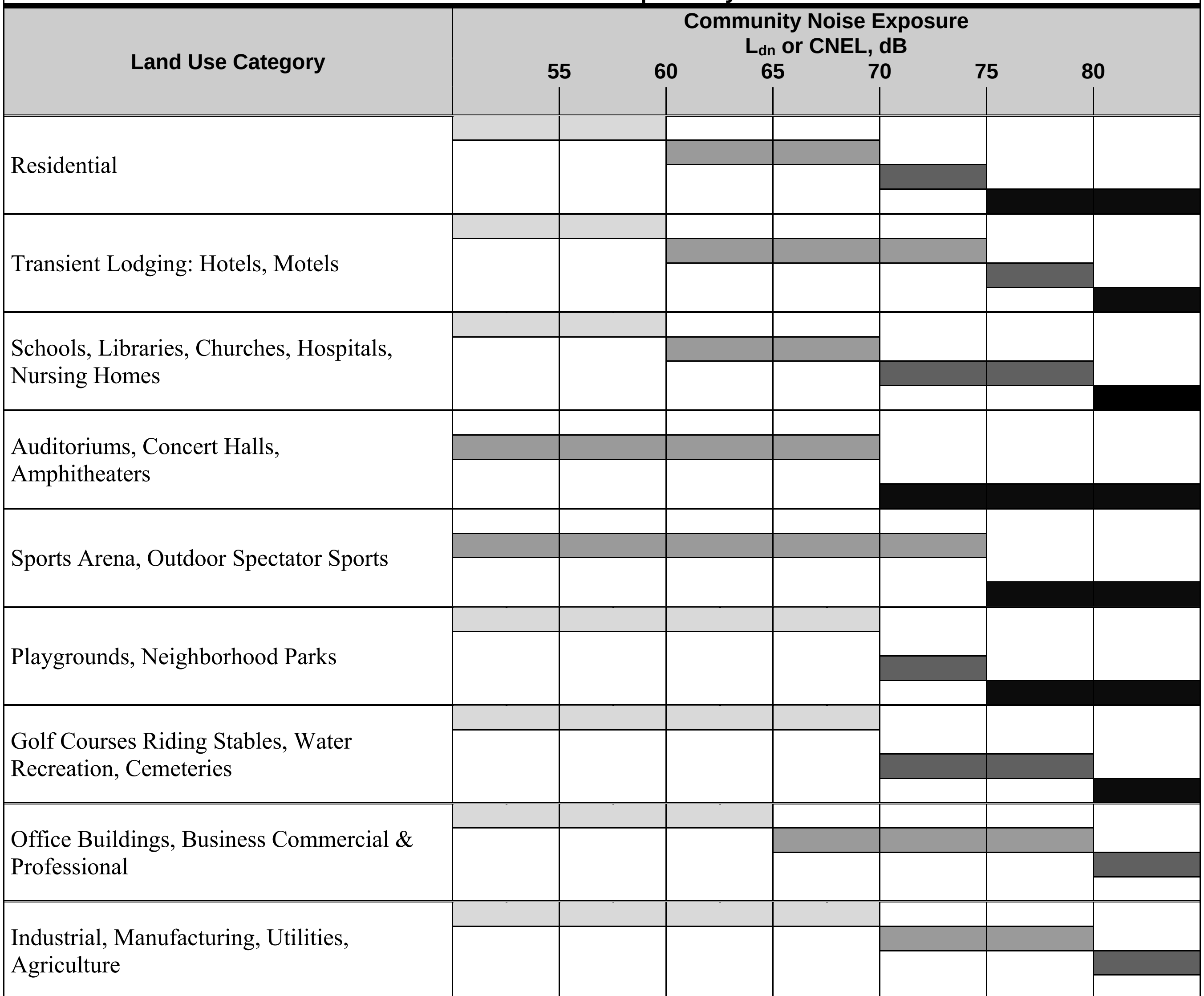
LOCAL REGULATIONS

City of Live Oak Noise Ordinance

The City of Live Oak has adopted a qualitative noise ordinance. The Noise Control Ordinance is contained in Chapter 9.30 of the City's Municipal Code (City of Live Oak 1989). The Ordinance sets forth procedures for extensions, variations, exceptions and identifies specific prohibitions regarding noise within the City. Codes applicable to this document are outlined below.

[5] Please refer to FHWA's web site for regulatory information and policies related to noise assessment and abatement, online at: http://www.fhwa.dot.gov/environment/noise/.

Table 4.4-6
State Land Use Noise Compatibility Guidelines



Normally Acceptable – Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise requirements

Conditionally Acceptable – New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design.

Normally Unacceptable – New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirement must be made and needed noise insulation features included in the design.

Clearly Unacceptable – New construction or development clearly should not be undertaken.

Source: OPR 2003

9.30.010 Declaration of Policy

It is declared to be the policy of the city to prohibit unnecessary, excessive and annoying noises from all sources subject to its police power. At certain levels noises are detrimental to the health and welfare of the citizenry and in the public interests shall be systematically proscribed. (Ord. 332 (part), 1989)

9.30.020 Offensive Noise Standards

Unnecessary, excessive and annoying noises are noises which originate from residential properties or on public ways in violation of this chapter, but such enumeration shall not be deemed to be exclusive:

E. Construction of Buildings and Projects. It is unlawful for any person within a residential zone, or within a radius of five hundred feet there from, to operate equipment or perform any outside construction or repair work on buildings, structures or projects, or to operate any pile driver, power shovel, pneumatic hammer, derrick, power hoist or any other construction-type device between the hours of ten p.m. and seven a.m. in such a manner that a reasonable person of normal sensitiveness residing in the area is caused discomfort or annoyance, unless beforehand a permit has been duly obtained from the officer or body of the city.

4.4.4 SIGNIFICANCE THRESHOLDS

METHOD OF ANALYSIS

To assess potential mobile, stationary, and area source noise impacts of General Plan implementation, noise-sensitive receptors and their relative exposure were identified.

The FHWA Traffic Noise Prediction Model was used to model traffic noise levels along affected roadways, based on daily volumes and the distribution, thereof, from the traffic analysis prepared for the 2030 General Plan (KDAnderson 2009). Truck usage and vehicle speeds on Planning Area roadways were taken from modeling conducted for the noise background report (BAC 2006). The project's contribution to the existing traffic source noise levels along area roadways was determined by comparing the modeled noise levels at 50 feet from the roadway centerline under no project (no 2030 General Plan) and plus project (with 2030 General Plan) conditions. The project's land use compatibility with 2030 traffic source noise levels was determined by comparing modeled noise levels at proposed noise-sensitive receptors under plus project conditions. Stationary noise sources were estimated based on the community noise survey and the proposed land use plan. Field measurements and standard noise propagation calculations were used to predict noise levels at adjacent sensitive receptors. Land use compatibility between conflicting land uses were determined based on the proposed land use plan and existing zoning. Vibration sources and levels were determined based on FTA guidance (FTA 2006).

The thresholds of significance applied in this analysis primarily address the exterior noise standards established by the City of Live Oak. Unless otherwise stated, an exceedance of interior noise level standards would not occur if exterior noise standards are achieved because of sufficient exterior-to-interior noise reduction of common buildings.

