4.9 NOISE AND VIBRATION

4.9.1 INTRODUCTION

This section addresses the potential for the Proposed Project to produce noise and vibration impacts. Following an overview of the existing noise setting in **Subsection 4.9.2** and the relevant regulatory setting in **Subsection 4.9.3**, project-related impacts and recommended mitigation measures, if any, are presented in **Subsection 4.9.4**.

4.9.2 ENVIRONMENTAL SETTING

Fundamentals of Acoustics

Sound Properties

Often described as unwanted sound, noise is a subjective reaction to a physical phenomenon. Sound is variations in air pressure that the ear can detect. The ear responds to pressure changes over a range of 0.000,000,000,000,01 to 1 watt per meter squared. To deal with the extreme range of pressures which the ear can detect, researchers express the amount of acoustical energy of a sound by comparing the measured sound pressure to a reference pressure, then taking the logarithm (base 10) of the square of that number. This original unit of sound measurement, a bel, corresponded well to human hearing characteristics if it was divided by a factor of 10. The resulting unit, one tenth of a bel, is called the decibel (dB). The threshold of hearing is considered to be zero (0) dB, and the range of sounds in normal human experience is 0 to 130 dB.

Because sound pressure levels are defined as logarithmic numbers, the values cannot be directly added or subtracted. For example, two sound sources, each producing 50 dB, will produce 53 dB when combined, not 100 dB. This is because two sources have two times the energy of one source, and 10 times the logarithm of 2 equals 3. Similarly, ten sources produce a 10 dB higher sound pressure level than one source, as ten times the logarithm of 10 equals 10.

The ear responds to pressure variations in the air from about 20 times per second to about 20,000 times per second. The frequency of the variations is described in terms of hertz (Hz). The ear does not respond equally to all frequencies. This difference in perceived loudness varies with the sound pressure level of the sound. In general, the maximum sensitivity of the ear occurs at frequencies between about 500 and 8000 Hz. To compensate for the fact that the ear is not as sensitive at some frequencies and sound pressure levels as at others, a number of frequency weighting scales have been developed. The "A" weighting scale is most commonly used for environmental noise assessment, as sound pressure levels measured using an A-weighting filter correlate well with community response to noise sources such as aircraft and traffic. When an A-weighting filter is used to measure sound pressure levels it is denoted as dBA. **Table 4.9-1** shows typical sound levels and relative loudness for various types of noise environments.

TABLE 4.9-1 EXAMPLES OF A-WEIGHTED SOUND LEVELS AND RELATIVE LOUDNESS

Sound	Sound Level (dBA)	Relative Loudness (approximate)	Relative Sound Energy
Jet aircraft, 100 feet	130	128	10,000,000
Rock music with amplifier	120	64	1,000,000
Thunder, snowmobile (operator)	110	32	100,000
Boiler shop, power mower	100	16	10,000
Orchestral crescendo at 25 feet, noisy kitchen	90	8	1,000
Busy street	80	4	100
Interior of department store	70	2	10
Ordinary conversation, 3 feet away	60	1	1
Quiet automobile at low speed	50	½	.1
Average office	40	1/4	.01
City residence	30	1/8	.001
Quiet country residence	20	1/16	.0001
Rustle of leaves	10	1/32	.00001
Threshold of hearing	0	1/64	.000001

Source: U.S. Department of Housing and Urban Development, "Aircraft Noise Impact -- Planning Guidelines for Local Agencies," 1972.
Note: dBA: A weighting decibel

Environmental Noise Descriptors

Ambient noise level is defined as the noise from all sources near and far. A similar term is background noise level. This term usually refers the ambient noise level that is present before a noise source being studied is introduced. A synonymous term is pre-project noise level.

Most environmental noise sources produce varying amounts of noise over time, so the measured sound levels also vary. For example, noise produced during a train passage will vary from relatively quiet background levels before the event to a maximum value when the train passes by, then returning down to background levels as the train leaves the observer's vicinity. Similarly, noise from traffic varies with the number and types of vehicles, speed, and proximity to the observer.

Variations in sound levels may be addressed by statistical methods. The simplest of these are the maximum (L_{max}) and minimum (L_{min}) noise levels, which are the highest and lowest levels observed. To describe less extreme variations in sound levels, other statistical descriptors may be used, such as the L_{10} and L_{50} and L_{90}. The L_{10} is the A-weighted sound level equaled or exceeded during 10 percent of a time period. Similarly, the L_{50} and L_{90} are the sound levels equaled or exceeded during 50 and 90 percent of a time period. The most common time period used with these statistical descriptors is one hour, although any time period could be used so long as it is stated. Because statistical descriptors such

as L_{10}, L_{50}, etc. are sometimes cumbersome to calculate, the equivalent sound level (L_{eq}) or energy average sound level is often used to describe the "average" sound level during stated time period, usually one hour.

