Zeta Solar and Battery Energy Storage System Project

Noise Assessment

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Abbreviations

AC	alternating current
Applicant	Longroad Development Company, LLC
BESS	battery energy storage system
CNEL	community noise equivalent level
County	Merced County Department of Community and Economic Development
dB	decibel
dB(A)	A-weighted decibel
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
gen-tie	generation-tie
I-5	U.S. Interstate 5
in/sec	inches per second
kV	kilovolt
Ldn	day-night noise level
Leq	equivalent noise level
Lmax	maximum noise level
Lmin	minimum noise level
MW	megawatt
O&M	operation and maintenance
PG&E	Pacific Gas and Electric
PPV	peak particle velocity
Project	Zeta Solar and Battery Energy Storage System Project
Project Site	all or portions of several contiguous parcels, totaling approximately 650 acres
PV	photovoltaic
RCNM	Roadway Construction Noise Model
SPL	sound pressure level
SR-165	State Route 165

1.0 Introduction

1.1 Purpose of Analysis

The purpose of this noise assessment is to analyze noise and vibration impacts from the Zeta Solar and Battery Energy Storage System Project (Project). This report provides analyses of potential project-related impacts for exposure to excessive noise and vibration during construction and operation and estimates the potential operational noise conditions at the project site.

1.2 Project Description

Longroad Development Company, LLC (Applicant) has applied to the Merced County Department of Community and Economic Development (County) for a Conditional Use Permit (Application No. CUP22-015 to construct, operate, maintain, and decommission the Project, a photovoltaic (PV) solar power generation facility with a battery energy storage system (BESS) and onsite Project substation. The Project would generate up to approximately 75 megawatts (MW) alternating current (AC) renewable electrical energy and include an energy storage capacity of up to 8 hours of 75 MW of AC. The Project is located on all or portions of several contiguous parcels, totaling approximately 650 acres (Project site), plus an additional 1,700-foot-long generation-tie (gen-tie) line to deliver power from the Project to Pacific Gas and Electric's (PG&E) existing Mercy Springs Substation (point of interconnection) in unincorporated Merced County.

The Project would include a solar array area surrounded by an up to 8-foot-tall security fence. Solar PV modules mounted in rows on single-axis trackers and racking equipment would occupy most of the Project site. The Project would also include, among other things, an underground DC collector system, up to 21 electrical equipment pads with inverters and transformers within the PV facility, an approximately 15-acre BESS with regularly spaced battery units and 70 electrical equipment pads, underground or above-ground AC collector system, an approximately 5-acre Project substation, an approximately 1,700-foot-long 70 kilovolt (kV) gen-tie line, an approximately 0.8-acre operation and maintenance (O&M) area, including an O&M office and adjacent O&M warehouse, and access roads. As part of construction, an approximately 10-acre staging area/laydown yard would be located within the Project site and accessed via internal graveled or compacted earth access roads.

As part of the interconnection process, PG&E would install gen-tie line terminal equipment and the termination of the Project's fiber optic line and install one circuit breaker to an existing 70 kV ring bus at the Mercy Springs Switching Station.

Construction of the Project facilities would occur over 24 consecutive months. The Project would operate year-round to generate electricity from the PV facilities during daylight hours and dispatch additional electricity during either daylight or non-daylight hours, depending on the application of the BESS portion of the Project.

2.0 Noise

2.1 Environmental Setting

2.1.1 NOISE FUNDAMENTALS AND TERMINOLOGY

Noise is generally defined as unwanted sound that annoys or disturbs people and potentially causes an adverse psychological or physiological effect on human health. Because noise is an environmental pollutant that can interfere with human activities, evaluation of noise is necessary when considering the environmental impacts of a proposed project.

Sound is mechanical energy transmitted by pressure waves over a medium such as air or water. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level (SPL) is the most common descriptor used to characterize the loudness of an existing sound level.

Although the decibel (dB) scale, which is a logarithmic scale, is used to quantify sound amplitude, it does not accurately describe how sound is perceived by human hearing. The perceived loudness of sound is dependent upon many factors, including SPL and frequency content. The human ear is not equally sensitive to all frequencies in the entire spectrum, so noise measurements are weighted more heavily for frequencies to which humans are sensitive in a process called A-weighting, written as dB(A), and referred to as A-weighted decibels. There is a strong correlation between A- weighted sound levels and community response to noise. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. Table 1 summarizes typical A-weighted sound levels for different common noise sources.