THRESHOLDS OF SIGNIFICANCE

For the purpose of this analysis, the following thresholds of significance, as identified by the State CEQA Guidelines (Appendix G) and the City of Live Oak have been used to determine whether implementation of the proposed project would result in significant noise impacts. Based on Appendix G of the State CEQA Guidelines, a noise impact is considered significant if implementation of the proposed project under consideration would do any of the following:

- Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- Expose people residing or working in the project area to excessive aircraft source noise levels; or
- Expose persons to or generation of excessive groundborne vibration or groundborne noise levels.

4.4.5 IMPACTS AND MITIGATION MEASURES

IMPACT ANALYSIS

IMPACT 4.4-1 **Traffic Noise Levels.** *Traffic generated by land uses accommodated under the General Plan would increase noise levels along transportation routes. Land uses are located along transportation routes in the City such that noise from transportation operations may be perceptible. Noise associated with vehicular transportation routes, however, is not expected to exceed local standards. The impact is considered* ***less than significant.***

Vehicular traffic on existing roadways in Live Oak is anticipated to increase as a result of traffic generated by land use change accommodated under the 2030 General Plan. The FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77-108) was used to predict traffic noise levels within the City of Live Oak under 2006 existing conditions, full buildout of the 1994 General Plan in 2030, and full buildout of the 2030 General Plan.

Table 4.4-7 shows projected 2030 average daily traffic (ADT) volumes for the major roadways and planned roadways located within Live Oak under the 2030 General Plan. It also contains the modeled distance from the roadway centerline to the 55, 60, 65, and 70 dB L_{dn} contour for each affected roadway segment and the noise level at 50 feet from the roadway centerline. The differences in noise levels at 50 feet were calculated between existing 2006 conditions and the 2030 General Plan and between future conditions in 2030 under the 1994 General Plan and the 2030 General Plan (see Table 4.4-7). The anticipated location of 55, 60, and 65 dB L_{dn} contours is also shown in Exhibit 4.4-5.

The roadway traffic noise levels shown represent conservative potential noise exposure. In reality, noise levels may vary from that represented since the calculations do not assume natural or artificial shielding or reflection from existing or proposed structures or topography. Actual noise levels would vary from day to day, depending on factors such as local traffic volumes and speed, shielding from existing and proposed structures, variations in attenuation rates resulting from changes in surface parameters, and meteorological conditions.

The City has included goals, policies, and programs in the 2030 General Plan to ensure that the citizens of Live Oak are protected from excessive noise levels. Table NOISE-1 in the 2030 General Plan provides the City’s guidelines regarding transportation noise for different land use environments. This information will be used to help determine whether transportation impacts from new projects and growth will occur in the Planning Area as a result of the 2030 General Plan. The policies under Goal NOISE-1 are meant to create land use patterns and transportation networks that reduce noise:

Table 4.4-7
Summary of Modeled 2030 Traffic Noise Contours under Full 2030 General Plan Buildout

#	Street	Segment		Daily Volume	Level at 50 Feet from Centerline of Near Travel Lane (dB L_{dn})	Noise Level Increase between 2006 Conditions and 2030 General Plan (dB L_{dn})	Noise Level Increase in 2030 between 1994 General Plan and 2030 General Plan (dB L_{dn})	Distance (feet) from Roadway Centerline to Noise Contour			
		From	To					70 dB L_{dn}	65 dB L_{dn}	60 dB L_{dn}	55 dB L_{dn}
1	Riviera Road	Township Road	State Route 99	5,550	64.7	**5.4**	**10.1**	22	48	103	221
2	Riviera Road	State Route 99	Larkin Road	1,850	59.9	-2.3	1.4	11	23	49	106
3	Road 1	Township Road	Luther Road	1,650	59.4	-	-	10	21	46	98
4	Road 1	Luther Road	N Street	5,450	64.6	-	-	22	47	101	218
5	Road 2	State Route 99	Larkin Road	4,800	64.1	-	-	20	43	93	201
6	West Sinnard Avenue	Township Road	Luther Road	7,225	65.8	-	-	26	57	122	264
7	West Sinnard Avenue	Luther Road	N Street	8,575	66.6	-	-	30	64	137	295
8	West Sinnard Avenue	N Street	State Route 99 connection	13,550	68.6	-	-	40	86	186	401
9	West Sinnard Avenue	State Route 99 connection	Larkin Road	7,750	66.1	-	-	28	59	128	276
10	West Sinnard Avenue	Larkin Road	Orchard Way	5,125	64.3	-	-	21	45	97	210
11	Road 4	F Street	Larkin Road	5,525	64.7	-	-	22	47	102	220
12	Road 4	Larkin Road	Sinnard Avenue	8,450	66.5	-	-	29	63	136	293
13	Road 5	State Route 99	Larkin Road	6,300	65.2	-	-	24	52	112	241
14	Road 5	Larkin Road	Sinnard Avenue	10,600	67.5	-	-	34	73	158	340
15	Road 6	Township Road	Luther Road	1,425	58.8	-	-2.9	9	19	41	89
16	Road 6	Luther Road	N Street	250	51.2	-	-10.0	3	6	13	28
17	Brianne Way	Larkin Road	Sinnard Avenue	7,600	66.0	-	-	27	59	127	273
18	Epperson Drive	Township Road	Luther Road	2,925	61.9	-	-1.9	14	31	67	144
19	Epperson Drive	Luther Road	N Street	3,475	62.6	-	1.4	16	35	75	162
20	Ramsdell Drive	N Street	Nevada Street	n/a	n/a	n/a	n/a	n/a	n/a	n/an	n/a
21	Ramsdell Drive	Nevada Street	State Route 99	3,975	63.2	-	-1.2	18	38	82	177
22	Road 3	State Route 99	Larkin Road	10,750	67.6	-	-	34	74	159	343
23	Road 3	Larkin Road	Sinnard Avenue	2,825	61.7	-	-	14	30	65	141
24	Kola Street	Road A	Luther Road	4,750	64.0	-	2.7	20	43	92	199
25	Kola Street	Luther Road	N Street	6,925	65.6	-	**3.3**	26	55	119	256
26	Kola Street	N Street	State Route 99	11,575	67.9	-	0.2	36	78	167	361
27	Kola Street	State Route 99	Larkin Road	5,925	65.0	-	-2.3	23	50	107	231
28	Road 7	Orchard Way	Larkin Road	1,550	59.1	-	-	9	20	44	94
29	Pennington Road	Township Road	Luther Road	3,475	62.6	2.8	0.0	16	35	75	162
30	Pennington Road	Luther Road	N Street	5,800	64.9	2.5	-0.1	23	49	106	228
31	Pennington Road	N Street	State Route 99	13,150	68.4	1.6	0.5	39	85	182	393

Table 4.4-7
Summary of Modeled 2030 Traffic Noise Contours under Full 2030 General Plan Buildout

