4.8 NOISE

4.8.1 INTRODUCTION

This section includes a description of acoustic fundamentals and the existing noise environment, a summary of applicable noise regulations, and an analysis of potential noise impacts of the proposed project. Mitigation measures are recommended, as necessary, to reduce significant noise impacts.

4.8.2 EXISTING SETTING

ACOUSTIC 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. Subsequently, 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.

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.

A wave is a 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).

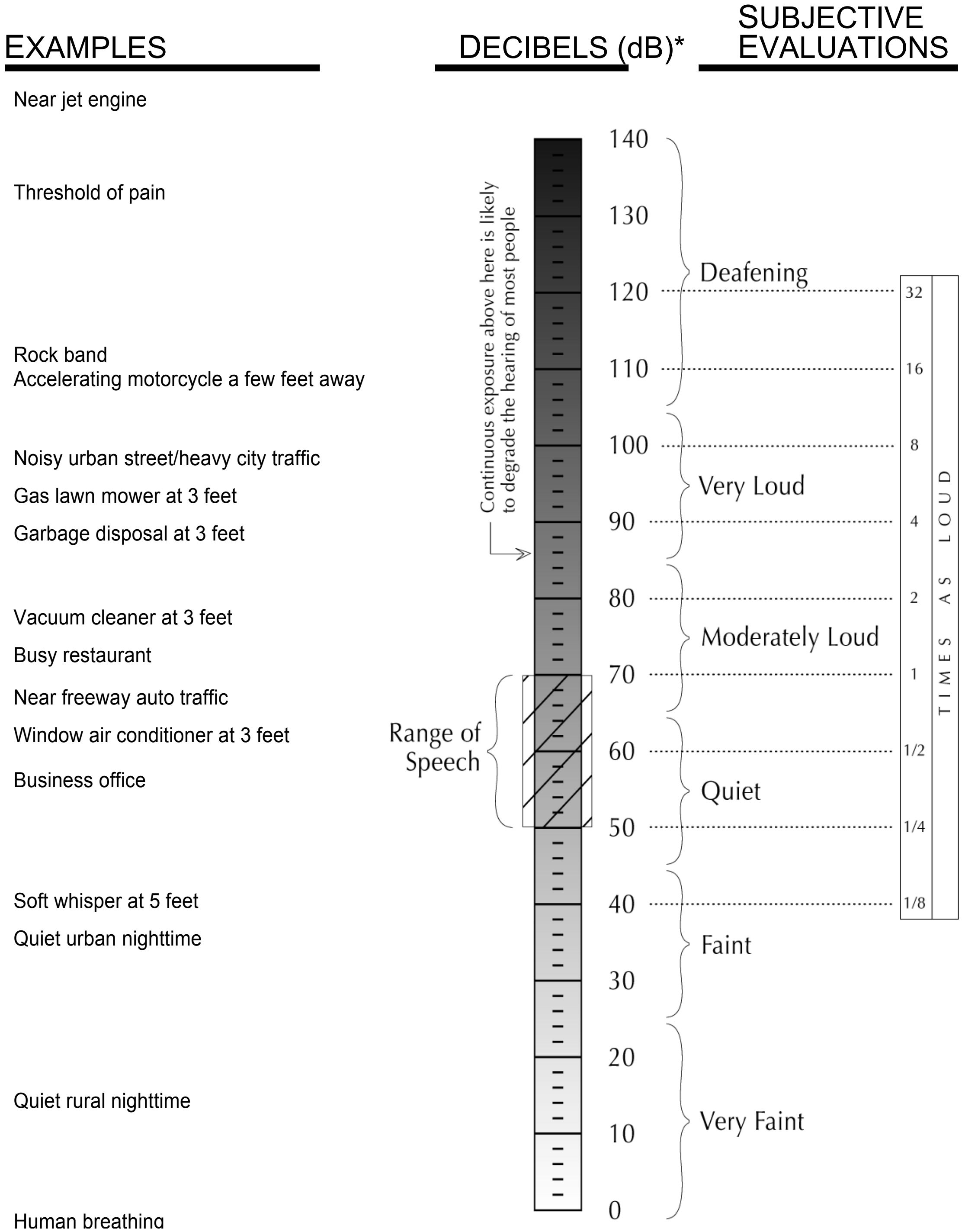
Because the human ear is not equally sensitive to all audible frequencies, a frequency-dependent rating scale was devised to relate noise to human sensitivity. An A-weighted dB (dBA) scale performs this compensation by discriminating against frequencies that are more sensitive to humans. The basis for compensation is the faintest sound audible to the average ear at the frequency of maximum sensitivity. This dBA scale has been chosen by most authorities for the purpose of regulating environmental noise. Typical indoor and outdoor noise levels are presented in Exhibit 4.8-1.

With respect to how humans perceive increases in noise levels, a 1 dBA increase is imperceptible, a 3 dBA increase is barely perceptible, a 6 dBA increase is clearly perceptible, and a 10 dBA increase is subjectively perceived as approximately twice as loud (Egan 1988). These perception parameters were 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 dBA, as this is the usual range of voice and interior noise levels. For these reasons, a noise level increase of 3 dBA or more is typically considered significant and/or substantial in terms of the degradation of the existing noise environment.

SOUND PROPAGATION

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 dBA per doubling of distance (dBA/DD). However, from a line source (e.g., a road), sound travels uniformly outward in a cylindrical pattern with an attenuation rate of 3 dBA/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 dBA 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 dBA with its windows closed (Paul S. Veneklasen & Associates 1973, cited in Caltrans 2002).



* dB are "average" values as measured on the A-scale of a sound-level meter.
From *Concepts in Architectural Acoustics* (M. David Egan, McGraw Hill, 1988) and *The Noise Guidebook* (U.S. Department of Housing and Urban Development, Office of Community Planning and Development, undated).

Source: Data compiled by EDAW in 2007

Typical Noise Levels **Exhibit 4.8-1**

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.
- L_{eq} (Equivalent Noise Level): The energy mean (average) noise level. The instantaneous noise levels during a specific period of time in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value is calculated, which is then converted back to dBA to determine the L_{eq}. In noise environments determined by major noise events, such as aircraft overflights, the L_{eq} value is heavily, and usually entirely, influenced by the magnitude and number of single events (SENL, see below) that produce the high work levels.
- L_{dn} (Day-Night Noise Level): The 24-hour L_{eq} with a 10 dBA "penalty" for noise events that occur during the noise-sensitive hours between 10:00 p.m. and 7:00 a.m. In other words, 10 dBA is "added" to single 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 normal sleeping hours.
- CNEL (Community Noise Equivalent Level): The CNEL is similar to the L_{dn} described above, but with an additional 5 dBA "penalty" added to single 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 dBA 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 (e.g., an automobile passing by or an air craft flying overhead), 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.

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), as in 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 (FTA 2006, Caltrans 2002).

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 velocity decibels (VdB), which serves to compress the range of numbers required to describe vibration (FTA 2006). 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 (FTA 2006).

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 (FTA 2006).

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 4.8-1 describes the general human response to different levels of groundborne vibration-velocity levels.

Table 4.8-1
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 = velocity decibels referenced to 1 microinch per second (μin/sec) and based on the root mean square (RMS) velocity amplitude.
Source: FTA 2006

4.8.3 EXISTING NOISE ENVIRONMENT

EXISTING SENSITIVE LAND USES

Noise- and vibration-sensitive land uses generally include those uses where exposure to noise would result in adverse effects, as well as uses where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Other noise-sensitive land uses include hospitals, convalescent facilities, parks, schools, hotels, churches, libraries, and other uses where low interior noise levels are essential.

The project site currently consists of undeveloped and fallow farmlands and orchards with no buildings or sensitive receptors on-site. Exhibit 4.8-2 shows the residences located closest to the project site, as well as schools located in the area. The nearest off-site sensitive receptors to the project site include the new housing development located approximately 1,250 feet west of the project site (across vacant land), a farm house located across Gerard Avenue approximately 400 feet from the southwest corner of the project site, a farm house located over 700 feet from the project site's southeast corner, and a farm house located over 800 feet east of the project site (across the Pacific Gas and Electric Company [PG&E] easement and Tower Road). Schools and school grounds are considered to be noise-sensitive receptors while being actively used. The closest schools to the project site are Weaver Elementary School, located at the northeast corner of Coffee Street and Childs Avenue, and Pioneer Elementary School, located at the southwest corner of Coffee Street and Gerard Avenue.

EXISTING NOISE SOURCES

The existing noise environment within the project area is influenced primarily by traffic on local roads, traffic on distant Highway 99, and activities on area farms and residences.