Table 1. Typical A-Weighted Sound Levels

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

Source: Caltrans Technical Noise Supplement Traffic Noise Analysis Protocol (Caltrans 2013).

Different types of measurements are used to characterize the time-varying nature of sound. These measurements include the equivalent sound level (L_{eq}), the minimum and maximum sound levels (L_{min} and L_{max}), percentile-exceeded sound levels (such as L10, L20), the day-night sound level (Ldn), and the community noise equivalent level (CNEL). Ldn and CNEL values often differ by less than 1 dB. As a matter of practice, Ldn and CNEL values are considered to be equivalent and are treated as such in this assessment. Table 2 defines sound measurements and other terminology used in this report.

Table 2. Definition of Sound Measurements

Sound Measurements	Definition
Decibel (dB)	A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.
A-Weighted Decibel (dB(A))	An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.
Maximum Sound Level (L_{max})	The maximum sound level measured during the measurement period.
Minimum Sound Level (L_{min})	The minimum sound level measured during the measurement period.
Equivalent Sound Level (L_{eq})	The equivalent steady state sound level that in a stated period of time would contain the same acoustical energy.
Percentile-Exceeded Sound Level (Lxx)	The sound level exceeded xx% of a specific time period. L10 is the sound level exceeded 10% of the time. L90 is the sound level exceeded 90% of the time. L90 is often considered to be representative of the background noise level in a given area.

Sound Measurements	Definition
Day-Night Level (Ldn)	The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m.
Community Noise Equivalent Level (CNEL)	The energy average of the A-weighted sound levels occurring during a 24-hour period with 5 dB added to the A-weighted sound levels occurring during the period from 7:00 p.m. to 10:00 p.m. and 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m.

Source: Federal Highway Administration Construction Noise Handbook (FHWA 2006)

With respect to how humans perceive and react to changes in noise levels, a 1 dB(A) increase is imperceptible, a 3 dB(A) increase is barely perceptible, a 5 dB(A) increase is clearly noticeable, and a 10 dB(A) increase is subjectively perceived as approximately twice as loud. These subjective reactions to changes in noise levels were developed on the basis of test subjects' reactions to changes in the levels of steady state pure tones or broadband noise and to changes in levels of a given noise source. These findings are thought to be most applicable to noise levels in the range of 50 to 70 dB(A), as this is the usual range of voice and interior noise levels. Many agencies and municipalities have developed or adopted noise level standards consistent with these and other similar studies to help prevent annoyance and to protect against the degradation of the existing noise environment.

For a point source such as a stationary compressor or construction equipment, sound attenuates at a rate of approximately 6 dB per doubling of distance. For a line source such as free-flowing traffic on a freeway, sound attenuates at a rate of approximately 3 dB per doubling of distance. Atmospheric conditions including wind, temperature gradients, and humidity can change how sound propagates over distance and can affect the level of sound received at a given location. The degree to which the ground surface absorbs acoustical energy also affects sound propagation. Sound that travels over an acoustically absorptive surface, such as grass, attenuates at a slightly greater rate than sound that travels over a hard surface, such as pavement. The increased attenuation is typically in the range of 1–2 dB per doubling of distance. Barriers, such as buildings and topography that block the line of sight between a source and receiver, also increase the attenuation of sound over distance.

2.1.2 DECIBEL ADDITION

Because decibels are logarithmic units, sound pressure levels cannot be added or subtracted through ordinary arithmetic. On the dB scale, a doubling of sound energy corresponds to a 3 dB increase. In other words, when two identical sources are each producing sound of the same loudness, their combined sound level at a given distance would be 3 dB higher than one source under the same conditions. For example, if one source produces a sound pressure level of 70 dB(A), two identical sources would combine to produce 73 dB(A). The cumulative sound level of any number of sources can be determined using decibel addition.

2.1.3 VIBRATION STANDARDS

Vibration is like noise such that it involves a source, a transmission path, and a receiver. While related to noise, vibration differs in that noise is generally considered to be pressure waves transmitted through air,

and vibration usually consists of the excitation of a structure or surface. As with noise, vibration consists of an amplitude and frequency. A person's perception to vibration depends on their individual sensitivity to vibration, amplitude, and frequency of the source.

Vibration can be measured in terms of acceleration, velocity, or displacement. A common practice is to monitor vibration in terms of peak particle velocity (PPV) in inches per second (in/sec).[1] Standards pertaining to perception and damage to structures have been developed for vibration levels defined in terms of PPV (in/sec).