#	Street	Segment		Daily Volume	Level at 50 Feet from Centerline of Near Travel Lane (dB L_{dn})	Noise Level Increase between 2006 Conditions and 2030 General Plan (dB L_{dn})	Noise Level Increase in 2030 between 1994 General Plan and 2030 General Plan (dB L_{dn})	Distance (feet) from Roadway Centerline to Noise Contour			
		From	To					70 dB L_{dn}	65 dB L_{dn}	60 dB L_{dn}	55 dB L_{dn}
32	Pennington Road	State Route 99	Larkin Road	2,875	61.8	-4.4	0.5	14	31	66	143
33	Pennington Road	Larkin Road	Sinnard Avenue	6,150	65.1	-1.1	2.8	24	51	110	237
34	Presley Street	Township Road	Richard Avenue	3,500	62.7	-	-4.0	16	35	75	163
35	Fir Street	Richard Avenue	Broadway	4,275	63.5	-	**6.3**	19	40	86	186
36	Elm Street	Broadway	State Route 99	3,650	62.9	-	2.4	17	36	78	167
37	Elm Street	State Route 99	Larkin Road	3,675	62.9	-	-1.5	17	36	78	168
38	Archer Ave	State Route 99	K Street	6100	65.1	**8.9**	**3.1**	24	51	109	235
39	Broadway/Apricot connection	Broadway	State Route 99	12,385	68.2	-	-1.2	38	81	175	377
40	Apricot Street	Richard Avenue	Broadway	6,250	65.2	-	-2.3	24	52	111	239
41	Ash Street	State Route 99	K Street	6100	65.1	-	**3.1**	24	51	109	235
42	Road 8	Township Road	Cannon Way	2,275	60.8	-	1.5	12	26	57	122
43	Road 9	Richard Avenue	Larkin Road	1,050	57.5	-	-4.0	7	16	34	73
44	Road 10/Coleman Avenue	State Route 99	Sinnard Avenue	1,300	58.4	-	2.1	8	18	39	84
45	Road 11	Richard Avenue	Larkin Road	1850	59.9	-	-1.7	11	23	49	106
46	Road 12	Richard Avenue	Larkin Road	1850	59.9	-	-1.7	11	23	49	106
47	Bishop Avenue	State Route 99	Sinnard Avenue	10,850	67.6	**17.8**	**6.1**	35	74	160	346
48	Road 13	Township Road	Richard Avenue	2,600	61.4	-	-6.0	13	29	62	133
49	Road 13	Richard Avenue	Larkin Road	5,450	64.6	-	-4.0	22	47	101	218
50	Road 14	Township Road	Richard Avenue	3,250	62.4	-	-	15	33	72	155
51	Road 14	Richard Avenue	Larkin Road	9,025	66.8	-	-2.2	31	66	142	306
52	Paseo Avenue	Township Road	Richard Avenue	3,775	63.0	**5.3**	-2.2	17	37	79	171
53	Paseo Avenue	Richard Avenue	Larkin Road	5,450	64.6	**6.9**	-4.1	22	47	101	218
54	Paseo Avenue	Larkin Road	D Street	7,025	65.7	**8.0**	-3.6	26	56	120	259
55	Paseo Avenue	Road D	State Route 99	10,750	67.6	**9.9**	-1.7	34	74	159	343
56	Paseo Avenue	State Route 99	Sinnard Avenue	3,400	62.6	**5.8**	2.1	16	34	74	159
57	Clark Road	Township Road	Broadway	8,400	66.5	-	-1.6	29	63	135	291
58	Township Road	Butte Co line	Riviera Road	7,750	66.1	-	-1.7	28	59	128	276
59	Township Road	Riviera Road	Sinnard Avenue	6,650	65.5	**5.5**	-2.4	25	54	116	249
60	Township Road	Sinnard Avenue	Pennington Road	8,500	66.5	**6.5**	-2.0	29	63	136	294
61	Township Road	Pennington Road	Road 8	8,725	66.6	**6.3**	-1.3	30	64	139	299

Table 4.4-7
Summary of Modeled 2030 Traffic Noise Contours under Full 2030 General Plan Buildout

#	Street	Segment		Daily Volume	Level at 50 Feet from Centerline of Near Travel Lane (dB L_{dn})	Noise Level Increase between 2006 Conditions and 2030 General Plan (dB L_{dn})	Noise Level Increase in 2030 between 1994 General Plan and 2030 General Plan (dB L_{dn})	Distance (feet) from Roadway Centerline to Noise Contour			
		From	To					70 dB L_{dn}	65 dB L_{dn}	60 dB L_{dn}	55 dB L_{dn}
62	Township Road	Road 8	Paseo Avenue	7,725	66.1	**5.8**	-0.5	28	59	128	276
63	Township Road	Paseo Avenue	Clark Road	8,400	66.5	-	-1.6	29	63	135	291
64	Road A	Riviera Road	Sinnard Avenue	3,450	62.6	-	-	16	35	75	161
65	Road A	Sinnard Avenue	Kola Street	5,000	64.2	-	0.8	21	44	96	206
66	Road A	Kola Street	Pennington Road	7,625	66.1	-	-0.8	27	59	127	273
67	Road A	Pennington Road	8 Street	5,575	64.7	-	-2.5	22	48	103	222
68	Road A	Road 8	Paseo Avenue	6,050	65.1	-	0.0	23	50	109	234
69	Luther Road	Riviera Road	Sinnard Avenue	3,450	62.6	**11.7**	-	16	35	75	161
70	Luther Road	Sinnard Avenue	Pennington Road	4,150	63.4	**12.5**	1.4	18	39	85	182
71	Richard Avenue	Pennington Road	Apricot Street	4,600	63.9	**4.4**	-1.5	20	42	91	195
72	Richard Avenue	Apricot Street	Road 13	5,450	64.6	**5.1**	-3.3	22	47	101	218
73	Richard Avenue	Road 13	Paseo Avenue	6,900	65.6	**6.1**	-3.2	26	55	119	256
74	Road C	Riviera Road	Sinnard Avenue	1,850	59.9	-	-	11	23	49	106
75	Road C	Sinnard Avenue	Epperson Drive	1,800	59.8	-	-0.2	10	22	48	104
76	N Street	Road 1	Sinnard Avenue	4,025	63.3	1.4	-	18	38	83	178
77	N Street	Sinnard Avenue	Epperson Drive	2,400	61.0	-0.9	1.0	13	27	59	126
78	N Street	Epperson Drive	Kola Street	2,200	60.7	-1.2	-1.8	12	26	55	119
79	N Street	Kola Street	Pennington Road	7,200	65.8	**3.9**	0.0	26	57	122	263
80	N Street	Pennington Road	Fir Street	10,850	67.6	**8.9**	-0.2	35	74	160	346
81	N Street	Fir Street	Apricot Street	8,950	66.8	**8.1**	-1.3	30	65	141	304
82	N Street	Apricot Street	Road 13	9,150	66.9	**8.2**	-1.1	31	66	143	308
83	N Street	Road 13	Paseo Avenue	3,200	62.3	**3.6**	-2.9	15	33	71	153
84	Broadway	Pennington Road	Elm Street	3,625	62.8	-	**3.2**	17	36	77	166
85	Broadway	Elm Street	Ash/Apricot/99 conn.	1,825	59.9	-	0.2	11	23	49	105
86	Broadway	Broadway/Apricot connection	Apricot Street	13,975	68.7	-	-1.1	41	88	190	409
87	West Larkin Road	Apricot Street	Road 13	8,625	66.6	-	-0.5	30	64	138	297
88	West Larkin Road	Road 13	Paseo Avenue	9,050	66.8	-	-3.3	31	66	142	306
89	Road D	Road 11	Paseo Avenue	8,500	66.5	-	-	29	63	136	294
90	Road E	Riviera Road	Road 2	5,750	64.8	-	-	23	49	105	226
91	Road F	Road 2	Sinnard Avenue	2,100	60.5	-	-	12	25	54	116
92	Road F	Sinnard Avenue	State Route 99	4,400	63.7	-	-	19	41	88	189