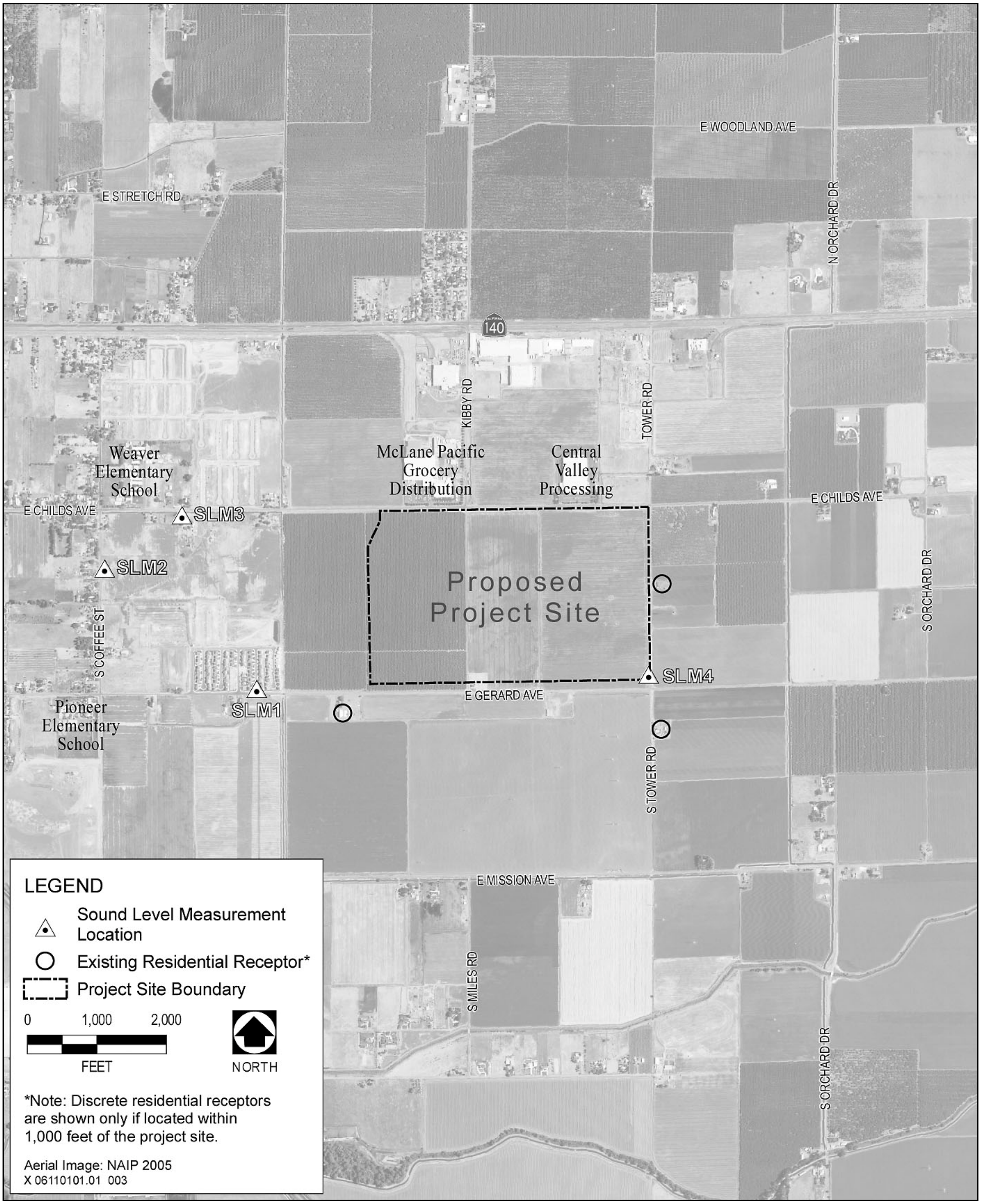
Table 4.8-2 presents existing traffic noise levels on area roadways, which were modeled using the FHWA Traffic Noise Model RD77-108 (FHWA 1988) and traffic data obtained from the traffic analysis prepared for this project (DKS 2008). Additional input data included day/evening/night percentages of autos, medium trucks and heavy trucks, vehicle speeds, and ground attenuation factors. Table 4.8-2 presents the predicted L_{dn} noise levels at 100 feet from the centerline of area roads for existing average daily traffic volumes.

The closest railroad is approximately a half mile to the north and runs east-west along the south side of SR 140. At this distance, train noise is not audible at the project site other than the occasional train horn. This line also has a spur that turns south and extends approximately one third of a mile towards the McLane Pacific Grocery Distribution Center on Childs Road.

EXISTING AMBIENT NOISE SURVEY

An ambient noise survey was conducted by EDAW on Tuesday, November 21, 2006 to document the existing noise environment at various locations within the project area. It should be noted that the nearby schools were still in session and school-related traffic was observed.

Short-term noise level measurements were taken in accordance with the American National Standards Institute (ANSI) acoustic standards at four locations within the project area using a Larson Davis model 824 sound level meter. Exhibit 4.8-2 shows the locations at which ambient noise measurements were collected. The short-term L_{eq} value along with the L_{max}, and L_{min}, for each ambient noise measurement location is presented in Table 4.8-3. Based on the short-term measurements conducted, average daytime noise levels (L_{eq}) within the project area range from 53.8 to 69.4 dBA L_{eq}, depending primarily on prevalence of nearby traffic, while maximum noise levels (L_{max}) range from 71.6 to 84.7 dBA L_{max}.



Source: Adapted by EDAW 2007

Ambient Noise Measurements and Nearby Sensitive Receptors **Exhibit 4.8-2**

Table 4.8-2
Summary of Modeled Existing Vehicle Traffic Noise Levels

Roadway	From	To	L_{dn} (dBA) 100 Feet from Centerline of Roadway
SR 140	SR 99	Parsons Avenue	61.1
SR 140	Parsons Avenue	Santa Fe Avenue	61.1
SR 140	Santa Fe Avenue	Kibby Road	61.5
SR 140	Kibby Road	Tower Road	61.2
Childs Avenue	SR 99	Parsons Avenue	60.5
Childs Avenue	Parsons Avenue	Coffee Street	58.8
Childs Avenue	Coffee Street	Kibby Road	60.5
Childs Avenue	Kibby Road	Tower Road	57.9
Gerard Avenue	Parsons Avenue	Coffee Street	47.2
Gerard Avenue	Coffee Street	Tower Road	52.5
Mission Avenue	SR 99	Coffee Street	52.8
Parson Avenue	Gerard Avenue	Childs Avenue	56.8
Parson Avenue	Childs Avenue	SR 140	59.0
Coffee Street	Mission Avenue	Parsons Avenue	52.3
Coffee Street	Gerard Avenue	Childs Avenue	53.2
Coffee Street	Childs Avenue	Baker Drive	52.3
Kibby Road	Childs Avenue	SR 140	53.9
Baker Drive	SR 140	Coffee Street	52.8
Tower Road	Gerard Avenue	Childs Avenue	42.5
Tower Road	Childs Avenue	SR 140	42.5

Notes: SR = State Route; Traffic noise levels were modeled using the FHWA Traffic Noise Model RD77-108 (FHWA 1988) based on traffic volumes obtained from the traffic report prepared for this project. Calculated noise levels do not consider any shielding or reflection of noise by existing structures or terrain features or noise contribution from other sources. See modeling results in Appendix D for further detail.
Source: Modeling performed by EDAW in 2008

Table 4.8-3
Summary of Monitored Existing Ambient Noise Levels

Noise Measurement Location	Time of Day on November 21, 2006	Predominant Noise Source(s)	Noise Level (dBA)		
			L_{eq}	L_{max}	L_{min}
1. North side of Gerard Avenue between Coffee Street and proposed project site; 35 feet north of centerline of Gerard Avenue and 15 feet from entrance gate to residential neighborhood.	1:10 pm – 1:26 pm	Traffic on Highway 99 and Gerard Avenue.	53.8	71.6	38.8
2. East side of Coffee Street between Gerard Avenue and Childs Avenue; 70 feet east of centerline of Coffee Street.	1:58 pm – 2:13 pm	Traffic on Coffee Street.	58.8	72.8	40.7
3. South side of Childs Avenue between Coffee Street and Kibby Road; 35 feet south of the centerline of Childs Avenue.	2:47 pm – 3:03 pm	Traffic on Childs Road.	69.4	84.7	44.4
4. Northwest corner of intersection of Gerard Avenue and Tower Road; 57 feet north of centerline of Gerard Avenue and 41 feet west of centerline of Tower Road.	3:51 pm – 4:16 pm	Farm tractor over approximately 1,000 feet to the north-northeast.	55.4	73.3	40.4

Note: Ambient noise level measurement locations are shown in Exhibit 4.8-2. Field measurement forms are provided in Appendix D.
Source: Data collected by EDAW on November 21, 2006.

4.8.4 REGULATORY SETTING

FEDERAL PLANS, POLICIES, REGULATIONS, AND LAWS

No federal plans, policies, regulations, or laws related to noise are applicable to the proposed project. However, the FTA has set forth guidelines for maximum-acceptable vibration criteria for different types of land uses to address the human response to groundborne vibration (FTA 1995):

- 65 VdB (referenced to 1 μin/sec and based on the RMS 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).

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 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 dBA. Such acoustical studies are required to establish mitigation measures that will limit maximum L_{dn} levels to 45 dBA 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 has developed land use compatibility guidelines for community noise environments. The State of California General Plan Guidelines (California Governor's Office of Planning and Research 2003), published by the state Governor's Office of Planning and Research, provides guidance for the acceptability of projects within specific L_{dn} contours. Table 4.8-4 presents 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 dBA L_{dn}. Residential uses are normally unacceptable in

Table 4.8-4
State Land Use Noise Compatibility Guidelines

Land Use Category	Community Noise Exposure (L_{dn} or CNEL, dBA)			
	Normally Acceptable[1]	Conditionally Acceptable[2]	Normally Unacceptable[3]	Clearly Unacceptable[4]
Residential-Low-Density Single-Family, Duplex, Mobile Home	<60	55–70	70–75	75+
Residential-Multi-Family	<65	60–70	70–75	75+
Transient Lodging-Motel, Hotel	<65	60–70	70–80	80+
Schools, Libraries, Churches, Hospitals, Nursing Homes	<70	60–70	70–80	80+
Auditoriums, Concert Halls, Amphitheaters		<70	65+	
Sports Arena, Outdoor Spectator Sports		<75	70+	
Playgrounds, Neighborhood Parks	<70		67.5–75	72.5+

Table 4.8-4 State Land Use Noise Compatibility Guidelines				
Land Use Category	Community Noise Exposure (L_{dn} or CNEL, dBA)			
	Normally Acceptable[1]	Conditionally Acceptable[2]	Normally Unacceptable[3]	Clearly Unacceptable[4]
Golf Courses, Riding Stables, Water Recreation, Cemeteries	<75		70–80	80+
Office Building, Business Commercial and Professional	<70	67.5–77.5	75+	
Industrial, Manufacturing, Utilities, Agriculture	<75	70–80	75+	

1 Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

2 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. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

3 New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design. Outdoor areas must be shielded.

4 New construction or development should generally not be undertaken.

Source: State of California Governor's Office of Planning and Research 2003

areas exceeding 70 dBA L_{dn} and conditionally acceptable within 55 to 70 dBA L_{dn}. Schools are normally acceptable in areas up to 70 dBA CNEL and normally unacceptable in areas exceeding 70 dBA CNEL. Commercial uses are normally acceptable in areas up to 70 dBA CNEL. Between 67.5 and 77.5 dBA CNEL, 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.