Community Noise Equivalent Level (CNEL) is calculated from hourly L_{eq} values, after adding a "penalty" to the noise levels measured during the evening (7 p.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) periods. The penalty for evening hours is a factor of 3, which is equivalent to 4.77 dB. The penalty for nighttime hours is a factor of 10, which is equivalent to 10 dB. To calculate L_{dn} (also called DNL), the evening penalty is omitted (EPA, 2009).

Noise Attenuation

Stationary point sources of noise, including stationary mobile sources such as idling vehicles, attenuate (lessen) at a rate of 6 to 9 dB per doubling of distance from the source, depending on environmental conditions (i.e., atmospheric conditions and noise barriers, either vegetative or manufactured, etc.). Widely distributed noises, such as a large industrial facility spread over many acres, or a street with moving vehicles, would typically attenuate at a lower rate, approximately 4 to 6 dB.

Vibrations

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings. The root mean square (RMS) amplitude is most frequently used to describe the affect of vibration on the human body. The RMS amplitude is defined as the average of the squared amplitude of the signal. Decibel notation (VdB) is commonly used to measure RMS. The decibel notation acts to compress the range of numbers required to describe vibration. Typically, gound-bourne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration.

Existing Conditions

Noise Sensitive Receptors

Noise sensitive land uses are generally defined as land uses with the potential to be adversely affected by the presence of noise. Examples of noise sensitive land uses include residential housing, schools, health care facilities, and outdoor activity areas. Existing noise sensitive receptors in the project area with the potential to be adversely affected by the project are residential housing located near the project site and along roadways utilized by construction-related traffic. The nearest residential sensitive receptors consist of a single family home located within approximately 650 feet from the northwest boundary of the project site where major construction activities would occur, followed by a single family residential neighborhood in the Town of Elmira, beginning approximately 750 feet from the site. Additionally, three single-family homes are located approximately 1,000 feet east of the project site along Lewis Road.

Ambient Noise Levels

The area surrounding the Easterly Wastewater Treatment Plant is primarily rural in nature (i.e. agriculture and scattered residences), with the small community of Elmira located to the northwest. Ambient noise measurements were conducted to calculate Ldn at three locations in the vicinity of the proposed project site (Sites A, B, and C indicated on **Figure 4.9-1**) on June 30 to July 1, 2009. Measurements taken at Site A were intended to describe the existing traffic noise levels along Leisure Town Road, an anticipated haul route for construction related traffic. The purpose of measurements taken at Sites B and C was to describe the overall 24-hour ambient noise environment at the EWWTP site boundaries, which is dominated by operation of wastewater treatment plant equipment, traffic on Vaca Station Road, and passing trains along the Union Pacific Railroad (UPRR), located 0.3 miles west. Additionally, three 15-minute noise level measurements were conducted at Sites 1, 2, and 3 as shown in **Figure 4.9-1**. The purpose of the measurement taken at Site 1 was to characterize the noise level produced from operation of existing pumps at the EWWTP. The purpose of the noise measurements taken at Sites 2 and 3 was to characterize the existing traffic noise levels along roadways that may be utilized by project related construction traffic. **Table 4.9-2** summarizes the noise measurement results. Noise measurement output files are provided in **Appendix K**.

TABLE 4.9-2 MEASURED EXISTING AMBIENT NOISE LEVELS

Date	Sites					
	15-Minute Measurements (reference distance of 50 feet)			24-Hour Measurements (reference distance of 50 feet)		
June 30 - July 1, 2009	**1**	**2**	**3**	**A**	**B**	**C**
Noise Levels (Ldn, dBA)	79.7	77.2	68.4	74.8	63.8	61.3
Source: AES, 2009						

Ambient noise measurements taken near the EWWTP boundaries (Sites B and C, **Figure 4.9-1**) indicate that background noise levels are relatively constant. Average hourly noise levels during the survey period at these sites ranged from about 42 to 76 dBA. Ambient noise measurement at Site A ranged between 38 and 87 dBA. Noise monitoring at Sites 1, 2, and 3 was conducted between 1:20 pm and 2:10 pm and varied between 68 to 79 dBA Leq.

