APPENDIX F

Noise Study Report

DRY-FERMENTATION ANAEROBIC DIGESTION FACILITY
NOISE STUDY REPORT
SAN JOSÉ, CALIFORNIA

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INTRODUCTION

This report presents the results of the noise study for the project, which proposes the construction and operation of a Dry-Fermentation Anaerobic Digestion (AD) Facility at 2100 Los Esteros Road in San José, California. The project-site proposes to occupy 41 acres of a 96-acre property adjacent to the Zanker Road Resource Recovery Operation and Landfill (ZRRROL) and Zanker Material Processing Facility (ZMPF).

This analysis evaluates the noise impacts resulting from the operation of the project. The Setting Section of the report presents a discussion of the fundamentals of environmental noise, regulatory background information, and a discussion of the existing noise environment at noise-sensitive residential receivers in the project's vicinity. The Impacts and Mitigation Measures Section evaluates the potential for noise impacts resulting from the project and presents mitigation measures for all identified significant impacts.

Fundamentals of Environmental Noise

Noise is defined as unwanted sound. Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Sound levels are usually measured and expressed in decibels (dB) with 0 dB corresponding roughly to the threshold of hearing. Decibels and other technical terms are defined in Table 1.

Most of the sounds that we hear in the environment do not consist of a single frequency, but rather a broad band of frequencies, with each frequency differing in sound level. The intensities of each frequency add together to generate a sound. The method commonly used to quantify environmental sounds consists of evaluating all of the frequencies of a sound in accordance with a weighting that reflects the facts that human hearing is less sensitive at low frequencies and extreme high frequencies than in the frequency mid-range. This is called "A" weighting, and the decibel level so measured is called the A-weighted sound level (dBA). In practice, the level of a sound source is conveniently measured using a sound level meter that includes an electrical filter corresponding to the A-weighting curve. Typical A-weighted levels measured in the environment and in industry are shown in Table 2 for different types of noise.

Although the A-weighted noise level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a conglomeration of noise from distant sources that create a relatively steady background noise in which no particular source is identifiable. To describe the time-varying character of environmental noise, the statistical noise descriptors, L01, L10, L50, and L90, are commonly used. They are the A-weighted noise levels equaled or exceeded during 1%, 10%, 50%, and 90% of a stated time period. A single number descriptor called the Leq is also widely used. The Leq is the average A-weighted noise level during a stated period of time.

In determining the daily level of environmental noise, it is important to account for the difference in response of people to daytime and nighttime noises. During the nighttime, exterior background noises are generally lower than the daytime levels. However, most household noise also decreases at night and exterior noise becomes very noticeable. Further, most people sleep at night and are very sensitive to noise intrusion. To account for human sensitivity to nighttime noise levels, a descriptor, Ldn (day/night average sound level), was developed. The Ldn divides the 24-hour day into the daytime of 7:00 AM to 10:00 PM and the nighttime of 10:00 PM to 7:00 AM. The nighttime noise level is weighted 10 dB higher than the daytime noise level. The Community Noise Equivalent Level (CNEL) is another 24-hour average, which includes both an evening and nighttime weighting.

Table 1 Definitions of Acoustical Terms Used in this Report

Term	Definitions
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, Leq	The average A-weighted noise level during the measurement period.
Lmax, Lmin	The maximum and minimum A-weighted noise level during the measurement period.
L01, L10, L50, L90	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, Ldn or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

Table 2 Typical Noise Levels in the Environment

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

Source: Technical Noise Supplement (TeNS), Caltrans, November 2009.