Table 4.4-7
Summary of Modeled 2030 Traffic Noise Contours under Full 2030 General Plan Buildout

#	Street	Segment		Daily Volume	Level at 50 Feet from Centerline of Near Travel Lane (dB L_{dn})	Noise Level Increase between 2006 Conditions and 2030 General Plan (dB L_{dn})	Noise Level Increase in 2030 between 1994 General Plan and 2030 General Plan (dB L_{dn})	Distance (feet) from Roadway Centerline to Noise Contour			
		From	To					70 dB L_{dn}	65 dB L_{dn}	60 dB L_{dn}	55 dB L_{dn}
93	East Larkin Road	Butte County line	Riviera Road	13,150	68.4	-	0.1	39	85	182	393
94	East Larkin Road	Riviera Road	Sinnard Avenue	12,950	68.4	**14.5**	0.5	39	84	180	389
95	East Larkin Road	Sinnard Avenue	Road 5	9,700	67.1	**13.2**	-0.8	32	69	149	321
96	East Larkin Road	Road 5	Road 3	16,300	69.4	**15.5**	-0.4	45	98	210	453
97	East Larkin Road	Road 3	Pennington Road	10,600	67.5	**13.6**	0.6	34	73	158	340
98	East Larkin Road	Pennington Road	Ash Street	8,850	66.7	-	0.3	30	65	140	302
99	K Street	Pennington Road	Ash Street	6,050	65.1	-	**3.9**	23	50	109	234
100	K Street	Ash Street	Bishop Avenue	3,400	62.6	-	**5.4**	16	34	74	159
101	Orchard Way	Sinnard Avenue	Road 3	7,575	66.0	-	-	27	59	126	272
102	Orchard Way	Road 3	Pennington Road	6,150	65.1	-	2.7	24	51	110	237
103	Sinnard Avenue	Road 4	Road 3	3,500	62.7	-	-	16	35	75	163
104	Sinnard Avenue	Road 3	Pennington Road	3,225	62.3	-	-	15	33	71	154
105	Sinnard Avenue	Pennington Road	Bishop Avenue	3,025	62.0	1.0	**7.8**	15	32	68	147
106	Sinnard Avenue	Bishop Avenue	Paseo Avenue	3,400	62.6	**11.6**	2.1	16	34	74	159
107	Metteer Road	Riviera Road	Brianne Way	2,000	60.3	-2.5	0.0	11	24	52	112
108	Metteer Road	Brianne Way	Pennington Road	4,000	63.3	0.5	0.0	18	38	82	178
109	Sheldon Road	Pennington Road	Bishop Avenue	500	54.2	0.9	0.0	4	10	21	44
110	State Route 99	Butte Co line	Riviera Road	23,250	70.9	-	0.5	57	124	267	574
111	State Route 99	Riviera Road	Sinnard Avenue	30,500	72.1	-	1.5	69	148	320	688
112	State Route 99	Sinnard Avenue	Road F	32,650	72.4	**3.3**	1.8	72	155	334	720
113	State Route 99	Road F	Ramsdell Drive	32,650	72.4	**3.3**	1.8	72	155	334	720
114	State Route 99	Ramsdell Drive	Kola Street	44,075	73.7	**4.6**	2.4	88	190	408	880
115	State Route 99	Kola Street	Pennington Road	36,675	72.9	**3.8**	1.3	78	168	361	778
116	State Route 99	Pennington Road	Ash/Apricot Streets	35,100	72.7	2.7	1.5	76	163	351	756
117	State Route 99	Ash-Apricot Streets	Bishop Avenue	43,250	73.6	**3.6**	1.1	87	187	403	869
118	State Route 99	Bishop Avenue	Paseo Avenue	40,800	73.3	**3.3**	1.1	84	180	388	836
119	State Route 99	Paseo Avenue	Clark Road	51,475	74.4	**4.4**	0.3	98	210	453	976

Refer to Appendix D for complete FHWA model input and output.

Notes: Bolded numbers indicate an increase of 3 dB or more, dB = decibels, L_{dn} = day-night noise level

[1] Traffic data not available

Source: EDAW 2009

- **Policy NOISE-1.1:** New development shall disperse vehicular traffic onto a network of fully connected smaller roadways, where feasible, and minimize funneling of local traffic onto large-volume, high-speed roadways located within or adjacent to neighborhoods.

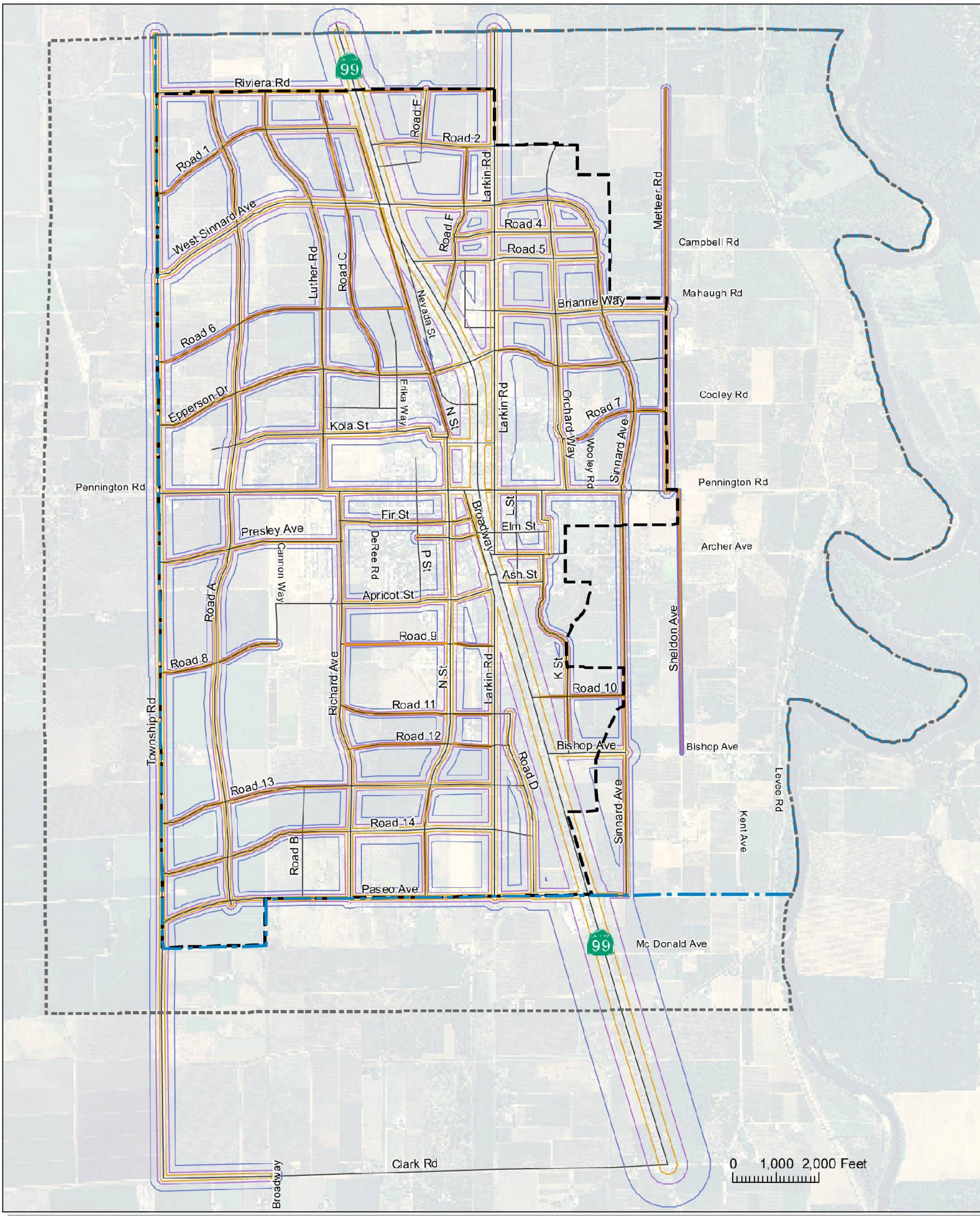
- **Policy NOISE-1.2:** New development of noise-sensitive land uses in areas exposed to existing or projected levels of noise from transportation, stationary sources, or agricultural operations exceeding, or estimated to exceed, levels specified in Table NOISE-1 and NOISE-2 shall implement site planning techniques and/or feasible mitigation shown to reduce noise exposure in outdoor activity areas and interior spaces to the levels specified in Table NOISE-1 and NOISE-2. Techniques can include dispersing traffic, traffic calming, site planning, buffering, sound insulation, or other methods approved by the City.