Existing Noise Sources

Vaca Station Road Traffic

Vaca Station Road has a low volume of traffic that produces intermittent increases in noise in the vicinity of the project site. 24-hour noise measurements near the project site (Site B, **Figure 4.9-1**) show that background noise levels along Vaca Station Road are relatively constant.

Rail Traffic

The UPRR line that services AMTREK passenger and freight trains is located between Interstate 80 (I-80) and the project site. The railroad line runs northeast to southwest through the town of Elmira

SOURCE: DigitalGlobe aerial photograph, 6/2007; AES 2010

Figure 4.9-1
Location of Noise Measurement Sites

approximately 1,550 feet from the northwestern edge of the project site. The rail traffic near the project site is moderate to heavy, and is periodically the main noise source in the immediate area of the railroad tracks.

Pumps

There are two locations of existing influent pumps at the EWWTP, one in the North Plant and one in the South Plant. The three North Plant influent pumps are used periodically and are closest to the noise receptors in the town of Elmira (approximately 750 feet from the nearest single family home). The North Plant pumps are older and have no noise insulation features. The three South Plant influent pumps are used constantly and are located further away from receptors (approximately 1200 feet from the nearest single family home). The South Plant pumps were installed with the 1998 expansion and have noise protection features. The North Plant pumps will be demolished as part of the Proposed Project, and a new pump will be added at the South Plant to handle the capacity of the demolished North Plant. Removal of the noisy pumps at the North Plant will significantly reduce noise currently produced by the EWWTP during peak flow periods. Noise monitoring was conducted in the vicinity of the South Plant pumps (Site 1, **Figure 4.9-1**), and demonstrated a consistent pump operational noise level of 79.7 dBA at 100 feet from the pump station.

Agricultural Machinery

Agricultural machinery can produce noise up to 90 dB, in some instances creating short term noise nuisances. However, agricultural noise is seasonal and short term and is generally not the main source of noise in the project area.

Travis Air Force Base (AFB)

The Travis AFB is located approximately four miles south of the project site. According to the 2002 Travis AFB Land Use Compatibility Plan (LUCP), discussed in **Section 4.9.3** below, the project site is located outside of the 60-65 CNEL contour line; therefore, ambient noise in the project vicinity resulting from proximity to the Travis AFB is, at most, less than 60 CNEL.

Sources of Groundborne Vibration

Based upon the field investigations conducted by AES in 2009, the only source of vibration in the area of the proposed project are trains passing 1,550 feet from the northwest corner of the project site. The average train produces 85 vibration velocity levels in dB (VdB) at a distance of 50 feet. The perceptible level of vibration for humans is 65 VdB. Vibration levels decrease at an average rate of about 7.5 dB per doubling of distance (U.S.DOT, 1995); therefore, the project site would experience approximately 50 VdB level from trains, which is below the threshold of human perceptibility.

4.9.3 REGULATORY CONTEXT

Noise Levels

Federal

Travis Air Force Base Land Use Compatibility Plan (2002)

The project site is located within the boundaries of the Travis AFB LUCP. The LUCP sets forth land use compatibility policies to ensure that future land uses in the surrounding area will be compatible with the realistically foreseeable aircraft activity at the base. As described in more detail in **Section 4.6.3**, the majority of the project site is located in Zone C while the northwest corner of the site is located within Zone D. EWWTP facilities located in Zone D include the majority of the North Plant, the maintenance building, and approximately half of the existing "west pond" area.

Noise is one of three Compatibility Factors identified within the LUCP. The LUCP states that "the acceptability of nonresidential development in noise-impacted areas is dependent upon the noise sensitivity of the specific use and the extent to which the usage can be shielded from aircraft noise." As discussed above, the project site is located outside of the 60-65 CNEL noise contour line. The LUCP characterizes public utility uses as being "clearly acceptable" for land within Zone C and outside the 60-65 CNEL noise contour line. This characterization means that the activities associated with a public utility land use, such as the EWWTP, can be carried out with essentially no interference from the exposure to noise from the Travis AFB. Zone D is located significantly outside of the 60-65 CNEL contour line, and limitations on structure height are the only compatibility factors within this zone.

Local

The Proposed Project is located within the City of Vacaville, but is surrounded by County unincorporated lands. Because the policies and regulations outlined in the Solano County General Plan only pertain to County jurisdiction, and because City General Plan policies pertain only to City land, both are discussed below.