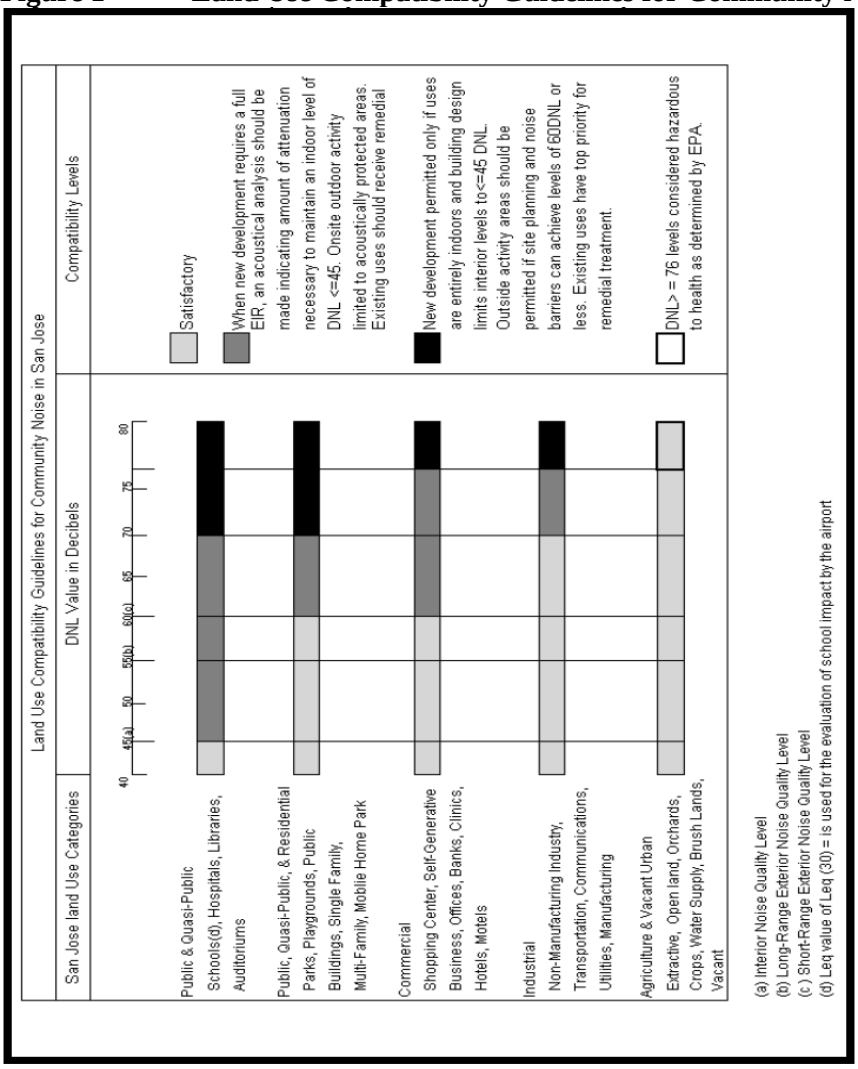
Regulatory Background

(1) City of San José General Plan

The Noise Element of the City of San José's 2020 Plan identifies noise and land use compatibility standards for various land uses. The City's goal is to, "...minimize the impact of noise on people through noise reduction and suppression techniques, and through appropriate land use policies." Policies presented in the Noise Element applicable to this project are as follows:

> Policy 11. When located adjacent to existing or planned noise sensitive residential and public/quasi-public land uses, nonresidential land uses should mitigate noise generation to meet the 55 DNL guideline at the property line.
>
> Policy 12. Noise studies should be required for land use proposals where known or suspected peak event noise sources occur which may impact adjacent existing or planned land uses.

Figure 1 Land Use Compatibility Guidelines for Community Noise



(2) City of San José Zoning Ordinance

The City's Zoning Ordinance applies specific noise standards to Residential, Commercial and Industrial zoning districts which limit the sound pressure level generated by any use or combination of uses at any property line as shown in Table 3.

Table 3 City of San José Zoning Code Noise Standards

Land Use Types	Maximum Noise Level in Decibels at Property Line
Residential, open space, industrial or commercial uses adjacent to a property used or zoned for residential purposes	55
Open space, commercial, or industrial use adjacent to a property used or zoned for commercial purposes or other non-residential uses	60
Industrial use adjacent to a property used or zoned for industrial or use other than commercial or residential purposes	70

The City of San José has also adopted noise standards for the operation of recycling facilities. The maximum allowable noise level at the closest property line in a residential area is 55 dBA. The City of San José does not specify whether the 55 dBA criteria is in terms of an average (L_{eq}), maximum (L_{max}), or day-night average (DNL) noise level. For previous noise studies conducted in the City of San José, the standard has been assumed to be an hourly L_{eq} limit if project operations would take place during daytime hours only, and a DNL limit if project operations would take place during daytime and nighttime hours. This would be consistent with the General Plan policies.

Existing Noise Environment

The project site is located at 2100 Los Esteros Road in San José, California. Current land uses surrounding the project site include agriculture, industrial and service, public open space (marshland), public facilities (unclosed landfill), private open space, wastewater treatment plant, residential, sanitary landfill, salt evaporators, and public thoroughfare. The nearest noise sensitive receptors are located in the residential community of Alviso, approximately ¾ mile southwest of the project site, and the Don Edwards San Francisco Bay National Wildlife Refuge ("NWR") and the Environmental Education Center ("EEC"), located to the northwest. The predominant noise sources at noise sensitive receivers adjacent to the project site are jet aircraft and vehicular traffic. Additionally, noise resulting from existing operations on the ZMPF landfill and other nearby industrial facilities is audible.