With respect to vibration, the California Department of Transportation (Caltrans) recommends a threshold of 0.2 in/sec PPV for the protection of normal residential buildings and 0.08 in/sec PPV for the protection of old or historically significant structures (Caltrans 2002). These standards are more stringent than the federal standard established by CHABA, presented above.

LOCAL PLANS, POLICIES, REGULATIONS, AND ORDINANCES

Merced Vision 2015 General Plan (City)

The *Merced Vision 2015 General Plan* (City of Merced 1997) Noise Element contains several policies for controlling and reducing environmental noise, which are applicable only to the areas inside the City of Merced. The following policies and implementing actions are applicable to the proposed project:

- **Policy N-1.2.** Reduce Surface Vehicle Noise.

  1.2a: Continue to discourage truck traffic and through traffic in residential areas in Merced.

  1.2b: Evaluate the need to prepare and adopt a Noise Ordinance for the City of Merced.

- **Policy N-1.3.** Reduce Equipment Noise Levels.

  1.3a: Limit operating hours for noisy construction equipment used in the City of Merced.

1.3b: Review City functions (e.g., constructions, refuse collection, street sweeping, tree trimming) to insure that noise generated by equipment has been reduced to the lowest practicable level.

1.3c: Include maximum noise level permitted for City equipment purchases and construction contracts.

► **Policy N-1.4.** Reduce Noise Levels at the Receiver where Noise Reduction at the Source is Not Possible.

1.4a: Require new residential projects to meet acceptable noise level standards as follows:

- A maximum of 45 dB CNEL for interior noise level for residential projects.
- A maximum of 60 dB CNEL for exterior noise level, especially when outdoor activities are important components of a project.
- A maximum of 65 dB CNEL when all the best available noise-reduction techniques have been exhausted without achieving 60 dB CNEL and the strict application of such a maximum becomes a hindrance to development needed or typical for an area.
- A maximum of 70 dB CNEL for rail noise when 45 dB CNEL is maintained in bedrooms and the accumulation of the total number of noisy events does not exceed 45 dB for more than 30 minutes during night-time hours (11:00 p.m. to 7:00 a.m.) and does not exceed an accumulated 60 minutes during any 24-hour period.

1.4c: Use the "normally acceptable" noise levels as established in the "Noise and Land Use Compatibility Guidelines" (Figure 10.6 [Table 4.8-5 in this document]) for the review of nonresidential land uses.

► **Policy N-1.5.** Coordinate planning efforts so that noise-sensitive land uses are not located near major noise sources.

1.5c: As feasible, require noise barriers and/or increased setbacks between heavy circulation corridors and noise-sensitive land uses (see Figures 10.2a and 10.2b).

1.5d: Require field noise measurements when new development may be impacted by high noise levels.

Table 4.8-5
City of Merced Noise Compatibility Guidelines

Land Use Category	Community Noise Exposure (L_{dn} or CNEL, dBA)			
	Normally Acceptable[1]	Conditionally Acceptable[2]	Normally Unacceptable[3]	Clearly Unacceptable[4]
Residential	<60	60–70	70–75	75+
Transient Lodging - Motels, Hotels	<65	60–75	75–80	80+
Schools, Libraries, Churches, Hospitals, Nursing Homes	<60	60–70	70–80	80+
Auditoriums, Concert Halls, Amphitheaters		<70		70+
Sports Arena, Outdoor Spectator Sports		<75		75+
Playgrounds, Neighborhood Parks	<70		70–75	72.5+
Golf Courses, Riding Stables, Water Recreation, Cemeteries	<70		70–80	80+
Office, Business, Commercial, Professional	<65	65–77.5	75+	
Industrial, Manufacturing, Utilities, Agriculture	<70	70–80	75+	

Table 4.8-5
City of Merced Noise Compatibility Guidelines

Land Use Category	Community Noise Exposure (L_{dn} or CNEL, dBA)			
	Normally Acceptable[1]	Conditionally Acceptable[2]	Normally Unacceptable[3]	Clearly Unacceptable[4]

[1] Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
[2] 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. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
[3] New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design. Outdoor areas must be shielded.
[4] New construction or development should generally not be undertaken.
Source: California Governor's Office of Planning and Research 2003

- **Policy N-1.6.** Mitigate all significant noise impacts as a condition of project approval for sensitive land uses.

  1.6a: Consider site design techniques for new construction as the primary means to minimize noise impacts, such as building placement, increased landscape setbacks, orientation of noise-tolerant components (i.e., parking, utility areas, maintenance facilities) between the noise source and the receptor, use of a combination of noise barriers and landscaped berms, etc. (see Figures 10.2a and 10.2b).

  1.6b: Encourage developers to consider alternative architectural designs as a means of meeting noise reduction requirements, such as:

  - Use noise tolerant rooms (kitchen, garages, bathrooms) to shield other noise sensitive rooms or areas (living rooms, bedrooms).
  - Locate bedrooms away from major roadways.
  - Use architectural design techniques and materials for building facades that will help shield noise.
  - Avoid balconies or operable windows facing major travel routes.

Furthermore, Section 10.3.5 of the noise element stresses the following pertinent considerations, along with the guidelines for land use compatibility shown in Table 4.8-5, should be taken into account when evaluating proposed development:

- A maximum outdoor noise level of 60 L_{dn} in residential areas where outdoor use is a major consideration, and whenever the realm of economic or aesthetic consideration makes it possible; a maximum of 65 L_{dn} in any other case.
- The indoor noise level as required by the State of California Noise Insulation Standards must not exceed 45 L_{dn} in multi-family dwellings. This maximum should also be used for single-family homes.

With regard to implementing action 1.2b under Policy N-1.1, the City has not developed a noise ordinance (Espinosa, pers. comm. 2006). For this reason, noise standards within the City are established by the General Plan.

Merced County General Plan 2000

The *Merced County General Plan 2000* (County General Plan) includes land use compatibility standards for residential land uses, which are shown in Table 4.8-6. These standards apply to unincorporated areas of Merced County, including areas adjacent to the project site that are not inside the City of Merced limits.

Table 4.8-6
Merced County General Plan Land Use Compatibility Noise Levels Shown as dBA, L_{dn} or CNEL

Noise Source	Exterior Standard		Interior Standard [1]
Traffic on public roadways, railroad line operations, and aircraft in flight	65 dBA L_{dn}/CNEL		45 dBA L_{dn}/CNEL
Other sources	Daytime (7:00 a.m.–10:00 p.m.) Hourly L_{eq} of 55 dBA L_{max} of 75 dBA	Nighttime (10:00 p.m.–7:00 a.m.) Hourly L_{eq} of 45 dBA L_{max} of 65 dBA	—

[1] Windows and doors closed.
Source: Merced County 2000

The County General Plan also sets forth Goals, Objectives, Policies, and Implementation measures to protect residences and other noise sensitive land uses. The following items are pertinent to the proposed project.

- **Goal 1:** All citizens of the County free from the harmful effects of excessive noise.
  - **Objective 1.A.:** Residential areas are not significantly impacted by excessive exterior noise
  - **Objective 1.B.:** Interior noise levels for residential dwelling units in residential areas do not exceed 45 dBA.
    - Policy 5: For existing houses in residential areas, the County will provide technical assistance to property owners to achieve an interior noise level which does not exceed 45 dBA.
  - **Objective 1.C.:** Hospitals and Schools are not significantly impacted by excessive exterior noise levels.
    - Policy 8: The County should assist owners of schools and hospitals in reducing excessive noise exposure.

      Implementation: During the review of conditional use applications or capital improvement plans, all hospital and school expansions will be reviewed for exposure to noise levels exceeding 70 dBA. Otherwise, when requested by hospital or school authorities, the County will provide technical assistance to help reduce existing noise exposure to hospitals and schools.
  - **Objective 1.D.:** Existing noise conflicts are reduced or eliminated.
    - Policy 9: Existing residential areas that are exposed to an exterior noise level greater than 65 dBA shall be considered “noise impacted.”
    - Policy 10: Existing schools and hospitals exposed to an exterior noise level of greater than 70 dBA shall be considered “noise impacted.”

- Policy 11: The County should evaluate and identify means to reduce noise conflicts for noise sensitive land uses that are "noise impacted."

  Implementation: As noise impacted areas are identified through complaints and during the review of building permits and discretionary applications, the County will work with property owners or responsible agencies to determine appropriate noise reduction measures.

- **Goal 1:** Noise generating land uses and facilities important to the economic health of the County are not adversely affected by incompatible land uses.

  - **Objective 2.A.:** The current operation and expansion of existing Commercial and Industrial designated areas are not significantly impaired by the encroachment of new incompatible noise sensitive land uses.

    - Policy 1: New noise sensitive land uses and land use designations should not be approved where existing and projected noise levels from Commercial or Industrial designated areas will result in those noise sensitive uses being "noise impacted."