City of Vacaville General Plan (1990)

Goals and policies the Noise Element of the City of Vacaville General Plan that are applicable to the Proposed Project are listed below.

10.6-G3 Ensure that noise does not exceed interior noise levels of 45 DNL for residential, transient lodging, hospital and nursing/convalescent structures from transportation or fixed-point noise sources.

10.6-G4 Minimize vehicular noise sources and noise emanating from transportation activities; control noise at its source to maintain existing noise levels, and in no case exceed acceptable noise levels as established in the Noise and Land Use Compatibility Guidelines, **Table 4.9-3** (Table 10-1 of General Plan).

10.6-G6 Limit truck traffic in residential areas to designated truck routes.

10.6-G8 Encourage other agencies to reduce noise levels generated by roadways, railways, airports and other facilities.

10.6-G 9 Noise created by transportation noise sources shall be mitigated so as not to exceed the interior and exterior noise level standards of **Table 4.9-3** (Table 10-1 of General Plan).

TABLE 4.9-3 NOISE & LAND USE COMPATIBILITY POLICY FOR TRANSPORTATION SOURCES[1] (Table 10-1).

Land Use Category	Noise standard (DNL)		Community Noise Exposure Unmitigated Day/Night Average Noise Level (DNL) in Decibels (dB)																	
			Noise contour																	
	Interior	Exterior	40		45		50		55		60		65		70		75		80	
Residential	45	60																		
Transient Lodging Motels, Hotels	45	--																		
Hospitals, Nursing Homes	45	60																		
Other uses	--	--																		
	Normally acceptable with typical conditions of approval (setbacks, walls, fences and standard building practices).																			
	conditionally acceptable - subject to noise study to demonstrate noise can be reduced to normally acceptable levels with acceptable mitigation																			
	normally unacceptable - regardless of measures implemented to reduce noise.																			

Notes:
1. This table establishes the maximum transportation noise levels that persons should be exposed to and helps determine the type of review necessary when land uses are proposed within existing noise contours. For the purposes of the Noise Element, transportation noise sources are defined as traffic on public roadways, railroad line operations and aircraft in flight.
2. In multi-family/attached unit projects, applies to courtyards, patios, private areas and activity areas.
3. Areas designed for outdoor activity should be located away from noise sources.
4. Applies to courtyards, patios, private areas and activity areas.
5. Other uses are subject to federal and state OSHA noise exposure standards.
Source: City of Vacaville, 1990

10.6-G10 Noise created by non-transportation noise sources shall be mitigated so as not to exceed the interior and exterior noise level standards in **Table 4.9-4** (Table 10-4 of the General Plan).

10.6-I7 Encourage the use of open space, parking, accessory buildings, and landscaping to buffer new and existing development from noise. Use sound walls when other methods are not practical or when recommended by an acoustical expert as part of a mitigation program, consistent with back-up landscape treatments where residential subdivision back-up to roadway.

10.6-I22 Work with the Solano County ALUC and other agencies to reduce noise generated from sources outside the City's jurisdiction.

Table 4.9-4 NOISE & LAND USE COMPATIBILITY POLICY FOR NON-TRANSPORTATION SOURCES[1] (Table 10-4)

Land Use Category	Noise Level Descriptor	Exterior Noise Levels[2, 3, 4, 5]		Interior Noise Levels[2, 3, 4, 5]	
		Daytime (7 a.m. to 10 p.m.)	Nightime (10 p.m. to 7 a.m.)	Daytime (7 a.m. to 10 p.m.)	Nightime (10 p.m. to 7 a.m.)
Residential	Hourly Leq, dBA	50[6]	45[6]	45	35
	Maximum Level, dBA	70[6]	65[6]	--	--
Transient Lodging	Hourly Leq, dBA	--[7]	--[7]	45	35
Hospitals, Nursing Homes	Hourly Leq, dBA	50[8]	45[8]	45	35
Other uses[9]	Hourly Leq, dBA	--	--	--	--
	Maximum Level, dBA	--	--	--	--

Each of the noise levels specified above shall be lowered by five dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises. These noise level standards do not apply to residential units established in conjuction with industrial or commercial uses (e.g., caretaker dwellings).