Our firm has documented the noise environment at the nearest residences in Alviso several times since 2004. To supplement data obtained in 2004, a noise monitoring survey was conducted at nearby residences on January 24th, 2007, which included two short-term (10-minute) noise measurements. An additional noise monitoring survey was conducted on January 31st, 2007 to tour and measure noise levels generated at the MRF facility. Measurement locations are shown in Figure 2.

Noise monitoring surveys were conducted on January 5th to 6th, 2004 and March 2nd to 3rd, 2004 at three representative locations in the residential community of Alviso and at the EEC. Noise levels were monitored continuously over a 24-hour period at these locations. Locations LT-1 and LT-3 were representative of the nearest residential area to the AD facility, approximately ¾ mile southwest of the project site, and LT-2 was located at the EEC, approximately ½ mile northwest of the site. The results of the long-term noise measurements are summarized in Table 4 and the daily trend in noise levels are shown in Figures 3, 4, and 5.

Table 4 Summary of Noise Levels at Noise Sensitive Areas

Location	DNL	Avg Daytime L_{eq} (L_{eq} Range) 7:00 am - 7:00 pm	Avg Evening L_{eq} (L_{eq} Range) 7:00 pm - 10:00 pm	Avg Nighttime L_{eq} (L_{eq} Range) 10:00 pm - 7:00 am
LT-1: State St, between Spreckles Ave and Pacific St	66 dBA	63 dBA (55 - 70 dBA)	59 dBA (50 - 67 dBA)	59 dBA (41 - 69 dBA)
LT-2: Environmental Education Center	57 dBA	56 dBA (47 - 61 dBA)	54 dBA (46 - 61 dBA)	49 dBA (41 - 58 dBA)
LT-3: Grand Blvd and Pacific St	61 dBA	61 dBA (55 - 70 dBA)	56 dBA (46 - 62 dBA)	53 dBA (35 - 65 dBA)

On January 24th, 2007, a noise monitoring survey of the adjacent noise sensitive areas was conducted to supplement the 2004 data. Noise measurements were conducted at a location representative of the nearest residences to the project site, along Spreckles Avenue between Grand Boulevard and Michigan Avenue, and at a location in the EEC parking lot. The results of the short-term noise measurements are summarized in Table 5.

Table 5 Summary of Short-Term Noise Measurement Locations

Location	L_{eq}	L_1	L_{10}	L_{90}
ST-1: Spreckles Ave, between Grand Blvd and Michigan Ave (1/24/07, 10:40-10:50)	62 dBA	77 dBA	62 dBA	48 dBA
ST-2: Environmental Education Center parking lot (1/24/07, 11:17-11:27)	53 dBA	65 dBA	57 dBA	45 dBA