Human and structural response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. Table 3 notes the general threshold at which human annoyance could occur is 0.035 in/sec PPV for continuous/frequent sources. Table 4 indicates that the threshold for damage to typical residential and commercial structures ranges from 0.3 to 0.5 PPV for continuous/frequent sources.

Table 3. Guideline Vibration Annoyance Potential Criteria

Human Response	Maximum Peak Particle Velocity (Inches per Second)	
	Transient Sources	Continuous/Frequent Sources
Barely perceptible	0.035	0.012
Distinctly perceptible	0.24	0.035
Strongly perceptible	0.90	0.10
Severe	2.0	0.40

Source: Caltrans Transportation and Construction Vibration Guidance Manual (Caltrans 2020).
Notes: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seal equipment, vibratory pile drivers, and vibratory compaction equipment.

Table 4. Guideline Vibration Damage Potential Criteria

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.30	0.12
Historic and some old buildings	0.50	0.20
Older residential structure	0.70	0.30
New residential structures	1.2	0.50
Modern industrial/commercial buildings	2.0	0.50

Source: Caltrans Transportation and Construction Vibration Guidance Manual (Caltrans 2020).
Notes: Transient sources again create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seal equipment, vibratory pile drivers, and vibratory compaction equipment.

[1] Peak Particle Velocity (Peak Velocity or PPV) is a measurement of ground vibration defined as the maximum speed (measured in inches per second) at which a particle in the ground is moving relative to its inactive state. PPV is usually expressed in inches/second.

The operation of heavy construction equipment, particularly pile driving, and other impact devices, such as pavement breakers, create seismic waves that radiate along the surface of the ground and downward into the earth. These surface waves can be felt as ground vibration. Vibration from the operation of this equipment can result in effects ranging from annoyance of people to damage of structures. Varying geology and distance will result in different vibration levels containing different frequencies and displacements. In all cases, vibration amplitudes will decrease with increasing distance. Perceptible groundborne vibration is generally limited to areas within a few hundred feet of construction activities.

Table 7-4 "Vibration Source Levels for Construction Equipment" in the 2018 *Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual* (FTA 2018) lists vibration source levels for the construction equipment most likely to generate high levels of ground vibration. The equipment listed in the Federal Transit Administration (FTA) table includes impact and sonic pile drivers, clam shovel drops, hydromills, vibratory rollers, hoe rams, large and small bulldozers, caisson drilling, loaded trucks, and jackhammers. Table 5 summarizes typical reference vibration levels generated by select construction equipment proposed for this project.

Table 5. Reference Vibration Source Levels for Construction Equipment

Equipment	Reference in/sec PPV (in/sec PPVref) at 25 Feet
Vibratory Roller	0.210
Caisson Drilling	0.089
Loaded Trucks	0.076
Large Bulldozer	0.089
Small Bulldozer	0.003

Source: Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual (FTA 2018)
Key:
in/sec = inches per second
PPV = peak particle velocity

Vibration amplitude attenuates over distance and is a complex function of how energy is imparted into the ground and the soil conditions through which the vibration is traveling. The following equation can be used to estimate the vibration level at a given distance for typical soil conditions (FTA 2018). "PPVref" is the reference in/sec PPV from Table 5 and "Distance" is the distance between the source and the receptor:

$$PPV = PPVref \times (25/Distance)^{1.5}$$

2.2 Regulatory Setting

Federal, state, and local agencies regulate different aspects of environmental noise. Generally, the federal government sets standards for transportation-related noise sources closely linked to interstate commerce, including aircraft, locomotives, and trucks. No federal noise standards are directly applicable to this project. The state government sets standards for transportation noise sources such as automobiles, light trucks, and motorcycles. Noise sources associated with industrial, commercial, and construction activities are generally subject to local control through noise ordinances and general plan

policies. Local general plans identify general principles intended to guide and influence development plans.

2.2.1 STATE REGULATIONS

2.2.1.1 California Noise Act of 1973 (Health and Safety Code Sections 46000-46002)

The California Noise Act of 1973 sets forth a resource network to assist local agencies with legal and technical expertise regarding noise issues. The objective of the act is to encourage the establishment and enforcement of local noise ordinances. Chapter 10.60, Noise Control, of the Merced County Code was adopted to implement noise control regulations.