Notes:

1. This table establishes the maximum non-transportation noise levels that persons should be exposed to. For the purposes of the Noise Element, non-transportation noise sources may include industrial operations, outdoor recreation facilities, HVAC units, loading docks, construction equipment, etc.
2. Compliance with the noise level standards is to be measured at the affected location of the land use category.
3. If the existing noise levels exceed that of a proposed noise generator, these standards would not be applied to the new noise source unless the additional noise generated would increase the projected, combined noise levels a minimum of three decibels.
4. These standards are applicable to land use determinations and entitlements. They are not applicable for nuisance abatement within residential areas.
5. Exceptions to the standards may be approved for public parks or playgrounds upon a finding that the facility has been designed in a manner that practically limits the noise impact upon other land uses.
6. In multi-family/attached unit projects, applies to courtyards, patios, private areas and activity areas.
7. Areas designed for outdoor activity should be located away from noise sources.
8. Applies to courtyards, patios, private areas and activity areas.
9. Other uses are subject to federal and state OSHA noise exposure standards.

Source: City of Vacaville, 1990

Solano County General Plan (2008)

The criteria for evaluating noise impacts in the County are set forth in the Health and Safety Element of the Solano County's General Plan. The standards and policies, of the County's Health and Safety Element applicable to the Proposed Project are listed below:

Policies and Standards

HS.P-48 – Consider and promote land use compatibility between noise-sensitive and noise-generating land uses when reviewing new development proposals.

HS.P-52 **–** Minimize noise conflicts between current and proposed land uses and transportation networks by encouraging compatible land uses around critical areas with higher noise potential.

Implementation Programs

HS.I-69 – Promote the use of berms, landscaping, setbacks, or architectural design for noise abatement, in addition to conventional wall barriers, to enhance aesthetics and minimize pedestrian barriers. Development of noise-sensitive land uses in areas exposed to existing or projected levels of noise from transportation, stationary sources, or agricultural operations exceeding, or estimated to exceed, levels specified in **Table 4.9-5** (Table HS-2) shall require transportation planning, traffic calming, site planning, buffering, sound insulation, or other methods to reduce noise exposure in outdoor activity areas and interior spaces to the levels specified in Table HS-2.

HS.I-71 – Locate industrial and other noise-generating land uses away from noise-sensitive land uses and/or require substantial noise sources to be completely enclosed within buildings or structures.

Vibration Standards

The Federal Transit Administration (FTA) has published guidelines for assessing the impacts of ground-borne vibration which would be suitable for this project. The FTA recommendations are expressed in terms of the "vibration level," which is calculated from the peak particle velocity due to ground-borne vibration. The FTA measure of the threshold of perception is 65 VdB, which correlates to a peak particle velocity of about 0.002 inches per second (in/sec). The FTA measure of the threshold of architectural damage for conventional sensitive structures is 100 VdB, which correlates to a peak particle velocity of about 0.2 in/sec.

TABLE 4.9-5 SOLANO COUNTY – NOISE LEVELS USED TO DETERMINE PROJECT IMPACTS (Table HS-2)

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 - Multifamily	<65	60-70	70-75	75+
Transient Lodging - Motel, Hotel	<65	60-70	70-80	80+
Schools, Libraries, Churches, Hopitals, 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+
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+	

Notes:

CNEL = community noise equivalent level; dBA = A-weighted decibel; Ldn = day-night average noise level.

These standards are not applicable for development within the airport compatibility review area. Development in the airport compatibility review areas are subject to standards in the applicable airport land use plan.

[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: Solano County, 2008.

4.9.4 Impacts and Mitigation Measures

Methodology

This section identifies any impacts to the existing noise environment that could occur from construction, operation, and/or maintenance of the Proposed Project. Impacts to ambient noise conditions were analyzed based on an examination of the project site and published information regarding noise of the project area, and comparison of these factors to the significance criteria listed below. If significant impacts are likely to occur, mitigation measures are included to increase the compatibility of the Proposed Project and reduce impacts to less-than-significant levels. The increase in traffic noise resulting from the Proposed Project is determined through a comparison of trip generation to existing traffic levels on affected roadways. A doubling of traffic on a roadway would result in a three dBA increase in traffic noise, the lower threshold for human detection of increase in the ambient noise environment (FHWA, 2006).