Figure 2 Noise Monitoring and Project Site Locations

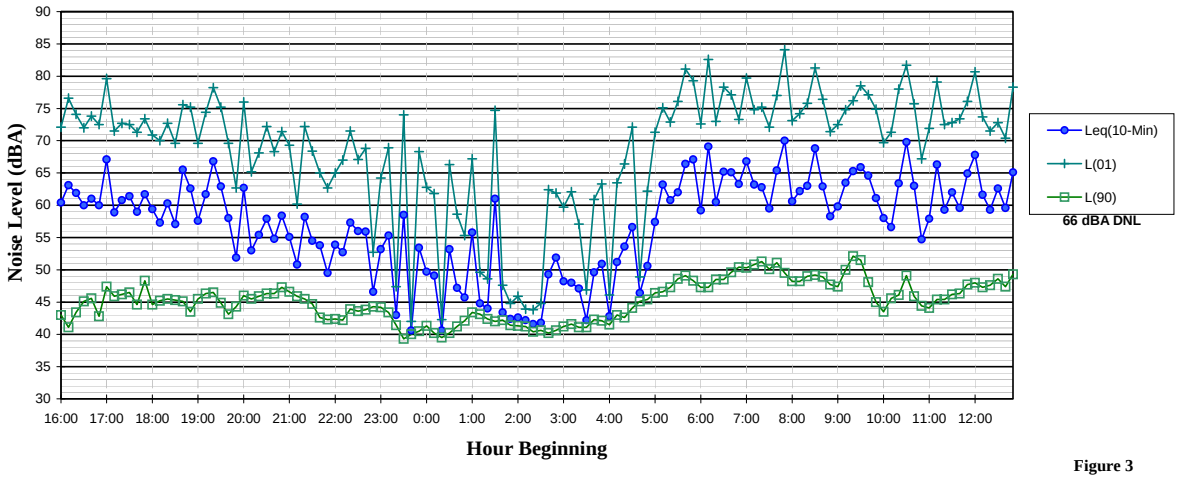


Figure 3

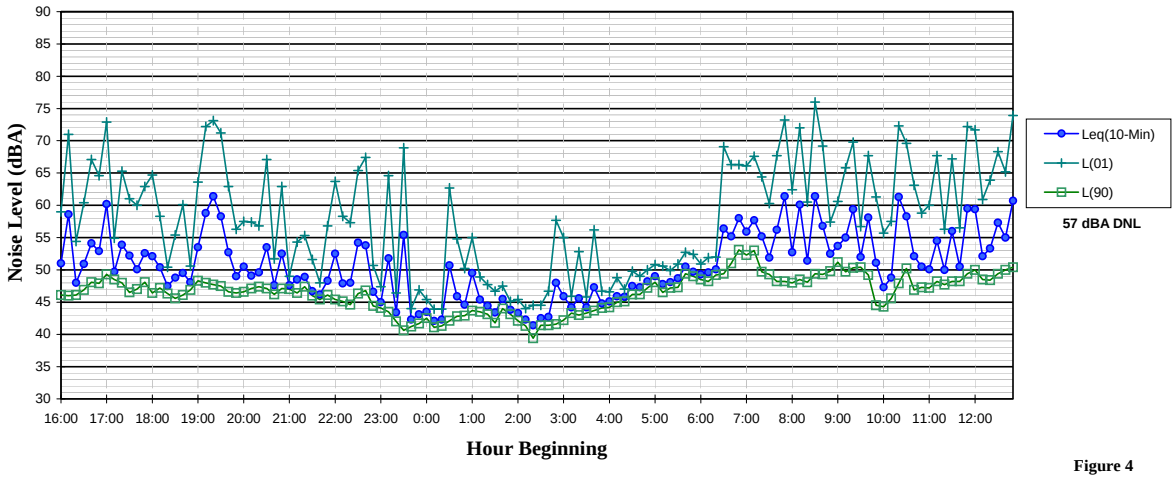


Figure 4

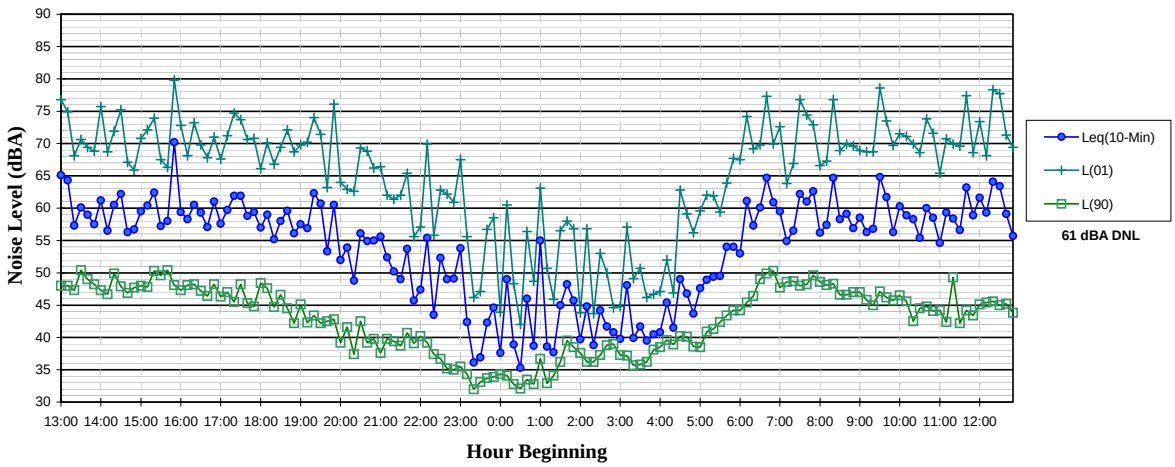


Figure 5

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

A significant noise impact would occur if project operations increase noise levels at noise sensitive areas by more than 3 dBA DNL or generate noise levels in excess of 55 dBA DNL at adjacent residential uses or 60 dBA DNL at noise sensitive non residential uses.