      Implementation: All noise sensitive land uses, including but not limited to, hospitals, schools and residential dwellings, will be reviewed at the building permit or discretionary review stage to determine noise exposure levels. Discretionary applications generally include general plan amendment and/or zone change applications to redesignate property to accommodate a noise sensitive land use, as well as conditional use applications, location and development applications and administrative permits.

  - **Objective 2.B.:** New Commercial and Industrial areas are located to minimize encroachment by incompatible noise sensitive land uses.

    - Policy 2: When establishing new Commercial and Industrial land use designations, the potential for encroachment by residential and other noise sensitive land uses on adjacent lands which could significantly impact the viability of the Commercial or Industrial area shall be considered.

      Implementation: Recognition of future land uses will be evaluated during the general plan amendment and zone change application review process.

Merced County Noise Ordinance

The noise standards of the Merced County Code (Code 18.41.070) apply to unincorporated areas of Merced County, including areas adjacent to the project site that are not inside the City of Merced limits: Noise generated by mechanical equipment, buzzers, bells, loud speakers or other noise generating devices shall comply with the noise standards below at any boundary line of the parcel, except fire protection devices, burglar alarms and church bells. The following general plan standards for unacceptable noise levels shall apply:

A. If the proposed use is adjacent to property that is zoned for residential use, the maximum noise level shall not exceed 65 dBA L_{dn} or 75 dBA L_{max} at the property line.

B. If the proposed use is adjacent to a parcel that is not zoned for residential land use, the maximum noise level at the property line shall not exceed 70 dBA L_{dn} or 80 dBA L_{max} at the property line.

C. The maximum noise level for uses receiving noise shall be 65 dBA L_{dn} for uses in Residential Zones and 70 dBA L_{dn} for Institutional, Commercial, Industrial, and Agricultural Zones.

Elevated Noise Level During Construction. During construction, the noise level may be temporarily elevated. To minimize the impact, all construction in or adjacent to urban areas shall follow the following procedures for noise control: Construction hours shall be limited to the daytime hours between 7 a.m. and 6 p.m., and all construction equipment shall be properly muffled and maintained.

Code Section 10.60.030 – Sound level limitations – provides further:

A. No person shall cause, suffer, allow, or permit the operation of any sound source on property or any public space or public right-of-way in such a manner as to create a sound level that exceeds the background sound level by at least 10 dBA during daytime hours (7 a.m. to 10 p.m.) and by at least 5 dBA during nighttime hours (10 p.m. to 7 a.m.) when measured at or within the real property line of the receiving property, which shall constitute a noise disturbance, provided, however, that if the background sound level cannot be determined, the absolute sound level limits set forth in Table 4.8-7, Maximum Permissible Sound Levels, provided that if the sound source in question is a pure tone, the limits of Table 4.8-7 shall be reduced by 5 dBA.

Table 4.8-7
Maximum Permissible Noise Levels of Merced County Code

Residential Property (dBA)	Nonresidential Property (dBA)
65 L_{dn} or 75 L_{max}	70 L_{dn} or 80 L_{max}
Source: Merced County Code 2004	

B. The following are exempt from the sound level limits of Section 10.60.030(A):

1. Noise from emergency signaling devices;

2. Noise from an exterior burglar alarm of any building provided such burglar alarm shall terminate its operation within five minutes of its activation;

3. Noise from domestic power tools, lawn mowers, and agricultural equipment when operated between seven a.m. and eight p.m. on weekdays and between eight a.m. and eight p.m. on weekends and legal holidays, provided they generate less than 85 dBA at or within any real property line of a residential property;

4. Sound from church bells and chimes when a part of a religious observance or service;

5. Noise from construction activity, provided that all construction in or adjacent to urban areas shall be limited to the daytime hours between 7 a.m. and 6 p.m., and all construction equipment shall be properly muffled and maintained.

C. When the source being analyzed is a stereo system with low frequency signals as part of its output, the stereo shall not cause a C-weighted level of 10 dB or greater above the C-weighted ambient level at a distance of ten (10) feet from the source, or the complainant's real property line, whichever is greater.

4.8.5 ENVIRONMENTAL IMPACTS

METHOD OF ANALYSIS

To assess potential construction, area, and stationary source noise impacts, sensitive receptors and their relative exposure were identified. Noise levels of specific equipment expected to be used in project construction or operation were determined and resultant noise levels at sensitive receptors were calculated using the Roadway Construction Noise Model (RCNM) (FHWA 2006). RCNM default noise levels for construction equipment and usage rates were used for a standard list of heavy duty development equipment. Because the City of Merced has no established policies regarding construction noise or hourly L_{eq} standards, those policies and standards established by the County of Merced are applied to sensitive receptors located in both the unincorporated areas of Merced County and in the City of Merced . One reason this approach is considered reasonable is because many of the noise-sensitive receptors located near the project site are in unincorporated areas of the County.

The Federal Highway Association Traffic Noise Model (FHWA 1988) was used to model traffic noise levels along affected roadways, based on the trip distribution estimates obtained from the traffic analysis prepared for this project (DKS 2008). The project's contribution to the baseline traffic noise levels along area roadways was determined by comparing the predicted noise levels at 50 feet from the centerline of the near travel lane with and without project-generated traffic. Predicted traffic noise levels at particular sensitive receptors were calculated assuming a noise reduction of 3.0 dBA/DD from the roadway (i.e., the centerline of the near traffic lane), unless otherwise noted due to intervening "soft" or vegetated ground. Separate thresholds of significance are applied based on whether the noise-sensitive receptor is located within Merced's city limits or in the unincorporated area of Merced County according to the differing noise level standards of the two jurisdictions. All estimated noise levels from traffic noise modeling are expressed in L_{dn} (and not CNEL) because the traffic analysis did not provide complete day/evening/night temporal distribution for background traffic volumes on the area roadways.

The thresholds of significance applied in this analysis primarily address the exterior noise standards established by the City of Merced and Merced County. 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.

Groundborne vibration impacts were qualitatively assessed based on existing documentation (e.g., vibration levels produced by specific construction equipment) and the distance of sensitive receptors from the given vibration source. Attenuation of groundborne vibration levels at receptors were calculated according to formulas and methodologies established by the Federal Transit Administration (FTA) (2006).

THRESHOLDS OF SIGNIFICANCE

Based on Appendix G of the State CEQA Guidelines, a noise impact is considered significant if implementation of the proposed project would do any of the following:

- result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

  - **Short-Term Construction Noise Impacts.** Short-term construction noise impacts would be significant if construction-generated noise levels would exceed the Land Use Compatibility Noise Levels from the County General Plan (Table 4.8-6) or result in a noticeable increase (i.e., 3 dBA or greater, according to Caltrans 1998) in ambient noise levels at nearby noise-sensitive land uses during the more noise-sensitive early morning, evening and nighttime periods of the day (i.e., outside the hours considered exempt by the Merced County Noise Ordinance [i.e., 7 a.m. to 6 p.m., daily]). While the City of Merced has a policy to limit the operating hours for noisy construction equipment (*Merced Vision 2015 General Plan* Noise Element Policy N-1.3a), the policy does not designate specific hours during which construction activity is prohibited. Therefore, the City of Merced has elected to, for the purposes of this EIR only, use the time-of-day exemption established by the Merced County Noise Ordinance for construction noise. (Note: The ordinances of most cities and counties exempt construction-generated noise during daytime hours.)

- expose persons to or generation of noise levels in excess of standards establish in the local general plan or noise ordinance, or applicable standards of other agencies;

- 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 noise levels; or

  - **Traffic Noise Impacts.** For the analysis of long-term traffic noise, separate thresholds of significance were applied based on whether the nearest affected noise-sensitive receptor is located in the City of Merced or in the unincorporated area of Merced County.

    - At noise-sensitive receptors located in the City of Merced, long-term traffic noise impacts would be significant if traffic generated by operation of the proposed project would cause the overall exterior noise level to exceed the "normally acceptable" standard for land use compatibility established by the City of Merced's general plan (Table 4.8-5) (e.g., 60 dBA L_{dn}/CNEL for residential land uses).

    - At noise-sensitive receptors located in unincorporated areas of Merced County, long-term traffic noise impacts would be significant if traffic noise generated by implementation of the proposed project would cause the exterior noise level at a residential land uses to exceed the Land Use Compatibility Noise Levels from the County General Plan for traffic on public roadways (Table 4.8-6) (i.e., 65 dBA L_{dn}/CNEL).

    - For all affected residential land uses, regardless of location, long-term traffic noise impacts would be significant if, without mitigation, traffic noise generated by implementation of the proposed project would resulting a noticeable increase in exterior noise levels (i.e., 3 dBA or greater, according to Caltrans 1998), or if traffic noise generated by implementation of the proposed project would exceed 45 dBA L_{dn}/CNEL in any habitable rooms (under 24 CCR 10.3.5 of the *Merced Vision 2015 General Plan* Noise Element, and the County General Plan Land Use Compatibility Noise Levels for traffic on public roadways [Table 4.8-6]).

    - For all affected interior rooms of residential structures, regardless of location, SENLs generated by truck pass-bys generated by the project would be significant if they are higher than 64.8 dBA SENL, which is the level determined by the Federal Interagency Committee on Aviation Noise (FICAN) to result in sleep disturbance to 5% of the exposed population (FICAN 1997).