Additionally, Goal NOISE-2 and policies 2.1 through 2.4 describe measures to be taken to reduce noise impacts of new development. The Land Use Diagram includes buffer areas along SR 99 and the railroad to help reduce noise impacts.

The goals and policies in the 2030 General Plan provide thresholds and guidance to be used in the evaluation of project impacts and criteria to ensure that noise is not a substantial quality of life issue for existing and future Live Oak residents. The 2030 General Plan anticipates traffic increases and includes many policies that would effectively mitigate much of the traffic noise attributable to implementation of the 2030 General Plan. For example, the 2030 General Plan limits the use of high-volume, high-speed roadways (which are noise generators) through neighborhoods. The General Plan promotes a strategy of using many lower-volume, lower-speed roadways with many choices in routes, rather than funneling all traffic to higher-volume, higher-speed routes. The 2030 General Plan includes policies throughout the Land Use, Circulation, Community Character and Design, and Conservation and Open Space elements that reduce traffic generation and encourage alternatives to travel by car, which would further reduce potential traffic noise along roadways. There are many options for site planning and design, as illustrated in the 2030 General Plan, to reduce noise exposure for developing sensitive uses, even those developed along roads that are anticipated to carry relatively high traffic volumes.

While General Plan policies and program will reduce noise impacts, project-level analysis and mitigation will also be needed as development projects under the General Plan are proposed, using General Plan policy as guidance. There may be existing or future noise-sensitive land uses under the 2030 General Plan where roadway noise is perceptible. The Noise Element identifies what noise levels considered acceptable, as well as noise levels that are considered conditionally acceptable. Please refer to the Noise Element of the 2030 General Plan, under separate cover, for more information.

The portion of SR 99 in the southern portion of the Planning Area is anticipated to have the highest traffic volumes compared to any other roadway segments in the Planning Area. Here, there are nonresidential, non noise-sensitive land uses planned east of SR 99 and the “Buffer” land use designation is placed west of the highway in order to reduce noise levels as experienced in planned residential areas. The width of this “Buffer” area was designed to place residential uses outside the estimated 70-dBA L_{dn} noise contour. Similarly, along SR 99 in the northern portion of the Planning Area, a “Buffer” land use designation is used to avoid exposing residential areas to unacceptable noise levels. Land uses along SR 99 through the central portion of Live Oak are either not noise sensitive, or the orientation of the uses is such that outdoor activity areas are buffered from the highway by distance or intervening buildings or both. For example, a limited number of existing single-family residences are located along SR 99, but backyards (the relevant outdoor activity area) are located behind the home. Other roadways in the community have lower projected traffic volumes and therefore lower anticipated levels of noise. Unacceptable noise levels would for the most part be limited to the public rights-of-way associated with these lower level roadways. With homes fronting future roads and backyards (the applicable outdoor activity area) separated from the roadways, unacceptable noise levels in outdoor activity areas would be avoided. The impact is considered **less than significant**.



LEGEND

Boundaries

- Study Area
- Planning Area
- Sphere of Influence

Community Noise Equivalent Level

- 65 dB
- 60 dB
- 55 dB

0 1,125 2,250
FEET

X 08110072.01 037 9/09

Exhibit 4.4-5

Estimated Traffic Noise Contours at General Plan Buildout

Source: Live Oak GIS, Adapted by EDAW 2009

IMPACT 4.4-2 **Railroad Noise Levels.** *Exposure to railroad noise could exceed local standards and this impact is considered* ***significant.***

Railroad operations within the City of Live Oak consist of freight and Amtrak passenger service on the UPRR mainline track. There were 21 recorded train passages in a 24-hour period in a recent noise study of the UPRR. The modeled 70 dB L_{dn} noise contour for the Live Oak line is 191 feet from the track (Table 4.4-4). Given the proximity of existing and proposed sensitive land uses to the railroad line (e.g., residences along N Street, Nevada Street, and Road D), noise generation is expected to exceed accepted land-use compatibility criteria in certain portions of the City. This is a **significant** impact.

General Plan Policy NOISE-1.2 is designed to prevent and mitigate all sources of excessive noise, including those from transportation sources. The guidance included in this 2030 General Plan would be applied at the project level as the City considers land use change in the future. Development projects located along the railroad line would be required to follow General Plan policy and the City's Noise Ordinance, including project design and site planning techniques to reduce noise exposure, as appropriate. Although many techniques exist to achieve both internal and exterior noise objectives, it is possible that future development projects may encounter significant and unavoidable noise impacts relative to exposure to the railroad line, despite inclusion of all feasible mitigation techniques. In order to address train noise, the City has drafted an implementation program as a part of the Noise Element to include wayside horns or other means to reduce noise levels attributable to trains in coordination with the railroad:

- **Implementation Program NOISE-4.** The City will coordinate with Union Pacific Railroad with the goal of establishing a Quiet Zone within the city limits of Live Oak, as feasible. As funding is available, the City will improve crossings with appropriate technologies to implement the Quiet Zone. The City will seek the cooperation of Union Pacific Railroad to reduce or eliminate the use of horns in noise sensitive areas of the community by installing alternative sounding devices.

The City has included all feasible mitigation as policies and programs in the 2030 General Plan. Each project specific analysis will account for and mitigate any potential noise exposure issues resulting from train pass-bys in accordance with the City of Live Oak Municipal Code and the General Plan. However, it cannot be guaranteed that the City's objectives, upon which this impact analysis is based, could be achieved in every case. Therefore, the impact is considered **significant and unavoidable**.