2.2.2 LOCAL REGULATIONS

2.2.2.1 2030 Merced County General Plan

The "Noise" section within Chapter 10 "Health and Safety" in the 2030 Merced County General Plan (Merced County 2012) provides information to quantify noise impacts in the County. Tables HS-1 and HS-2 (Tables 6 and 7) set standards for noise-sensitive land uses affected by transportation and non-transportation sources. As shown in Table 6, the noise standards for residential uses affected by traffic, railroad, and airport noise are 65 dB(A) Ldn for outdoor areas and 45 dB(A) for sensitive interior areas. Table 7 lists non-transportation noise standards of 55 dB(A) L50 and 75 dB(A) L_{max} for residential uses during daytime hours and 50 dB(A) L50 and 70 dB(A) L_{max} during nighttime hours.

Table 6. 2030 Merced County General Plan Table HS-1 – Noise Standards for New Uses Affected by Traffic, Railroad, and Airport Noise

New Land Use	Sensitive Outdoor[1] Area – Ldn	Sensitive Interior[2] Area – Ldn	Notes
All Residential	65	45	3
Transient Lodging	65	45	3,4
Hospitals & Nursing Homes	65	45	3,4,5
Theaters & Auditoriums	---	35	4
Churches, Meeting Halls, Schools, Libraries, etc.	65 65	40 40	4 4
Office Buildings	65	45	4
Commercial Buildings	---	50	4
Playgrounds, Parks, etc.	70	---	
Industry	65	50	4

Notes:
[1] Sensitive Outdoor Areas include primary outdoor activity areas associated with any given land use at which noise-sensitivity exists and the location at which the County's exterior noise level standards are applied.
[2] Sensitive Interior Areas include any interior area associated with any given land use at which noise sensitivity exists and the location at which the County's noise level standards are applied. Examples of sensitive interior spaces include, but are not limited to, all habitable rooms of residential and transient lodging facilities, hospital rooms, classrooms, library interiors, offices, worship spaces, theaters. Interior noise level standards are applied within noise-sensitive areas of the various land uses with windows and doors in the closed positions.
[3] Railroad warning horn usage shall not be included in the computation of Ldn.
[4] Only the interior noise level standard shall apply if there are no sensitive exterior spaces proposed for these uses.
[5] Since hospitals are often noise generating uses, the exterior noise level standards are applicable only to clearly identified areas designated for outdoor relaxation by either hospital staff or patients.
Key:
Ldn = day-night noise level

Table 7. 2030 Merced County General Plan Table HS-2 – Non-Transportation Noise Standards Median (L50) / Maximum (L_{max})[1]

Outdoor Area[2]			Interior[3]	
Receiving Land Use	**Daytime**	**Nighttime**	**Day or Night**	**Notes**
All Residential	55 / 75	50 / 70	35 / 55	
Transient Lodging	55 / 75	---	35 / 55	4
Hospitals & Nursing Homes	55 / 75	---	35 / 55	5,6
Theaters & Auditoriums	---	---	30 / 50	6
Churches, Meeting Halls, Schools, Libraries, etc.	55 / 75	---	35 / 60	6
Office Buildings	60 / 75	---	45 / 65	6
Commercial Buildings	55 / 75	---	45 / 65	6
Playgrounds, Parks, etc.	65 / 75	---	---	6
Industry	60 / 80	---	50 / 70	6

Notes:
1 These standards shall be reduced by 5 dB for sounds consisting primarily of speech or music, and for recurring impulsive sounds. If the existing ambient noise level exceeds the standards in this table, then the noise level standards shall be increased at 5 dB increments to encompass the ambient.
2 Sensitive Outdoor Areas include primary outdoor activity areas associated with any given land use at which noise sensitivity exists and the location at which the County's exterior noise level standards are applied.
3 Sensitive Interior Areas include any interior area associated with any given land use at which noise sensitivity exists and the location at which the County's interior noise level standards are applied.
4 Outdoor activity areas of transient lodging facilities are not commonly used ruing nighttime hours.
5 Since hospitals are often noise-generating uses, the exterior noise level standards are applicable only to clearly identified areas designated for outdoor relaxation by either hospital staff or patients.
6 The outdoor activity areas of these uses (if any) are not typically used ruing nighttime hours.
7 Where median (L50) noise level data is not available for a particular noise source, average (L_{eq}) values may be substituted for the standards of this table provided the noise source operates for at least 30 minutes. If the source operates less than 30 minutes, the maximum noise level standards shown shall apply.
Key:
L_{max} = maximum noise level

The 2030 Merced County General Plan also lists several policies relating to noise applicable to this project, including the following:

- Policy HS-7.1: Noise Standards for New Land Uses. Require new development projects to meet the standards shown in Tables HS-1 and HS-2 (Tables 6 and 7) at the property line of the proposed use, through either project design or other noise mitigation techniques. [Source: New Policy, GPU Consultants]

- Policy HS-7.4: New Noise-Generating Uses. Require new commercial and industrial uses to minimize encroachment on incompatible noise-sensitive land uses. Also consider 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 areas. [Source: Existing GP Policy NOI.2.2]

- Policy HS-7.5: Noise-Generating Activities. Limit noise-generating activities, such as construction, to hours of normal business operation. [Source: New Policy, GPU Consultants]

- Policy HS-7.7: Noise Impacted Residential Area Monitoring. Consider any existing residential area "noise impacted" if the exposure to exterior noise exceeds the standards shown in Table HS-2 (Table 7). Identify and evaluate potential noise impacted areas and identify possible means

to correct the identified noise/land use incompatibilities. [Sources: Existing GP Policy NOI.1.3, GPU Consultants]

- Policy HS-7.8: Project Design. Require land use projects to comply with adopted noise standards through proper site and building design, such as building orientation, setbacks, natural barriers (e.g., earthen berms, vegetation), and building construction practices. Only consider the use of soundwalls after all design-related noise mitigation measures have been evaluated or integrated into the project or found infeasible. [Source: New Policy, GPU Consultants]

- Policy HS-7.12: New Project Noise Mitigation Requirements. Require new projects to include appropriate noise mitigation measures to reduce noise levels in compliance with the Table HS-2 (Table 7) standards within sensitive areas. If a project includes the creation of new non-transportation noise sources, require the noise generation of those sources to be mitigated so they do not exceed the interior and exterior noise level standards of Table HS-2 (Table 7) at existing noise-sensitive areas in the project vicinity. However, if a noise-generating use is proposed adjacent to lands zoned for residential uses, then the noise-generating use shall be responsible for mitigating its noise generation to a state of compliance with the standards shown in Table HS-2 (Table 7) at the property line of the generating use in anticipation of the future residential development. [Source: New Policy, GPU Consultants]

2.2.2.2 Merced County Code

Chapter 10.60, Noise Control, of the Merced County Code (Merced County 2005) sets the following limitations on noise levels at the property line of affected parcels as follows:

A. No person shall cause, suffer, allow, or permit the operation of any sound source on private property in such a manner as to create a sound level that results in any of the following, when measured at or within the real property line of the receiving property:

    1. Exceeds the background sound level by at least ten (10) dBA during daytime hours (seven a.m. to ten p.m.) and by at least five dBA during nighttime hours (ten p.m. to seven a.m.). The background sound level for purposes of this section shall be determined as set forth in Section 10.60.060; or

    2. Exceeds sixty-five (65) dBA Ldn on residential real property or seventy (70) dBA Ldn on nonresidential real property; or

    3. Exceeds seventy-five (75) dBA L_{max} on residential real property or eighty (80) dBA L_{max} on nonresidential real property.

The Code exempts several noise sources, including noise generated from construction activity between 7 a.m. and 6 p.m. if all construction equipment is properly muffled and maintained (Ord. 1869 §2, 2009; Ord. 1726 §1, 2004).

2.3 Existing Noise Environment

2.3.1 SENSITIVE RECEPTORS

Some land uses are more tolerant of noise than others. For example, schools, hospitals, churches, and residences are considered to be more sensitive to noise intrusion than are commercial or industrial activities. Ambient noise levels can also affect the perceived desirability or livability of a development.

There are no noise-sensitive uses or residential dwellings located in the immediate vicinity of the Project site. The nearest sensitive receptor location is the property at 25001 Poleline Road, about 3,750 feet northwest of the Project site. The property at 24477 S. Wood Road is approximately 4,330 feet north of the project site.

The closest vibration sensitive receptor was assumed to be the existing aqueduct and berm located about 270 feet south of the edge of the Project site.

2.3.2 AMBIENT NOISE LEVELS

The existing, or ambient, noise environment in a project area is characterized by the area's general level of development. Areas which are not urbanized are typically relatively quiet, while areas which are more urbanized are noisier as a result of roadway traffic, industrial activities, and other human activities.