  - **Stationary- and Area-Source Noise Impacts.** Long-term stationary source noise impacts would be significant if stationary and area noise sources associated with operation of the proposed project would result in noise levels that exceed the County General Plan Land Use Compatibility Noise Levels for nontransportation noise sources (Table 4.8-6) at residential land uses. As shown in Table 4.8-6, the noise control standards limit exterior noise levels at residential land uses to 55 dBA hourly-L_{eq} and 75 dBA L_{max} during the daytime hours (7 a.m. to 10 p.m.) and 45 dBA hourly-L_{eq} and 65 dBA L_{max} during the nighttime hours (10 p.m. to 7 a.m.). As shown in Table 4.8-7, the maximum permissible exterior noise levels at residential properties is 65 dBA L_{dn} or 75 dBA L_{max}. It shall be noted that projects that comply with these General Plan standards would also comply with the Maximum Permissible Noise Levels of 65 L_{dn} and 75 L_{max} established by the Merced County Noise Ordinance for residential land uses (Table 4.8-7). Because the *Merced Vision 2015 General Plan* Noise Element does not contain specific standards for stationary and area noise sources, the City has elected to, for the purposes of this EIR only, also use these standards to evaluate the impact significance at residential land uses located in the City of Merced as well as in unincorporated areas of the County of Merced.

  - **Land Use Compatibility with On-site Noise Levels.** Development of the proposed land uses would have a significant impact if predicted on-site ambient noise levels under existing or future cumulative conditions would exceed the "normally acceptable" land use compatibility standard established by the City of Merced Noise Compatibility Guidelines (Table 4.8-5) and pursuant to Policy N-1.4c of the

Merced Vision 2015 General Plan Noise Element. As a light industrial land use the "normally acceptable" noise standard would be 75 dBA for the proposed Wal-Mart distribution facility.

- expose persons to or generation of excessive groundborne vibration or groundborne noise levels.

  - **Exposure of Sensitive Receptors or Generation of Excessive Vibration Levels.** Short- and long-term vibration impacts would be significant if construction or operation of the proposed project would result in the exposure of sensitive receptors to or generate vibration levels that exceed Caltrans's recommended standard of 0.2 in/sec PPV with respect to the prevention of structural damage for normal buildings (Caltrans 2002) or the FTA's maximum acceptable vibration standard of 80 VdB with respect to human response for residential uses (i.e., annoyance) (FTA 2006) at any nearby existing sensitive land uses.

IMPACT ANALYSIS

IMPACT 4.8-1 **Short-Term Construction Noise.** *Short-term construction-generated noise levels could exceed local exterior noise standards for non-transportation noise sources (Table 4.8-6) or result in a noticeable increase in ambient noise levels (i.e., 3 dBA CNEL) at existing nearby off-site sensitive land uses. This would be a* ***significant*** *impact.*

Construction activities at the project site would include site preparation (e.g., excavation, grading, and clearing), trenching, pouring of concrete foundations, paving, frame erection, equipment installation, finishing, cleanup, and other miscellaneous activities. No pile driving or rock blasting would occur as part of project construction.

The on-site equipment required is not known at this time but, based on similar projects, would be anticipated to include excavators, graders, scrapers, loaders, backhoes, haul trucks, and cranes. Equipment noise levels were calculated with the RCNM using default program noise and usage data. The noise levels of primary concern are typically associated with the site preparation phase because of the on-site equipment associated with clearing, grading, and excavation. Depending on the operations conducted, individual equipment noise levels can range from 80 to 85 dBA at 50 feet, as indicated in Table 4.8-8. The simultaneous operation of the on-site heavy-duty equipment associated with the project, as identified above, could result in combined intermittent noise levels of approximately 87 dBA at 50 feet from the project site. This value assumes default equipment distribution and usage from RCNM . Based on the output from RCNM, exterior noise levels at sensitive receptors located within approximately 2,150 feet of the project site could exceed the County's daytime hourly L_{eq} standard of 55 dBA (Table 4.8-6) without feasible noise controls. Residential subdivisions are located within this distance to the west and north of the site, as are farm houses located to the east and south of the site, as shown in Exhibit 4.8-2. This 55 dBA construction noise contour would not extend as far as Pioneer Elementary School and Weaver Elementary School, which are over 3,800 feet and 3,200 from the respective closest portions of the project site, respectively. Noise levels at the four closest sensitive receptors were modeled by RCNM as presented in Table 4.8-9. The levels do not include any shielding or intervening attenuation and thus would represent the most conservative estimates of noise levels at the receptors.

Table 4.8-8
Typical Construction Equipment Noise Levels

Type of Equipment	Noise Level in dBA at 50 feet	
	Without Feasible Noise Control	With Feasible Noise Control [1]
Dozer or Tractor	85	75
Excavator	85	80
Compactor	80	75
Front-end Loader	80	75

Table 4.8-8 Typical Construction Equipment Noise Levels		
Type of Equipment	Noise Level in dBA at 50 feet	
	Without Feasible Noise Control	With Feasible Noise Control[1]
Backhoe	80	75
Grader	85	75
Crane	85	75
Generator	82	75
Truck	84	75

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

Sources: U.S. Environmental Protection Agency 1971, FTA 2006, FHWA 2006

Table 4.8-9 Construction Noise Levels at Nearby Sensitive Receptors		
Sensitive Receptor(s)	Distance from Project Site (feet)	Resulting Noise Level (dBA L_{eq})[1]
Baseline Construction Noise Level	50	87.1
Crossing and River Oaks/Sandcastle Residential Development	1,250	59.2
Farm house 400 feet from southwest corner of project site (and on south side of Gerard Avenue)	400	69.1
Farm house 700 feet from southeast corner of project site (and on south side of Gerard Avenue and east side of Tower Road)	700	64.2
Farm house 800 feet east of project site (and on the east side of Tower Road)	800	63.1
Pioneer Elementary School	3,800	49.5
Weaver Elementary School	3,200	51.0
Daytime hourly L_{eq} standard of Merced County (Table 4.8-6)	—	55

[1] Noise levels do not include attenuation from intervening topography or structures.

Source: Modeling performed by EDAW in 2008 using Roadway Construction Noise Model (FHWA 2006)

Noise from construction activities between the hours of 7 a.m. to 6 p.m. is exempt from local standards by the City of Merced, which is consistent with the hours exempt by the Merced County Noise Ordinance (Espinosa, pers. comm., 2007). Though construction activity would likely only occur during the daytime, the exact hours are not stated in the project description. If construction operations were to occur during the noise-sensitive hours outside of these hours, the applicable noise standards could be exceeded at residential land uses near the proposed project. Thus, if construction activities are not limited to the hours exempt by the Merced County Noise Ordinance, the temporary construction noise generated by on-site equipment could expose off-site sensitive receptors to, or generate noise levels in excess of, the applicable noise standards and/or result in a noticeable increase in ambient noise levels at noise-sensitive receptors. This would be a ***significant*** impact.

Mitigation Measure 4.8-1: Regulate Construction before Approval of Implementation Plans. Prior to approval of Implementation Plans and subsequent projects, the City shall require the applicant to regulate construction as follows:

- Construction shall occur only in the daytime hours between 7 a.m. to 6 p.m., daily.
- Construction staging areas shall be set back from nearby off-site sensitive receptors, as much as possible, including the new Crossing at River Oaks/Sandcastle housing development located west of the site, the existing farmhouse located across Gerard Avenue near the southwest corner of the site, and the existing farmhouse located east of the site across Tower Road.
- Construction equipment mufflers shall be well tuned and maintained according to the manufacturer's specifications, and the equipment's standard noise reduction devices shall be maintained in good working order.
- Construction equipment noise shall be minimized during project construction by muffling and shielding intakes and exhaust on construction equipment (according to the manufacturers' specifications) and by shrouding or shielding impact tools. All equipment shall have sound-control devices no less effective than those provided by the manufacturer.
- To further address the nuisance impact of project construction, construction contractors shall implement the following:
  - Signs shall be posted at the construction site that include permitted construction days and hours, a day and evening contact number for the job site, and a day and evening contact number for the City in the event of problems.
  - An on-site complaint and enforcement manager shall be posted to respond to and track complaints and questions related to noise.
- The transportation management plan that is required by Mitigation Measure 4.11-2a and 2b in Section 4.11, "Traffic and Transportation," shall route construction-related traffic away from Weaver Elementary School, Pioneer Elementary School, and residences in the area.

Combined with the transportation management plan included as a mitigation measure in Section 4.11, this mitigation measure would ensure that construction operations would be consistent with the daytime exemption provided by Merced County Noise Ordinance and that construction would not result in a noticeable increase in ambient noise levels at noise-sensitive receptors during the more noise-sensitive hours of the day, thereby reducing potential impacts to a ***less-than-significant*** level.

IMPACT 4.8-2	**Stationary- and Area-Source Noise.** *Noise levels generated by stationary- and area-noise sources on the project site would not exceed local land use compatibility noise level standards at existing nearby noise-sensitive land uses. This would be a* **less-than-significant** *impact of the proposed project.*

Multiple sound level measurements were collected at an existing Wal-Mart distribution facility in Apple Valley to identify stationary and area noise sources typical of distribution center operations and identify their respective sound levels. The Apple Valley facility has the same design, size, and operating parameters of the proposed project, and was therefore considered representative of the types and magnitude of sound generation that would occur with the project. The short-term noise level measurements were collected in accordance with ANSI acoustic standards at multiple locations of the Apple Valley facility using a Larson Davis model 824 sound level meter on August 7 and 8, 2006. Table 4.8-10 lists the various noise sources identified on the site and their measured noise levels.