IMPACT 4.4-3 **Expose Noise Sensitive Receptors to Construction Noise Levels Exceeding City of Live Oak Standards.** *Short-term construction source noise levels could exceed the applicable City standards at nearby noise-sensitive receptors. In addition, if construction activities were to occur during more noise-sensitive hours, construction source noise levels could also result in annoyance and/or sleep disruption to occupants of existing and proposed noise-sensitive land uses and create a substantial temporary increase in ambient noise levels. However, with the application of the Municipal Code and Noise Element policy, the impact is considered* ***less than significant.***

Residences and businesses located adjacent to areas of construction activity would be affected by construction noise during buildout of areas identified for land use change under the 2030 General Plan. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise sensitive land uses, or when construction durations last over extended periods of time.

Major noise generating construction activities could include demolition activities, site grading and excavation, building erection, paving and landscaping. The highest construction noise levels would be generated during grading and excavation, with lower noise levels occurring during building construction.

Large earth-moving equipment, such as graders, excavators, and dozers, generate maximum noise levels of 75 to 91 dB at a distance of 50 feet (see Table 4.4-8). Typical hourly average construction-generated noise levels are about 80 to 85 dB measured at a distance of 50 feet from the site during busy construction periods. Although most development in Live Oak would be lower-profile buildings, it is possible that pile driving could occur at some of the development sites. Construction noise levels drop off at a rate of approximately 6 dB per doubling of distance between the noise source and receptor. Intervening structures or terrain would result in lower noise levels.

Table 4.4-8
Typical Construction Equipment Noise Levels

Type of Equipment	Noise Level in dB at 50 feet	
	Without Feasible Noise Control	With Feasible Noise Control [1]
Dozer or Tractor	80	75
Excavator	88	80
Compactor	82	75
Front-end Loader	79	75
Backhoe	85	75
Grader	85	75
Crane	83	75
Generator	78	75
Truck	91	75

[1] Feasible noise control includes the use of intake mufflers, exhaust mufflers, and engine shrouds in accordance with manufacturer's specifications.

Sources: EPA 1971; FTA 2006

Noise levels anticipated over temporary periods of time as a result of construction facilitated by the 2030 General Plan would expose sensitive receptors to noise levels that exceed the current (60 dB L_{dn}) and proposed daytime and nighttime standards (60 and 45 dB L_{eq}), as well as temporarily increasing ambient noise levels by 3 dB or more (see Table 4.4-5).

Policy NOISE-2.4 and Table NOISE-3 require project specific mitigation of construction noise in the vicinity of noise sensitive land uses. Additionally, City Ordinance 9.30.020 (E) requires that construction does not take place during noise-sensitive times of the day (nighttime and early morning hours). The analysis in this EIR assumes this regulation is required as a routine City practice, and thus construction activities would not occur during more sensitive hours of the day.

The aforementioned policies and regulation are sufficient to mitigate most construction noise impacts, however requiring all manufacturer specified noise control be used on construction equipment will reduce the noise level an additional 3-15 dB and reduce human annoyance in construction vicinities. This is addressed by the Noise Element:

- **Policy NOISE-2.4:** New development shall provide all feasible noise mitigation to reduce construction and other short-term noise and vibration impacts as a condition of approval.

- **Policy NOISE-2.5:** New development shall ensure that construction equipment is properly maintained and equipped with noise control, such as mufflers, in accordance with manufacturers' specifications.

Implementation of these Noise Element policies would reduce construction noise levels by approximately 3-15 dB. Compliance with the Municipal Code would restrict activities to less sensitive daytime hours. As a result, this impact is considered **less than significant**.

Mitigation Measures: No mitigation is required.

IMPACT 4.4-4	**Expose Noise Sensitive Receptors to Stationary and Area-Source Noise Levels Exceeding City of Live Oak Standards.** *Long-term 2030 General Plan buildout of stationary- and area- source noise levels would not exceed applicable standards. As a result, this impact would be* ***less than significant****.*

The 2030 General Plan would accommodate a variety of land uses, including residential; commercial, office, and industrial; open space and recreation; and institutional and public facilities (e.g., electrical substations, wastewater treatment facilities and filtered water treatment facilities, and schools). The long-term operation of these uses could result in stationary and area noise from, but not limited to, the following potential sources:

- landscape and building maintenance activities (e.g., hand tools, power tools, lawn and garden equipment);
- voices;
- amplified music;
- mechanical equipment (e.g., pumps, generators heating, ventilation, and cooling systems);
- loading dock activities;
- parking lots;
- garbage collection; and
- other noise sources.

The 2030 General Plan includes the following policies that would control future noise levels at existing and proposed noise-sensitive land use areas from stationary sources:

- **Policy NOISE-1.2:** New development of noise-sensitive land uses in areas exposed to existing or projected levels of noise from transportation, stationary sources, or agricultural operations exceeding, or estimated to exceed, levels specified in Table NOISE-1 and NOISE-2 shall implement site planning techniques and/or feasible mitigation shown to reduce noise exposure in outdoor activity areas and interior spaces to the levels specified in Table NOISE-1 and NOISE-2. Techniques can include dispersing traffic, traffic calming, site planning, buffering, sound insulation, or other methods approved by the City.

- **Policy NOISE-1.3:** Proposed noise-generating industrial and other land uses shall be located away from noise-sensitive land uses, shall enclose any substantial noise sources completely within buildings or structures, or use other site planning or mitigation techniques to achieve the standards established in this Noise Element).

- **Policy NOISE-1.6:** In general, the newest land use is responsible for mitigating noise. If a use that generates noise is proposed adjacent to lands zoned for uses that may be sensitive to noise (i.e., residential neighborhoods), then the noise-generating use is responsible for mitigating noise consistent with Table NOISE-2 standards at the property line of the generating use.

- **Policy NOISE-2.2:** Developments that generate, or are affected by, noise related to anything other than transportation shall be designed and, if necessary, mitigated below maximum allowable levels specified in Table NOISE-2, as measured at outdoor activity areas of existing and planned noise-sensitive land uses. If existing noise levels exceed the maximum allowable levels listed in Table NOISE-2, as measured at outdoor activity areas of noise sensitive land uses, projects are required to incorporate mitigation to reduce noise exposure in outdoor activity areas to the maximum extent feasible and to include feasible mitigation for interior spaces to achieve the levels specified in Table NOISE-1 and NOISE-2.