Thresholds of Significance

Criteria for determining the significance of impacts to the noise environment have been developed based on Appendix G of the CEQA *Guidelines* and relevant agency thresholds. Impacts to the noise environment would be considered significant if the proposed project would result in:

- Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies
- Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project
- For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels
- For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels

Additionally, the following thresholds of significance have been developed for this project based on the City of Vacaville and Solano County noise standards. Only standards relevant to the applicable jurisdiction where an increase in noise would occur are used to evaluate noise impacts of the Proposed Project. For example, construction related traffic noise along County roadways would occur from a source located in the County, therefore, County noise standards are the applicable threshold. Non-transportation noise from construction activities at the EWWTP and operation of the Proposed Project would occur in the City, but would affect sensitive receptors located in the County. Although County residents would be affected, because of the location of the noise source, City noise standards are

applicable. Noise related impacts resulting from the project would be considered significant if any of the following occur:

Construction Related Traffic Noise within the City Limits (refer to **Table 4.9-3**).

- Traffic resulting from the Proposed Project causes the community noise exposure at residential land uses to exceed the normally accepted exterior level of 60 dBA DNL, or interior level of 45 dBA DNL.

Construction Related Traffic Noise within the County (refer to **Table 4.9-5**)

- Traffic resulting from the Proposed Project causes the community noise exposure at residential land uses to exceed the conditionally accepted exterior level of 70 dBA DNL.

On-site EWWTP Construction and Operational Noise (refer to **Table 4.9-4**)

- Operational and construction activities at the EWWTP resulting from the Proposed Project causes the exterior noise level at residential land uses to exceed 50 dBA Leq (hourly), or 70 dBA Lmax (single event), during daytime hours (7 a.m. to 10 p.m.) .
- Operational and construction activities at the EWWTP resulting from the Proposed Project causes the interior noise level at residential land uses within the City to exceed 45 dBA Leq (hourly), during daytime hours (7 a.m. to 10 p.m.)

The following threshold of significance has been developed for this project based on the FTA and Caltrans' standards for vibration. Groundbourne vibration related impacts resulting from the project would be considered significant if it would result in the following:

- Construction or operation of the project results in the exposure of sensitive receptors to excessive groundbourne vibration levels in exceedance of the FTA vibration standards (65 VdB for land uses such as hospitals where low ambient vibration in essential for interior operations, 83 VdB for institutional land uses such as offices, and 80 VdB for residential land uses).
- Construction or operation of the project results in the exposure of structures to excessive groundbourne vibration levels in exceedance of the Caltrans' Guidelines Vibration Damage Potential Threshold Criteria (0.50 PPV for newer residential structures, commercial and industrial buildings).

Effects Found Not to Be Significant

The project site is not located within two miles of a public airport or public use airport, or within the vicinity of a private airport landing strip. Although the project site is located within the Travis Airport Land Use Plan area, the project is consistent with acceptable uses within the land use plan for the zone that it is located in and would not expose people residing or working in the project area to excessive noise levels.

Therefore, as determined within the Initial Study (**Appendix B**), further analysis of these issues is not included within this EIR.

Project Specific Impacts and Mitigation Measures

Construction Impacts

Impact

4.9-1 Construction activities could intermittently and temporarily generate noise levels significantly greater than existing ambient levels in the Proposed Project vicinity.

Construction of basins, pumping stations, filters, lagoons, and buildings would involve heavy equipment usage such as grading, excavating, forklifts, and jack hammering. Activities associated with the demolition of facilities in the north plant and construction of proposed improvements would intermittently and temporarily add to the existing noise environment, and therefore, would have the potential to raise the ambient noise levels in the vicinity of sensitive receptors. **Table 4.9-6** shows typical noise level for common construction equipment.

TABLE 4.9-6 NOISE EMISSION LEVELS FOR CONSTRUCTION EQUIPMENT

Equipment Description	Typical Use Factor %	Predicted Lmax @ 50 ft (dBA, Lmax)
Backhoe	40	80
Concrete Mixer Truck	40	85
Concrete Pump Truck	20	82
Dozer	40	85
Dump Truck	40	84
Excavator	40	85
Flat Bed Truck	40	84
Front End Loader	40	80
Jack Hammer	25	80
Pickup Truck	40	55
Pneumatic Tools	50	85
All Other Equipment > 5 HP	50	85
Source: FHWA, 2006.		

The nearest sensitive receptor is 650 feet northwest of where major construction activities would occur in the northern section of the project site. As indicated in **Table 4.9-6**, the noisiest activities associated with construction would average 85 dBA, Lmax at 50 feet from the construction equipment. Construction noise attenuates at a rate of between 6 and 9 dBA per doubling of distance (FHWA, 2006). The area between where construction would occur and the nearest sensitive receptor is buffered with tall trees; therefore, it is appropriate to use a 7.5 dBA reduction for construction noise. Taking into account existing ambient noise levels, the resulting maximum

noise level as a result of construction activities that would occur at the nearest sensitive receptor west of the project site would be 58.75 dBA Lmax. Therefore, noise levels at additional sensitive receptors west of the project site in the Town of Elmira are expected to be lower than 58.75 dBA Lmax.