Table 4.8-10 Summary of Stationary and Area Noise Sources			
Activity/Noise Source	L_{max} (dBA) at 50 feet [1]	Closest Distance to Off-Site Receptor (feet)	L_{max} (dBA) at nearest sensitive receptor [2]
Voices of workers or truck drivers	57.2–59.2	575 (truck entrance)	36.0—38.0
Idling semi-truck	63.9–64.6	575 (truck entrance)	42.7—43.4
Truck with trailer passing at approx. 5 mph	64.6	575 (truck entrance)	43.4
Truck with trailer passing at approx. 10 mph	66.4–68.4	575 (truck entrance)	45.2—47.2
Yard truck revving engine, pulling away from stop	73.1	700 (trailer yard)	50.2
Compression brakes of truck in fuel shed	78.2	575 (truck entrance)	57.0
Yard truck coupling with trailer in trailer yard	79.5	700 (trailer yard)	56.6
Truck revving engine, pulling away from stop	69.0–80.4	575 (truck entrance)	47.8—59.2
Acceleration of truck without trailer in trailer yard passing at approx. 10 mph	84.6	700 (trailer yard)	61.7
Truck compression brakes	74.4–86.1	575 (truck entrance)	53.2—64.9
Back-up alarm and engine acceleration of yard truck in trailer yard	76.3–86.2	700 (trailer yard)	53.4—63.2
Air horn of yard truck in trailer yard	86.8–88.0	700 (trailer yard)	63.9—65.1

Notes:

[1] The durations of all measurements were less than 10 seconds. Because sound level measurements were collected at varying distances from the measured noise source, all measurements have been normalized to a distance of 50 feet. A range of sound levels is shown when the sound level of a particular activity type was measured more than once.

[2] The nearest off-site noise sensitive receptor to on-site noise activity would be the farm house on the south side of Gerard Avenue. The attenuated sound level measurements do not account for additional attenuation associated with the “soft” acoustical environmental provided by the vegetated ground surface between the project site and this receptor.

Refer to Appendix D for detailed measurement distances and attenuation calculations.

Sources: Measurement data collected by EDAW on August 7 and 8, 2006.

The closest off-site noise-sensitive receptor to these on-site noise sources would be the farm house on the south side of Gerard Avenue. The southwest corner of the project site would be approximately 400 feet from the location of this existing farm house. More pertinently, the truck entrance off of Gerard Avenue would be the closest location to the house where on-site noise-generating activity would occur and this location would be a distance of 575 feet from the farm house.

The loudest noise generated at the truck entrance would be the sound of truck compression brakes while trucks pull in and out of the entrance. The sound level of truck compression brakes was measured as loud as 86.1 dBA L_{max} at a distance of 50 feet. At a distance of 575 feet this sound level would attenuate to 64.9 dBA L_{max} at the farm house through distance alone. Some additional attenuation would be provided by the vegetated ground cover between the source and receptor. Thus, the resultant noise level at the farm house would be less than the nighttime standard of 65 dBA L_{max} established by County General Plan (Table 4.8-6).

The two loudest noise sources observed were the horn and back-up alarm of yard trucks, measured at 88.0 dBA L_{max} and 86.2 dBA L_{max}, respectively, from a distance of 50 feet. Yard trucks are used to pull trailers between the trailer yard and the loading docks, which are shown in Exhibit 3-3. Drivers of the yard truck occasionally honk the truck horns to caution others when driving around a blind corner. Back-up alarms automatically deploy when the trucks operate in reverse gear. Yard truck activity would generally occur in the trailer yard, which would be more than 700 feet from the existing farm house south of Gerard Avenue. At this distance, the noise of a yard truck horn and back-up alarm would attenuate to 65.1 dBA L_{max} and 63.2 dBA L_{max}, respectively, through distance alone. Some additional attenuation would occur because much of the ground surface is vegetated and therefore is indicative of a "soft" acoustic environment. Thus, at this distance, neither noise source would exceed the nighttime standard of 65 dBA L_{max} established by County General Plan (Table 4.8-6).

All other noise sources observed at the Apple Valley site, and shown in Table 4.8-10 have lower sound levels than the three sources discussed above and, therefore, also would not exceed the nighttime L_{max} standard.

The only on-site noise source that could potentially occur for an extended period of time would be the idling of trucks at the truck gate. State law prohibits individual trucks from idling for more than 5 minutes continuously (13 CCR Section 2485). Even if high-turnover at the gate resulted in up to four trucks idling at any one point in time during an entire 1-hour period, the cumulative sound level of truck idling would be 70.6 dBA L_{eq} at a distance of 50 feet. This noise level would attenuate to the County's more-stringent nighttime 45 dBA L_{eq} standard at a distance of 1,000 feet. Thus, the standard could be exceeded at any locations located within 1,000 feet of the truck gate or other areas where idling by multiple trucks could occur for an extended period. Because no off-site residences, including the farm house across Gerard Avenue, are located within 1,000 feet of the truck gate, which is approximately 900 feet north of Gerard Avenue, noise generated by constant truck idling would not result in an exceedance of the nighttime standard of 45 dBA L_{eq} established by County General Plan (Table 4.8-6). Furthermore, while extensive truck idling could potentially occur at the on-site truck waiting area(s) required by Mitigation Measure 4.11-2 in the traffic analysis, this mitigation measure also stipulates that the truck waiting area(s) shall be located at least 1,000 feet from the nearest off-site residence. If an on-site waiting area is located within 1,000 feet of an off-site residence, then the sound barrier(s) required by Mitigation Measure 4.8-3 to reduce traffic noise would provide the added benefit of ensuring that on-site truck idling would not result in an exceedance of the nighttime standard of 45 dBA L_{eq} established by the County General Plan (Table 4.8-6).

The loading and unloading of pallets and goods onto truck trailers and the opening and closing of trailer doors were not observed to be a substantial exterior noise source during the noise measurement survey on August 7 and 8 at the existing Wal-mart distribution center in Apple Valley. Furthermore, all loading and unloading of truck trailers would occur at the loading docks along the north sides of the warehouse building, which is more than 3,000 feet from the nearest off-site noise-sensitive receptor. Even if such activity produced a noise level equivalent to that of the air horn of yard truck, which is the loudest noise level observed at the Apple Valley facility at 88 dBA, this noise level would attenuate to 52.5 dBA across a distance of 3,000 feet, not including additional attenuation provided by the building itself. In summary, stationary and area noise generated by the project would not exceed local L_{max} and L_{eq} standards. As a result, this impact would be ***less than significant***.

Mitigation Measure

No mitigation is required.

IMPACT 4.8-3	Long-Term Operational Traffic Noise. *Implementation of the proposed project would result in increases in traffic noise levels greater than 3 dBA and cause traffic noise levels to exceed the City's 60 dBA L_{dn} exterior noise standard at sensitive receptors within the city limits. This would be a* **significant** *impact.*

The increase in daily traffic volumes resulting from implementation of the proposed project would generate increased noise levels along nearby roadway segments. The FHWA Traffic Noise Model RD77-108 (FHWA 1988) was used to predict traffic noise levels along affected roadways for baseline traffic conditions, with and without implementation of the proposed project, based on the trip distribution estimates obtained from the traffic analysis prepared for this project (DKS 2008). The proportion of truck trips to passenger-car-vehicle trips generated by the project was also accounted for, as well as the time of day (i.e., day, evening, or night) when those trips would occur, according to the employee shift change times and truck counts collected at Wal-Mart's existing distribution center in Apple Valley. Baseline traffic conditions include existing traffic levels as well as traffic that would be generated by all approved, projects planned for the future in the project area, as listed in Exhibit 4.11-1 of Section 4.11, “Traffic and Transportation.” The project’s contribution to the 2010 baseline traffic noise levels along area roadways was determined by comparing the predicted noise levels with and without project-generated traffic under 2010 baseline conditions. The traffic volumes used to estimate the traffic noise levels assume that proposed Phase I of the Campus Parkway from the State Route (SR) 99/Mission interchange to Childs Avenue and farther north would be completed before the construction of the distribution center, but Campus Parkway north of Childs would be completed sometime after the buildout of the distribution center but before the year 2030.

Table 4.8-11 displays the L_{dn} at a distance 100 feet from the centerline of each modeled road segment for the 2010 and 2030 baseline years with and without traffic generated by the proposed project. Note that most of the noise levels presented in Table 4.8-11 would be lower at the nearest sensitive receptors if they are located further than 100 feet from the modeled road segments. Table 4.8-11 also shows the net increase in roadside noise levels as compared to both baseline conditions (i.e., 2010 and 2030 no project). The roadway noise levels presented in the table represent worst-case potential traffic noise exposures, which assume no natural or artificial shielding between the roadway and a noise receptor located 100 feet from the roadway centerline. Sound barriers may already be planned to protect some of the future planned receptors. For instance, at the time sound level measurements were collected, a sound wall was being constructed along the north side of Gerard Avenue east of Coffee Street, which would provide some protection for receptors in the new housing development under construction there. The increases in traffic sound levels along many of the roadway segments are particularly large because the trips generated by the project include a disproportionately high number of truck trips and disproportionately high number of trips during the more-sensitive nighttime hours (10:00 p.m.–7:00 a.m.).

As shown by Table 4.8-11, project-generated traffic would result in a noticeable increase in traffic noise levels (i.e., greater than 3 dBA) on six of the modeled roadway segments (i.e., Gerard Avenue between Campus Parkway and project site entrances, Gerard Avenue between the project site entrances and Tower Road, Mission Avenue between SR 99 and Coffee Street, Campus Parkway between Coffee Street and Gerard Avenue, Tower Road between Gerard Avenue and Childs Avenue, Tower Road between Childs Avenue and SR140). This traffic noise analysis examines exposure of sensitive receptors located within the unincorporated areas of Merced County separately from residences located in the City of Merced because different standards of significance apply in these two jurisdictions.