Impact: **Construction Noise**. Noise generated by the construction on the site would not be expected to substantially increase noise levels at noise sensitive land uses in the vicinity of the site. **This is a less-than-significant impact.**

Site fill for grading purposes would occur over 5 weeks, and include 1000,000 cubic yards of imported soil. Construction of the AD facility is anticipated to take place over a period of about one year (52-weeks) once the grading is implemented.

Noise impacts from construction activities depend on the various pieces of construction equipment, the timing and length of noise generating activities, the distance between the noise generating construction activities and receptors that would be affected by the noise, and shielding. Construction activities for the project would be carried out in stages. During each stage of construction, there would be a different mix of equipment operating. Construction noise levels would vary by stage and vary within stages based on the amount of equipment in operation and location where the equipment is operating. Typical construction noise levels at a distance of 50 feet are shown in Tables 6 and 7. Table 6 shows the average noise level ranges by construction phase and Table 7 shows the maximum noise level ranges for different construction equipment. Most demolition and construction noise is in the range of 80 to 90 dBA L_{max} at a distance of 50 feet from the source. The highest noise levels would be generated during grading and foundation construction. Large pieces of earth-moving equipment, such as graders, scrapers, and bulldozers, generate maximum noise levels of 85 to 90 dBA at a distance of 50 feet. Average noise levels

would typically range from 75 to 85 dBA during busy construction periods at a distance of 50 feet. These noise levels drop off at a rate of about 6 dBA per doubling of distance between the noise source and receptor. Shielding from terrain, sound walls, and structures would further lower noise levels at receivers.

The nearest noise sensitive use is the EEC at the Don Edwards S.F. Bay Natural Wildlife Refuge, located more than 2,000 feet from the project site. Maximum instantaneous construction noise levels are calculated to range from 53 to 58 dBA L_{max} when activities are located in direct line of sight to the EEC. Hourly average noise levels generated during periods of heavy construction would range from 43 to 53 dBA L_{eq}. Noise levels due to construction activities would be 4 to 5 dBA lower at single-family homes in the residential community of Alviso, located over 3,500 feet from the project site. Construction activities would only take place during daytime hours. Maximum and average construction noise levels would typically be below levels generated by daytime ambient traffic, aircraft, and existing industrial operations in the vicinity. This is a less-than-significant impact.

Mitigation 3: None Recommended

Table 6: Typical Ranges of Energy Equivalent Construction Noise Levels at 50 Feet, L_{eq} in dBA

	Domestic Housing		**Office Building, Hotel, Hospital, School, Public Works**		**Industrial, Parking Garage, Religious, Amusement, Recreation, Store, Service Station**		**Public Works Roads & Highways, Sewers, and Trenches**	
	I	**II**	**I**	**II**	**I**	**II**	**I**	**II**
Ground Clearing	83	83	84	84	84	83	84	84
Excavation	88	75	89	79	89	71	88	78
Foundations	81	81	78	78	77	77	88	88
Erection	81	65	87	75	84	72	79	78
Finishing	88	72	89	75	89	74	84	84

I - All pertinent equipment present at site. **II** - Minimum required equipment present at site.

Source: U.S.E.P.A., Legal Compilation on Noise, Vol. 1, p. 2-104, 1973.

Table 7: Construction Equipment 50-foot Noise Emission Limits

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/Continuous
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor[3]	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous
Generator (25 KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	105	Impact
Insitu Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pmps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

1 Measured at 50 feet from the construction equipment, with a "slow" (1 sec.) time constant.

2 Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.

3 Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

Impact: **Operational Noise.** Noise generated by project operations would not generate noise levels in excess of 55 dBA DNL at adjacent residences, but would generate noise levels in excess of 60 dBA DNL at adjacent non-residential noise sensitive locations. **This is a significant impact.**

The project site is currently unused and the property contains a portion of the former Nine Par Landfill, a tidal marsh area, and the inactive WPCP recycled water filling station. The project will be developed in three phases, with each phase being capable of handling an additional 75,000 tons of organic waste material per year, for an eventual total of 225,000 tons of organic feedstock and 45,000 additional tons of bulking agent to be used in the AD process per year. The proposed project includes three approximately 60,000 square foot enclosed buildings that will house the AD process.