- **Policy NOISE-2.3:** The maximum noise level resulting from new sources and ambient noise shall not exceed the standards in 2030 General Plan Table N-3, as measured at outdoor activity areas of any affected noise sensitive land use except:
  - If the ambient noise level exceeds the standard in Table NOISE-3, the standard becomes the ambient level plus 5 dBA.
  - Reduce the applicable standards in Table NOISE-3 by 5 decibels if they exceed the ambient level by 10 or more dBA.
  - The City will exempt all school related events and City sponsored events from noise standards outlined in this chapter. Events that are not included in these two categories may apply for an exemption.
- **Policy LU-5.4:** Commercial or industrial uses that create noise, air pollution, or other substantial impacts for existing or planned residential uses shall be located, buffered, or otherwise designed to minimize such impacts.
- **Policy LU-5.6:** New residential development proposed adjacent to cultivated agricultural lands outside the City's Sphere of Influence shall provide buffers to reduce potential conflicts. The width of such buffers will be determined on a case-by-case basis, considering prevailing winds, crop types, agricultural practices, and other relevant factors. Buffers should be designed to minimize adverse dust, spraying, and noise impacts to newly established residents near ongoing agricultural operations and to avoid nuisance complaints from these newly established residents against farmers in the area. The width of public rights-of-way, drainages, and easements may count as part of the buffer. Within agricultural buffer areas, allowed land uses include drainage swales, trails, other infrastructure, community gardens, landscaped areas, linear parks, roads, and other uses that would be compatible with ongoing agricultural operations.
- **Policy DESIGN-11.2:** New commercial projects shall screen utilities, air conditioning units (HVAC), and waste collection service areas from street frontage.

Typical noise levels attributable to the above sources, as well as off-site agricultural activities, and land use compatibility impacts to the City's (e.g., existing and proposed) noise-sensitive receptors are discussed, along with relevant 2030 General Plan policies separately below.

Landscape and Building Maintenance Activities

One potential source of stationary and area noise levels could include landscape and building maintenance activities at land uses (e.g., residential; commercial, office, and industrial; recreation; and schools) within the Planning Area. Landscape maintenance activities, such as the use of leaf blowers, power tools, and gasoline-powered lawn mowers, could result in intermittent noise levels that range from approximately 88.3 dB at 6.5 feet, respectively (EDAW 2009). Based on an equipment noise level of 88.3 dB, the use of such equipment, assuming a noise attenuation rate of 6 dB per doubling of distance from the source, would result in exterior noise levels of approximately 70.1 dB at 50 feet. Although such activities would likely occur during the daytime hours, the exact hours and locations are unknown at this time. Such activities are anticipated to be intermittent and would occur during the daytime, which is a less noise-sensitive time of day. The use of such equipment is not so frequent that applicable daily noise standards or maximum single-event noise standards would be exceeded for noise-sensitive land uses. Therefore, the impact is considered **less than significant**.

Mechanical Equipment

One potential source of stationary and area noise levels is the operation of mechanical equipment at residential, commercial, office, and industrial; and institutional and public facilities (e.g., electrical substations, wastewater treatment facility and filtered water treatment facility, and schools) land uses within the City. The operation of mechanical equipment (e.g., pumps, generators; heating, ventilation, and cooling systems) could result in intermittent noise levels of approximately 90 dB at 3 feet (EPA 1971). Based on this equipment noise level, the operation of such equipment, assuming a noise attenuation rate of 6 dB per doubling of distance from the source, may result in exterior noise levels of approximately 60 dB at 95 feet.

Although these types of equipment are typically shielded from direct exposure (e.g., housed on rooftops, in equipment rooms, or in exterior enclosures), the actual placement of such equipment on future land uses within the City is not known at this time. It is possible that noise levels could exceed the applicable standards at existing and proposed noise-sensitive receptors and create a substantial permanent increase in ambient noise levels at existing noise-sensitive receptors if measures are not taken to reduce such noise exposure.

As noted, 2030 General Plan policies NOISE-1.2, 1.3, 1.6, 2.2, 2.3, and DESIGN-11.2 outlined above would ensure noise from non-transportation related sources are below applicable standards. The above policies would be implemented with the adoption of the 2030 General Plan and for the purposes of this analysis it is assumed that these policies would be enforced. With complete implementation of the above policies noise levels that exceed applicable standards at noise sensitive receptors would be reduced below the applicable standards. The impact is **less than significant**.

Garbage Collection Activities

Potential sources of stationary and area noise levels could also include garbage collection activities at land uses (e.g., residential; commercial, office, and industrial; and schools) within Live Oak. Garbage collection activities (e.g., emptying large refuse dumpsters, possible multiple times per week, and the shaking of containers with a hydraulic lift), could result in instantaneous maximum noise levels of approximately 89 dB L_{max} at 50 feet (EDAW 2004). Such activities are anticipated to be very brief, intermittent, and would occur during daytime hours, which are considered to be less noise-sensitive times of day. Garbage collection activities are infrequent, and therefore would not be expected to exceed daily noise standards. Noises would typically emanate from public rights-of-way, which would normally be separated from outdoor gathering spaces associated with residential uses. Noise associated with garbage collection would not be expected to create single-event noise that would be substantially disruptive to daily activities or cause sleep disturbance. Therefore, the impact is considered **less than significant**.

Parking Lots

Potential sources of stationary and area noise levels also includes parking lots and parking structures (e.g., vehicles entering/exiting the lot, alarms/radios, and doors slamming) at land uses within Live Oak. Neither the size (i.e., capacity) or location of parking lots is known at this time. However, according to the FHWA, parking lots with a maximum hourly traffic volume of approximately 1,000 vehicles per hour either entering or exiting the lot could result in a peak hour and daily noise levels of approximately 56 dB L_{eq} and 63 dB L_{dn} at 50 feet.

2030 General Plan policies (specifically NOISE 1.7) are designed to prevent and mitigate sources of excessive noise, including those from projects that may include some amount of parking. Development projects will analyze and mitigate noise impacts, including those attributable to parking areas, in accordance with Municipal Code requirements and General Plan policies. The above worst-case estimates for noise generation from large parking lots could be reduced through the application of site design and other techniques for mitigation developed at the project level. 2030 General Plan policy ensures that noise levels resulting from parking areas would be below applicable standards.

Commercial, Office, and Industrial Activities

Other potential sources of stationary and area noise levels typical of commercial, office, and industrial uses includes but is not limited to loading dock activities, air circulation systems, delivery areas, and the operation of trash compactors and air compressors. Such activities could result in intermittent noise levels of approximately

91 dB L_{max} at 50 feet (EPA 1971) and high single-event noise levels from backup alarms from delivery trucks during the more noise-sensitive hours of the day. Neither the exact hours of operation nor the location of such potential noise sources are known at this time. Thus, land use related noise levels could exceed the applicable standards at existing and proposed noise-sensitive receptors, especially if such activities were to occur during the more noise-sensitive hours (e.g., evening, nighttime, and early morning) and create a substantial increase in ambient noise levels at existing noise-sensitive receptors. In addition, if such activities were to occur during these more noise-sensitive hours, project-generated noise levels may result in annoyance and/or sleep disruption to occupants of the on-site (e.g., existing and proposed) noise-sensitive land uses.

However, 2030 General Plan policies are designed to prevent and mitigate sources of excessive noise, including those from commercial, office, and industrial projects. Specific policies in the 2030 General Plan are listed above.

Development projects will analyze and mitigate noise impacts, including that attributable to commercial, office, and industrial operations, in accordance with the Municipal Code and 2030 General Plan. The 2030 General Plan land use designations also consider the need for buffering between potentially incompatible uses. It can be reasonably assumed that all commercial, office, and industrial stationary source land use compatibility noise level conflicts would be resolved at the project level using the tools outlined above.