Sensitive Receptors in Unincorporated Merced County

The traffic noise level 100 feet from the segment of Tower Road between Gerard Avenue and Childs Avenue would increase from 45.5 to 57.2 dBA L_{dn} under baseline 2010 conditions (modeling provided in Appendix D). At the farm house located approximately 94 feet from the road, in an unincorporated area of the County, the noise level would increase to 57.6 dBA L_{dn}, which is less than the County’s applicable threshold of 65 dBA L_{dn}. Similarly, the traffic noise level 100 feet from the segment of Tower Road between Childs Avenue and SR 140 would increase from 45.5 to 53.6 dBA L_{dn}. At the house located approximately 75 feet from this road segment, also in an unincorporated area of the County, the traffic noise level would increase to 55.5 dBA L_{dn}. While the resultant noise levels at the houses located along both road segments would be less than the County’s land use compatibility threshold of 65 dBA L_{dn}, the L_{dn} increase at both sensitive receptors would be noticeable (i.e., greater than 3 dBA). Furthermore, because the size of the noise level increase along both Tower Road between Gerard Avenue and Childs Avenue would be greater than 10 dBA, it would be perceived as a doubling of the sound level (Egan 1988).

It is noted, however, that the traffic noise level increases along these two segments of Tower Road would be less upon completion of the segment of Campus Parkway north of Childs Avenue and past SR 140, which is anticipated to occur sometime after the full buildout of the proposed project and before the year 2030. This is because trucks would no longer use Tower Road to access the site from SR 140, according to the traffic analysis prepared for this project (DKS 2008). As shown in the Baseline “2030 + Project” column of Table 4.8-11, the traffic noise level along Tower Road between Gerard Avenue and Childs Avenue would be 53.2 dBA L_{dn}, which is a 7.7 dBA increase compared to Baseline 2030 conditions, and the traffic noise level along Tower Road between Childs Avenue and SR 140 would be 52.9 dBA L_{dn}, which is a 7.4 dBA increase compared to Baseline 2030 conditions. These increases are due to the fact that the project would continue to generate some employee-based trips on Tower Road. Because the noise level increases would be noticeable (i.e., greater than 3 dBA) at both residences along Tower Road, during both the near-term and long-term baseline conditions, they would be considered a ***significant impact***.

Sensitive Receptors within Merced City Limits

The traffic noise level along the segment of Gerard Avenue between Campus Parkway and the project site entrances would increase from 56.5 to 66.9 dBA L_{dn} at a distance of 100 feet from the road under baseline 2010 conditions, as shown in Table 4.8-11. This segment passes by one off-site sensitive receptor, a farm house located approximately 95 feet south of the road and within the city limits. At this distance the resultant noise level would be approximately 67.3 dBA L_{dn}, which exceeds the City’s “normally acceptable” standard of 60 dBA L_{dn} for residential land uses. Assuming a typical exterior-to-interior noise reduction of 25 dBA, the interior noise level at this residence would be 42.3 dBA L_{dn}, which is less than the interior noise level standard of 45 dBA L_{dn}. Nonetheless, the 10.5 dBA increase in the exterior L_{dn}/CNEL noise level would be perceived as a doubling of sound (i.e., greater than 10 dBA). As a result, the traffic noise level increase at this farmhouse would be considered a ***significant impact***.

The traffic noise level would increase by 10.4 dBA along the segment of Gerard Avenue between the project site entrances and Tower Road, by 4.6 dBA along the segment of Campus Parkway between Coffee Street and Gerard Avenue, and by 3.7 dBA along the segment of Mission Avenue between SR 140 and Coffee Street; however, there are no existing or planned noise-sensitive receptors located along these road segments.

Mitigation Measure 4.8-3: Implement Measures to Reduce Exposure to Traffic Noise from Project. The project applicant shall implement the following measures to reduce the exposure of existing sensitive receptors to project-generated traffic noise levels:

- The applicant shall offer the owners of the two affected residences on the east side of Tower Road between SR 140 and Gerard Avenue and the single residence located on the south side of Gerard Avenue between Campus Parkway and the project site entrances the installation of a sound barrier along the property line of their affected residential properties. The sound barriers must be constructed of solid material (e.g., wood, brick, adobe, an earthen berm, or combination thereof). All barriers shall blend into the overall landscape and have an aesthetically pleasing appearance that agrees with the color and rural character of the houses and the general area, and not become the dominant visual element of the community. Relocation of the driveway at each residence may be necessary in order to preclude having gaps in the sound barrier. Relocation of landscaping may also be necessary to achieve an aesthetically pleasing appearance. The owners of the affected properties may choose to refuse this offer; however, the offer shall be made available to subsequent owners of the property. If an existing owner refuses these measures a deed notice must be included with any future sale of the property to comply with California state real estate law, which requires that sellers of real property disclose “any fact materially affecting the value and desirability of the property” (California Civil Code, Section 1102.1[a]) and shall indicate that the applicant agrees to install a sound barrier, as described above.. The applicant shall be responsible for all costs incurred by the implementation of this mitigation measure.

- To ensure compliance with applicable noise standards, a site-specific noise study shall be conducted by the City or its approved consultant to determine specific noise barrier design. The applicant shall be responsible for all costs incurred by the implementation of this mitigation measure.

Table 4.8-11
Summary of Modeled Traffic Noise Levels Along Area Roads

#	Roadway	From	To	L_{dn} (dBA) 100 ft from Centerline of Near Travel Lane[1]					
				2010 No Project	2010 + Project	Increase	2030 No Project	2030 + Project	Increase
1	SR 140	SR 99	Parsons Avenue	63.2	63.5	0.3	63.6	63.9	0.3
2	SR 140	Parsons Avenue	Santa Fe Avenue	62.3	62.6	0.3	64.7	64.9	0.3
3	SR 140[2]	Santa Fe Avenue	Kibby Road	64.9	65.1	0.2	65.1	65.2	0.1
4	SR 140	Kibby Road	Tower Road	62.6	63.1	0.6	64.4	64.6	0.2
5	Childs Avenue	SR 99	Parsons Avenue	63.1	63.2	0.1	64.1	64.2	0.1
6	Childs Avenue	Parsons Avenue	Coffee Street	62.3	62.5	0.2	62.3	62.5	0.2
7	Childs Avenue	Coffee Street	Campus Parkway[3]	63.6	63.7	0.1	61.6	61.8	0.2
8	Childs Avenue	Campus Parkway[3]	Kibby Road	61.9	61.9	0.0	62.8	62.8	0.0
10	Childs Avenue	Kibby Road	Tower Road	60.0	60.0	0.0	62.7	62.7	0.0
11	Gerard Avenue	Parsons Avenue	Coffee Street	54.2	54.2	0.0	54.0	54.1	0.1
12	Gerard Avenue	Coffee Street	Campus Parkway[3]	56.5	57.3	0.8	61.3	61.3	0.1
13	Gerard Avenue	Campus Parkway[3]	Site Entrance	56.5	66.9	**10.5**	59.8	65.5	**5.7**
14	Gerard Avenue	Site Entrance	Tower	45.5	55.9	**10.4**	51.5	55.2	**3.7**
16	Mission Ave	SR 99	Coffee Street	60.5	64.2	**3.7**	65.3	66.8	1.5
17	Campus Parkway[3]	Coffee Street	Gerard Avenue	59.2	63.8	**4.6**	64.8	66.4	1.7
18	Campus Parkway[3]	Gerard Avenue	Childs Avenue	53.0	53.5	0.5	61.0	61.6	0.6
19	Parson Avenue	Gerard Avenue	Childs Avenue	58.8	58.8	0.0	60.3	60.3	0.0
20	Parson Avenue	Childs Avenue	SR 140	60.6	60.7	0.1	60.0	60.0	0.0
21	Coffee Street	Mission Avenue	Parsons Avenue	60.6	60.6	0.0	58.8	58.8	0.0
22	Coffee Street	Gerard Avenue	Childs Avenue	60.4	60.6	0.2	58.5	58.7	0.2
23	Coffee Street	Childs Avenue	Baker Drive	58.2	58.3	0.1	52.3	52.3	0.0
24	Kibby Road	Childs Avenue	SR 140	60.0	60.0	0.0	54.5	54.5	0.0
25	Baker Drive	SR 140	Coffee Street	58.3	58.4	0.1	53.8	53.8	0.0
26	Tower Road	Gerard Avenue	Childs Avenue	45.5	57.2	**11.8**	45.5	53.2	**7.7**
27	Tower Road	Childs Avenue	SR 140	45.5	53.6	**8.1**	45.5	52.9	**7.4**

Notes: SR = State Route

1 Traffic noise levels were predicted using the FHWA Traffic Noise Model RD77-108 based on traffic information (e.g., average daily traffic, vehicle speeds, roadway width) obtained from the data generated by DKS Associates used to prepare the traffic section for this DEIR. Modeled estimates assume no natural or human-made shielding (e.g., vegetation, berms, walls, buildings). Refer to Appendix D for modeling input assumptions and output results.

2 It is anticipated that SR 140 between Santa Fe Avenue and Kibby Road will be widened from two lanes to four lanes before year 2030, as stated in the traffic report (DKS 2008).

3 The exact timing of the development of the planned Campus Parkway extention is not known at this time. The new road is projected to be completed after full buildout of the proposed project and before the year 2030.

Source: Modeling performed by EDAW in 2008

- The cost to fully implement this mitigation measure, including related studies, and design and installation shall be completely funded by the applicant.

- The applicant shall maintain its truck fleet in proper working condition, including truck mufflers and exhaust systems, according to manufacturers' specifications.