The proposed AD facility will operate continuously 24-hours per day, 7-days per week, 365 days per year. The facility will be open to accept inbound materials and transport outbound materials from approximately 8:00am to 6:00pm everyday. In accordance with the San José Zoning Ordinance, project operations are limited to 55 dBA DNL at the closest residential property line, and 60 dBA DNL at the closest non-residential property line. As discussed previously in the fundamentals section of this report, the DNL is a 24-hour noise levels average with a 10-dBA weighting added to nighttime noise levels between 10:00 pm and 7:00 am.

Noise resulting from proposed on-site mechanical equipment was assessed for each phase of the project, individually and cumulatively, at the nearest residential receivers to the southwest and at the EEC to the northwest. Each of the three phases (I, II, and III) includes equipment with various types of fans, power generators, emergency generators, and a biofilter. The operation of the power generators would be the primary noise source. Each phase includes two power generators and one emergency generator, for a total of nine generators with all three phases operational. Each power generator would produce a noise level of 115 dBA PWL. Emergency generators would operate intermittently, and seldom in comparison to the continuous operation of the power generators. The operation of the emergency generators would not substantially contribute to day-night average noise levels resulting from overall operations. Noise from equipment fans was estimated to be 97 dBA PWL at an acoustical center with all three phases in full operation, and would contribute less than 40 dBA DNL at sensitive receiver locations.

Trucks would access the facility from SR 237 and Los Esteros/Zanker Road and enter the project site via the private access road. During busy times, truck queuing could occur at the scales, located in the northeastern portion of the site. Loaders would also circulate the site. Noise levels due to project vehicle circulation would be 40 dBA DNL or less at residences, and would not measurably increase the ambient noise environment.

A credible "worst-case" scenario would assume that the AD facility will operate all three phases of the project simultaneously and operations would occur 24-hours per day. Additionally, no noise barriers are assumed between the equipment and sensitive land uses. For each phase of the project, a drop-off of 6 dB per doubling of distance, and anomalous excess attenuation (assumed to be 1 dB/1000 ft) was included into the calculations of noise levels at distant receiver locations. Worst-case noise levels are calculated to be 55 dBA DNL at the closest residences and 59 dBA DNL at the EEC.

With phase I operational, average noise levels at the closest residences 4,050 feet away would be 44 dBA L_{eq}, and are calculated to be 50 dBA DNL assuming 24-hour operations. The EEC is about 2,900 feet from the power generators and would be exposed to a noise level of 48 dBA L_{eq} during phase I, which would result in day-night average levels of 54 dBA DNL. With Phase I and II operating simultaneously,

day-night average noise levels would be 53 dBA DNL at residential receivers and 57 dBA DNL at the EEC. With Phase I, II, and III operational; day-night average noise levels would be 55 dBA DNL at the nearest residences and 59 dBA DNL at the EEC.

Noise monitoring surveys indicate that existing noise levels at the nearest sensitive land uses exceed the 55 dBA DNL criteria. Although noise levels will be lower at residential properties that are further away from local roadways, worst-case operational noise levels would not be expected to measurably increase the existing noise environment. With all three phases of the project fully operational, noise levels at residences would be equal to but would not exceed the 55 dBA DNL criteria. At times when operations are reduced, noise levels would be lower. This is a **less-than-significant** impact.

The Dry-Fermentation Anaerobic Digestion Facility's operational noise levels are calculated to reach 59 dBA DNL at the EEC, where existing daily average noise levels are 57 dBA DNL, as shown in Figure 4. The project's operational noise levels combined with existing daily average noise levels would increase overall noise levels at the EEC to 61 dBA DNL, which is 4 dBA above ambient noise levels. This is a **significant** impact, as noise levels would be substantially increased.

Mitigation: The following mitigation measure shall be included in the project to reduce the impact to a less-than-significant level:

The proposed generators shall be designed so as to minimize impacts on surrounding uses, especially the EEC located northwest of the site. Noise barriers or acoustical enclosures shall be provided to avoid substantially increasing noise levels. If rooftop-mounted equipment is used, it should be shielded from the noise sensitive land uses by rooftop screens or perimeter parapet walls, noise control baffles, sound attenuators, or enclosures. If the equipment is mounted at ground level, mechanical equipment enclosures or noise barriers at the western and northern borders of the project should be incorporated. These measures would provide a minimum of 5 dBA of noise reduction, lowering project operational noise levels to 54 dBA DNL and would reduce overall noise levels to 59 dBA DNL or less at the EEC. Therefore, project operations would not increase noise levels at noise sensitive areas by more than 3 dBA DNL.