The nearest sensitive receptors east of the project site consist of three residences located along Lewis Road, near Old Alamo Creek. There are few trees east of the project site; however, the open fields are generally populated with crops; therefore, an attenuation of 6.0 is appropriate. Taking into account existing ambient noise levels, the resulting maximum noise level as a result of construction activities that would occur at the nearest sensitive receptor east of the project site would be 47.5 dBA Lmax.

Noise levels as a result of construction would not cause an exceedance of the City's land use compatibility max level of 70 dBA for residential land uses. However, based on the existing noise levels and nature of construction activities, it is anticipated that construction could result in hourly average noise levels (L_{eq}) above the City's residential land use category threshold of 50 dBA at the nearest residences located in the Town of Elmira. This is considered a potentially significant short term impact. The mitigation measures identified below would reduce noise-related construction impacts and facilitate communication between construction managers and adjacent sensitive receptors to avoid adverse effects. After mitigation, and taking into consideration the intermittent and temporal nature of project construction and noise generation, impacts would be considered less than significant. **Less than Significant with Mitigation.**

Mitigation Measure 4.9-1a. Construction activities should be limited to the hours of 7 a.m. to 7 p.m. seven days a week.

Mitigation Measure 4.9-1b. Stationary equipment and staging areas shall be located as far as practical from noise-sensitive receptors.

Mitigation Measure 4.9-1c. All construction vehicles or equipment, fixed or mobile, shall be equipped with properly operating and maintained mufflers and acoustical shields or shrouds, in accordance with manufacturers' recommendations.

Mitigation Measure 4.9-1d. To the extent feasible existing barrier features (structures) shall be used to block sound transmission between noise sources and noise sensitive land uses.

Mitigation Measure 4.9-1e. The general contractors for all construction and demolition activities shall provide a contact number for citizen complaints and a methodology for dealing with such complaints such as designating a noise disturbance coordinator. This noise disturbance coordinator shall receive all public complaints about construction-related noise and vibration, shall be responsible for determining the cause of the complaint, and shall implement any feasible measures to be taken to alleviate the problem. All complaints and resolution of complaints shall be reported to the City weekly.

Impact

4.9-2 Increased traffic associated with construction of the Proposed Project could intermittently and temporarily increase the ambient noise level in the project area.

During construction, the Proposed Project would increase traffic on the road network surrounding the project site by approximately 22 one-way truck trips, and 40 one-way worker car trips per day (refer to **Section 4.10**). One truck generates the same noise as approximately 10 cars (FHWA. 2006). Therefore, the number of noise equivalent cars the Proposed Project would add to the roadway network is 260 per day. Construction traffic would be intermittent and temporary, and would generally occur between the hours of 7:00 a.m. to 6:00 p.m. Due to the nature of the decibel scale, a doubling of traffic will result in a three dBA increase in noise level, which is barely perceivable (Caltrans, 2003). Leisure Town Road is a main route of project traffic from I-80 and is adjacent to a large residential area. The large residential area is separated from Leisure Town Road by an eight foot high sound wall. Existing traffic on Leisure Town Road is 15,000 vehicles per day (CEC, 2008a). Fry Road and Vaca Station Road do not have any sensitive receptors from Leisure Town Road to the project site.

Lewis Road also has the potential to be a main route of project traffic from I-80 and has several sensitive receptors adjacent to the potential haul routes. Existing traffic on Lewis Road is approximately 557 trips per day (CEC, 2008a). Fry Road and Vaca Station Road do not have any sensitive receptors from Lewis Road to the project site.

The existing ambient noise level along Leisure Town Road is 74.8 dBA LDN, which is greater than the City's and County's acceptable noise level for residential. The City and the County do not have general plan policies that provide noise thresholds for areas that are in exceedance of the City's or County's general plans thresholds. Therefore, for this analysis, an audible increase in ambient noise level along this roadway would be considered significant.

Because project related construction traffic would not double existing traffic levels on either Leisure Town or Lewis Road, a less than three dBA increase in the ambient noise level would occur. This increase in noise level would not be audible, and therefore would not adversely impact sensitive receptors located along these roadways. This impact is considered to be less than significant. **Less than Significant**.