The sound barriers required along the east side of Tower Road by Mitigation Measure 4.8-3 are considered feasible because they would need to achieve a minimum 4.7 dBA reduction to minimize the traffic noise increase to a ***less-than-significant*** **level under baseline 2030 conditions** (i.e., to an increase smaller than 3 dBA)*;* however, this would not occur until some of the project-generated traffic is diverted to the future extended Campus Parkway. Until the completion of Campus Parkway north of Childs Road, a reduction of 8.8 dBA would be needed at the house located on the segment of Tower Road between Gerard Avenue and Childs Avenue and a reduction of 5.1 dBA would be needed along the segment of Tower Road between Childs Avenue and SR 140 to offset noticeable traffic noise increases. Because it would not be feasible to design sound barriers that provide 8.3 dBA levels of reduction and meet the required aesthetic and design elements required by Mitigation Measure 4.8-3, this impact would be considered ***significant and unavoidable*** **until Campus Parkway is extended to SR 140**.

The sound barriers study required by Mitigation Measure 4.8-3 along the south side of the segment of Gerard Avenue between Campus Parkway and the project site entrances would provide some protection against the increased levels of traffic noise generated by the project; however, these barriers would not provide enough reduction to offset the 10.5 dBA traffic noise level increase along this road segment. Therefore, because it would not be possible to design a sound barrier that provides enough reduction to reduce the resultant noise level to less than the City's "normally acceptable" standard of 60 dBA L_{dn} for residential land uses and meet the required aesthetic and design requirements, this impact would be considered ***significant and unavoidable***.

IMPACT 4.8-4 — Intermittent Single-Event Noise from Trucks Passing Off-Site Sensitive Receptors. *Intermittent Single-Event Noise Level increases from Trucks Passing Off-Site Sensitive Receptors would result in a* **significant** *impact*.

In addition to increases in average daily traffic noise, as discussed in Impact 4.8-3, intermittent SENLs and increases in the frequency of occurrence of such levels would be of additional concern, particularly during the more noise-sensitive evening and nighttime hours. Although the average daily noise descriptors (i.e., L_{dn} and CNEL) incorporate a nighttime weighting or "penalty" that is intended to reflect the expected increased sensitivity to noise annoyance at night, L_{dn} and CNEL standards do not fully protect residents from sleep disturbance.

Noise levels generated by passing haul trucks typically range from approximately 87 to 90 dBA SENL at 50 feet (U.S. Environmental Protection Agency 1971). Assuming a typical exterior-to-interior noise reduction of 25 dBA, the interior SENL at residences 50 feet from the roadway would be 62 to 65 dBA SENL. Intermittent SENL impacts would vary considerably depending on various factors, such as background noise levels and the distance from source to receptor. Based on long-term counts collected at the existing Wal-Mart distribution center in Apple Valley, approximately 47% of the 644 truck trips generated by the project would occur during the evening or nighttime hours (i.e., approximately 303 truck trips per evening/night). Truck traffic generated by the project on nearby roads, particularly during nighttime hours on rural roads could potentially result in increased exposure of sensitive receptors along these roads. These SENLs could occur at residences located along those roadways where increased truck traffic would occur. Under baseline 2010 conditions, this impact could be experienced at the farm house located on the south side of the segment of Gerard Avenue between Campus Parkway and the project site entrance, the farm house located on the east side of the segment of Tower Road between SR 140 and Childs Avenue, and the farm house located on the east side of Tower Road between Childs Avenue and Gerard Avenue. The exact degree to which these truck pass-bys would result in sleep awakenings is not known; however, some insight is provided by studies concerning the sleep disturbance effects from aircraft overflights by the FICAN. According to the FICAN, 10% of the exposed population is estimated to be awakened when the SENL interior noise level of 81 dBA, an estimated 5 to 10% of the population is affected when the SENL interior noise level is between 64.8 and 81 dBA, and few sleep awakenings (less than 5 percent) are predicted if the interior SENL is less than 64.8 dBA (FICAN 1997). Thus, SENLs generated by truck pass-bys associated with project operations could affect 5 to 10 percent of the exposed population. In fact, assuming no varying topography or intervening barriers and the typical 25 dBA exterior-to-interior reduction of residential structures, the interior 64.8 SENL contour would extend approximately 55 feet from the roadway.

After Campus Parkway is extended to SR 140, all project-generated truck traffic would use the new road. Under these conditions, only the farm house located on the south side of Gerard Avenue between Campus Parkway and the project site entrance could experience high nighttime SENLs from truck trips associated with the project. As a result, this impact is considered ***significant*** under both baseline 2010 and baseline 2030 conditions.

Implement Mitigation Measure 4.8-3.

The project applicant shall implement the following measures to reduce the exposure of existing sensitive receptors to interior SENLs:

- In addition, the City, at the expense of the applicant, shall conduct a traffic noise study of all residential structures with inhabitable rooms that are within 55 feet of a projected truck route that is part of the traffic study area for this EIR (as shown in Exhibit 4.11-1 of Section 4.11, "Traffic and Transportation"). This study shall estimate the exterior-to-interior attenuation provided by the structure and the resultant interior SENL level from a truck pass-by that would generate an exterior SENL of 90 dBA at a distance of 50 feet. If the interior SENL level estimated by the study exceeds 64.8 dBA, then the owner of the affected residence shall be retrofitted to insure that interior SENL levels do not exceed 64.8 dBA. Retrofit measures may include increased wall insulation, installation of duel-pane windows with laminated glass, and, the installation of central air conditioning/ventilation system to the affected home if one is not already present.

- The party estimating the interior SENLs shall be selected by the City and the analysis shall be funded by the applicant. The cost to fully implement this mitigation measure, including related studies, and design, and building retrofitting shall be provided and completely funded by the applicant. All studies and building retrofitting shall be completed before the project becomes operational.

Implementation of Mitigation Measure 4.8-3 would reduce the loudness of SENLs associated with trucks passing sensitive receptors on nearby roads. Because Mitigation Measure 4.8-5 requires that interior SENLs be evaluated for affected residential receptors and reduced through building retrofitting, the impact at these receptors would also be reduced to a ***less-than-significant*** level.

IMPACT 4.8-5	**Exposure of Sensitive Receptors or Generation of Excessive Vibration Levels.** *Short-term construction-generated vibration levels and truck vibration levels during long-term operations would not exceed Caltrans's recommended standard of 0.2 in/sec PPV with respect to the prevention of structural damage for normal buildings or FTA's maximum acceptable vibration standard of 80 VdB regarding human response for residential uses (i.e., annoyance) at nearby existing residential dwellings. This impact 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 4.8-12 displays vibration levels for typical construction equipment.

As discussed under Impact 4.8-1 above, on-site construction equipment would include excavators, graders, scrapers, loaders, backhoes, and haul trucks; and no pile driving would occur. The closest off-site structures are the farm house and barn located across Gerard Avenue approximately 400 feet from the southwest corner of the project site. Based on the vibration levels presented in Table 4.8-12, there would be no potential structural damage to these structures because construction vibration levels would not exceed Caltrans's recommended standard of 0.2 in/sec PPV (Caltrans 2002) with respect to the prevention of structural damage for normal buildings.

According to FTA, and as shown in Table 4.8-12, vibration levels associated with the use of large bulldozers is 87 VdB (referenced to 1 µin/sec and based on the RMS velocity amplitude) at a distance of 25 feet. Using FTA's recommended procedure for applying a propagation adjustment to these reference levels, the vibration levels would attenuate to 69 VdB at a distance of 100 feet. Therefore, construction vibration levels would not exceed FTA's maximum-acceptable vibration standard of 80 VdB (FTA 2006) with respect to human annoyance at residential uses.

Table 4.8-12
Typical Construction Equipment Vibration Levels

Equipment		PPV at 25 feet (in/sec)[1]	Approximate L_v (VdB) 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 L_v is the velocity level in decibels (VdB) and based on the root mean square (RMS) velocity amplitude.

Source: FTA 1995

Vibration sources associated with long-term operation of the project would consist of haul trucks and yard trucks maneuvering on site and haul trucks traveling over area roadways. Similar to the heavy-duty equipment operated during project construction, vibration generated by on-site truck activity would have no potential to cause structural damage to off-site structures because truck vibration levels would not exceed Caltrans's recommended standard of 0.2 in/sec PPV (Caltrans 2002) with respect to the prevention of structural damage for normal buildings or FTA's maximum-acceptable vibration standard of 80 VdB (FTA 2006) with respect to human annoyance at residential uses. In addition, the project would not generate truck trips on area roads that pass within 50 feet of off-site residences (e.g., SR 140, Tower Road, proposed Campus Parkway).

Thus, short-term construction and long-term operation would not result in the exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels. As a result, this impact is considered ***less than significant***.

Mitigation Measure

No mitigation is required.

IMPACT 4.8-6 **Land Use Compatibility of Proposed Project with On-Site Noise Levels.** *As a light industrial land use, the proposed project would not be considered a noise sensitive receptor and existing and future projected noise levels are not expected to exceed the City's "normally acceptable" noise standard of 75 L_{dn} for industrial land uses. Therefore, exposure of proposed facility to noise generated at surrounding land uses would be a* ***less-than-significant*** *impact.*

The proposed project would not be considered a noise-sensitive land use and would be located near other light industrial land uses (i.e., Central Valley Processing and McLane Pacific Grocery Distribution Center) to the north across Childs Avenue, agricultural land uses to the east and south, and residential neighborhoods located over 1,200 feet to the west. These nearby land uses are not expected to generate noise levels that would exceed the City's "normally acceptable" noise standard of 75 L_{dn} for industrial land uses. In addition, future projected traffic noise levels on nearby roads are not expected to exceed 75 L_{dn} at the project site, as shown in Table 4.8-11. Furthermore, the proposed project is not located within an airport land use plan or within 2 miles of a public airport or public use airport. The closest airport, Merced Municipal Airport, is located more than 4 miles away. Therefore, the development of a distribution facility at the proposed project site would be noise-compatible with surrounding land uses. As a result, this impact would be **less than significant**.

Mitigation Measure

No mitigation is required.