Other Residential, School, and Recreation Activities and Events

Other potential sources of stationary and area noise levels typical of residential, school, recreation, and event uses could include voices and amplified music/speaker systems. Such sources could result in noise levels of approximately 60–75 dB L_{eq} at 50 feet (EDAW 2001). Although such activities would likely occur primarily during the daytime hours, neither the hours of operation nor location of such sources are known at this time. It is possible that noise levels could exceed the applicable standards at existing and proposed noise-sensitive receptors, especially if such activities were to occur during the more noise-sensitive hours (e.g., evening, nighttime, and early morning) and create a substantial increase in ambient noise levels at existing noise-sensitive receptors. In addition, if such activities were to occur during these more noise-sensitive hours, project-generated noise levels may result in annoyance and/or sleep disruption to occupants of the existing and proposed noise-sensitive land uses.

However, General Plan policies are designed to prevent and mitigate all sources of excessive noise, including those from residential, school, and recreational activities. Policy NOISE-2.3 exempts school and City sponsored events from noise standards and requires permitting for other commercial events that would create noise above applicable standards. Therefore, the impact is considered **less than significant**.

Stationary Source Summary

The stationary sources outlined above would be controlled by the 2030 General Plan, limited to hours exempted by applicable regulations and additional mitigation, and would therefore not cause excessive noise levels or annoyance/sleep disturbance to sensitive receptors. As a result, noise from stationary sources would be **less than significant**.

IMPACT 4.4-5	Agricultural Activities. *Noise sensitive land uses proposed at the edge of the Planning Area could be exposed to noise from operation of heavy-duty agricultural equipment. Agricultural buffers are required and given the typical noise levels and exposure periods associated with operation of agricultural equipment, this noise exposure is not expected to exceed local standards. This impact is* ***less than significant.***

Agricultural Activities

Agricultural activities surrounding the City involve the use of various types of heavy-duty equipment. Agricultural operations around Live Oak involve crop and orchard operations, which can occur during noise sensitive times of the day and involve substantial noise levels. The operation of heavy-duty equipment associated with agricultural activities typically results in noise levels of approximately 75 dB L_{eq} at 50 feet (EPA 1971). The closest distances between proposed noise-sensitive land uses and agricultural land uses would be approximately 50 to 200 feet in several locations. Based on the above noise levels and a typical noise-attenuation rate of 6.0 dB per doubling of distance, exterior noise levels at noise-sensitive receptors approximately 50 to 200 feet from agricultural activities could exceed 75 and 63 dB L_{eq}, respectively. It is important to note that the closest noise-sensitive receptors would not be exposed to this noise level for extended periods, given the mobile nature of agricultural activities (e.g., disking, plowing, harvesting). If, for instance, residential land uses were exposed to 75 dB L_{eq} for one entire hour during the daytime, and ambient noise levels were 50 dB L_{eq} during the rest of the daytime hours and 45 dB L_{eq} during the nighttime hours, the 24-hour noise level would be 62 dB L_{dn}.

The 2030 General Plan requires that development projects are evaluated for noise exposure of proposed noise sensitive land uses, as well as noise generation of proposed uses. This includes exposure of noise sensitive land uses, such as residential development, to ongoing and previously established noises associated with agriculture. 2030 General Plan Policy NOISE-1.5 requires buffers for noise and other aspects of agricultural operations for proposed development. Other 2030 General Plan policies relevant to agriculture from other elements include:

- **Policy LAND USE-5.6:** New residential development proposed adjacent to cultivated agricultural lands outside the City's Sphere of Influence shall provide buffers to reduce potential conflicts. The width of such buffers will be determined on a case-by-case basis, considering prevailing winds, crop types, agricultural practices, and other relevant factors. Buffers should be designed to minimize adverse dust, spraying, and noise impacts to newly established residents near ongoing agricultural operations and to avoid nuisance complaints from these newly established residents against farmers in the area. The width of public rights-of-way, drainages, and easements may count as part of the buffer. Within agricultural buffer areas, allowed land uses include drainage swales, trails, other infrastructure, community gardens, landscaped areas, linear parks, roads, and other uses that would be compatible with ongoing agricultural operations.

Buffer areas and noise reduction measures would be required under the 2030 General Plan to reduce agricultural-related noise. To further reduce noise exposure for residences establishing in an agricultural area, operations could be limited to less noise-sensitive times of day. In addition, equipment and machinery powered by internal combustion engines could be required to have a muffler and air intake silencer kept in good working order. However, the City has no authority to impose requirements on agricultural operations outside City limits.
In addition, the 2030 General Plan indicates the City's intent not to consider ongoing agricultural operations to be a nuisance in the instance where newly establishing residences or other sensitive land uses "come to the nuisance." Please refer to the 2030 General Plan Conservation and Open Space Element (under separate cover) for more information.

With the implementation of agricultural buffers, the foreseeable noise exposure for noise-sensitive land uses is not anticipated to exceed local standards. The City does not consider agricultural operations to be a nuisance for newly established residential uses near ongoing agricultural operations. The impact is considered **less than significant**.

Mitigation Measures: No mitigation is required.

IMPACT 4.4-6	Vibration Levels. *Short-term project-generated construction source vibration levels and vibration from train pass-bys could exceed Caltrans' recommended standard of 0.2 in/sec peak particle velocity (PPV) with respect to the prevention of structural damage for normal buildings and the FTA maximum acceptable vibration standard of 80 vibration decibels (VdB) with respect to human response for residential uses (i.e., annoyance) at vibration-sensitive land uses. With implementation of General Plan policy, however, impacts would be* ***less than significant****.*

Construction activities have the potential to result in varying degrees of temporary groundborne vibration, depending on the specific construction equipment used and operations involved. Vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance. Table 4.4-9 displays vibration levels for typical construction equipment.

The 2030 General Plan addresses vibration associated with construction. In Policy NOISE-2.4, the City requires that any new project must mitigate vibration from construction as a condition of approval. The approach to reducing vibration levels will depend on the type, location, timing, and other characteristics of future development, which is not knowable at this time. NOISE-2.4 would reduce vibration levels from construction below screening levels established by FTA and CalTrans.

Table 4.4-9
Typical Construction Equipment Vibration Levels

Equipment		PPV at 25 feet (in/sec)[1]	Approximate Lv at 25 feet[2]
Pile Driver (impact)	Upper range	1.518	112
	Typical	0.644	104
Pile Driver (sonic)	Upper range	0.734	105
	Typical	0.170	93
Large Bulldozer		0.089	87
Caisson Drilling		0.089	87
Trucks		0.076	86
Jackhammer		0.035	79
Small Bulldozer		0.003	58

1 Where PPV is the peak particle velocity
2 Where Lv is the velocity level in decibels (VdB) and based on the root mean square (RMS) velocity amplitude.
Source: Federal Transit Administration 2006

Railroads in Live Oak are an existing source of ground-borne vibration. FTA recommends that any potential receptor within 100 feet of a freight line receive a detailed vibration analysis to determine whether vibration generated by trains will cause an impact on the land use (greater than 80 VdB) (FTA 2006). This impact was also anticipated and is addressed in the Noise Element:

- **Policy NOISE-2.6:** Any new noise- or vibration-sensitive receptor proposed within 100 feet of the railroad tracks shall be required to undergo a vibration analysis and identify feasible mitigation, as appropriate, prior to project approval.

Implementation of the Noise Element will minimize vibration impacts on the General Plan buildout. The impact is considered **less than significant**.

Mitigation Measures: No mitigation is required.