Impact

4.9-3 Construction activities could expose sensitive receptors to excessive ground-borne vibration.

Construction activities such as bulldozer and heavy truck movements may produce detectable levels of vibration at nearby sensitive land uses. Ground vibrations due to construction activities very rarely reach the levels that can damage structures, but they can reach levels perceptible in buildings close to the site.

The Federal Transit Administration has published vibration levels caused by representative construction equipment (**Table 4.9-7**). Based upon these values, vibration due to the operation of equipment such as heavy trucks and bulldozers associated with the project could be perceived by and annoy residents in homes located within about 60 feet of the construction site. Structural damage due to construction-related vibration is unlikely outside 25 feet from the construction site.

The use of heavy equipment that would produce the highest vibration levels would be intermittent, and would be limited to daytime hours. The nearest vibration receptor is 550 feet from the site of construction. At this distance, vibration from construction activities would not be perceptible; therefore, no impact would occur. **No Impact**.

TABLE 4.9-7 VIBRATION SOURCE LEVELS FOR CONSTRUCTION EQUIPMENT

Equipment	Peak Particle Velocity at 25 feet (inches/second)	Approximate Vibration Level (VdB) at 25 feet
Large bulldozer	0.089	87
Caisson drilling	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58
Source: U.S DOT, 1995		

Operational Impacts

Impact

4.9-4 Operational activities could permanently generate noise levels above existing ambient levels in the Proposed Project vicinity.

The installation of a new pump at the South Plant has the potential to increase ambient noise levels in the area. However, the three older pumps located at the North Plant, which is closer to noise sensitive noise receptors, would cease to operate once the new pump at the South Plant is installed. The new pump would incorporate state of the art noise attenuation technology, replace the capacity of the removed pumps in the North Plant, and would be located approximately 500 feet further from noise sensitive receptors than the North Plant pumps. Due to the increased distance of the new pump to noise sensitive receptors and the noise reduction technology incorporated into the new equipment, the ambient noise level from operation of the influent pumps would decrease at the nearest sensitive receptors, resulting in a beneficial impact. **Beneficial Impact.**

Cumulative Impacts

Impact

4.9-5 Cumulative construction activities could temporarily generate noise levels above existing ambient levels in the Proposed Project vicinity.

Construction of the Proposed Project in combination with potential future development projects could result in a cumulative increase in ambient noise levels. The only potential project in the immediate area of the Proposed Project is the Competitive Power Ventures (CPV) Vaca Station electrical power generation facility proposed adjacent to the southeast portion of the project site.

Construction activities of the Proposed Project would result in a noise level of 47.5 dBA Lmax at the nearest shared sensitive receptor (approximately 1,400 feet east of the main construction area on the project site with an attenuation rate of 7.5 dBA). According to environmental studies conducted in support of CPV's Application for Certification submitted to the California Energy Commission, construction activities at the CPV site would result in a noise level of 71 dBA Lmax at the shared sensitive receptor (approximately 1,000 feet northeast of the CPV site with an attenuation rate of 7.5 dBA) (CPV, 2008). The resulting increase in the ambient cumulative noise level from construction of the Proposed Project would be 0.1 dBA Lmax (Environmental Noise, 2000). The cumulative noise level from concurrent construction of the Proposed Project and the CPV project at the sensitive receptor east of the project site would be 71.1 dBA Lmax. The Proposed Project's cumulative contribution to this increase (0.1 dBA Lmax) would not result in an audible increase in sound; therefore the Proposed Project would have less than significant cumulative construction related noise effect on the nearest sensitive noise receptor. **Less than Significant**.

Impact

4.9-6 Operation of the Proposed Project could generate noise levels above existing ambient levels in the Proposed Project vicinity under cumulative conditions.

Operation of the Proposed Project in combination with potential cumulative development in the project vicinity, including the potential development of the CPV power plant adjacent to the site, could lead to impacts related to noise and vibration materials. As stated in **Impact 4.9-4,** the Proposed Project would not increase operational noise on the project site over existing conditions. As a result of the Proposed Project, noise generating equipment on the EWWTP would be located farther from the nearest sensitive receptor to both the EWWTP and the proposed power plant. Further, the project would result in the development of a vegetative buffer around the City property, which could provide marginal noise attenuation for land uses within the City's property. Therefore, the Proposed Project's contribution to potential cumulative impacts associated with ambient noise levels would be beneficial. **Beneficial Impact**.