Merced County is exposed to several sources of noise, including traffic on major highways, like U.S. Interstate 5 (I-5), noise from traffic on busy arterial roads, and noise from commercial and industrial activities. Ambient noise levels around the Project site were determined using the noise contours listed in Table 15-1 of the 2030 General Plan, Predicted Traffic Noise Level and Project Related Traffic Noise Level Increases, Merced County 2030 General Plan and Draft Program Environmental Impact Report (Merced County 2013). This table lists future noise levels of 80 dB(A) Ldn at 100 feet from I-5 and future noise levels of 73 dB(A) Ldn 100 feet from State Route 165 (SR-165).

Using distance attenuation from a line source, as previously described in Section 4.12.1, noise levels at the Project site are anticipated to range from about 74 dB(A) Ldn at the edge of the Project site closest to the freeway to about 65 dB(A) Ldn at the edge of the Project site farthest from the freeway. Noise levels at the closest receptor at 25001 Poleline Road are calculated at 72 dB(A) Ldn accounting for noise from both I-5 and SR-165.

2.4 Methodology for Analysis

The Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) was used to estimate the impact from short-term construction activities. The RCNM is used as the FHWA's national standard for predicting noise generated from construction activities. The RCNM analysis includes the calculation of noise levels at a defined distance for a variety of construction equipment. The spreadsheet inputs include acoustical use factors and distance to receptors and calculates the expected L_{max} values and L_{eq} values at a selected receptor.

Noise impacts from the operation of the facility were calculated using the SoundPLAN acoustic modeling software. SoundPLAN uses standardized prediction techniques (per ISO 9613) and accounts for distance, topography, vegetation, and the effect of shielding and reflections produced by buildings and acoustic barriers.

Vibration impacts from construction of the project were calculated using the reference vibration levels from Table 5 and the following distance attenuation equation in the 2018 Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual (FTA 2018):

PPV = PPVref x (25/Distance)^1.5

"PPVref" is the reference PPV from Table 5 and "Distance" is the distance between the source and the receptor:

2.5 Environmental Analysis

This section describes the impact analysis related to noise and vibration for the project. It lists the thresholds used to conclude whether an impact would be significant, identifies potential impacts of the project and, if necessary, any mitigation measures.

2.5.1 THRESHOLDS OF SIGNIFICANCE

In accordance with Appendix G of the California Environmental Quality Act Guidelines, the project would have a significant effect if it would result in any of the conditions listed below.

- Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in a local general plan or noise ordinance, or applicable standards of other agencies.
- Generation of excessive groundborne vibration or groundborne noise levels.
- For a project located within the vicinity of a private airstrip or 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 this project, noise generated by construction activities was compared to the guidelines listed in Table 7-3 in the September 2018 FTA Transit Noise and Vibration Impact Assessment Manual. Table 7-3 lists a guideline threshold of 80 dB(A) for construction noise received by residential properties during daytime hours.

Operational noise from the project was compared with the limits listed in Chapter 10.60, Noise Control, of the Merced County Code (Merced County 2005). Again, this section lists a threshold of 65 dB(A) Ldn for noise received by a residential real property.

2.5.2 SHORT-TERM CONSTRUCTION NOISE

Construction tasks for the project would include civil work, facility construction, and testing and commissioning. Each construction task has its own mix of equipment, and consequently, its own noise characteristics. The various construction operations would change the character of the noise generated at the project site and the noise level as construction progresses. The loudest stages of construction typically involve earthmoving and grading equipment. The main types of noise-producing equipment for each task are shown in Table 8.

Table 8. Construction Tasks and Equipment

Construction Task	Construction Equipment	
Civil Work	Pickup Trucks (7) Excavators (2) Haul Truck	Graders (2) Front-End Loaders (2) Water Trucks (26)
Facility Construction	Pickup Trucks (7) Vibratory Rollers (1) Front-End Loaders (2)	Utility Truck Pile Drivers (Drill Rig Trucks) (6) Hydraulic Crane Water Trucks (26)
Testing and Commissioning	Pickup Trucks (7) Skid Steer Loaders (10) Utility Trucks / Pile Drivers (Drill Rig Trucks) (6)	Water Trucks (26) Excavators (2) Generators (2)

Table 9 lists the types of construction equipment and the maximum and average noise level estimates as measured at 3,750 feet from the operating equipment. The 3,750-foot distance represents the approximate distance between the project and the closest residential home at 25001 Poleline Road.

Table 9. Project Construction Noise Levels

Construction Equipment Source at the Project Site	Distance to Closest Residential Receptor, feet	Sound Level at Receptor		
		L_{max}, dB(A)	Acoustical Use Factor	L_{eq}, dB(A)
Crane (Hydraulic)	3,750	43.0	16%	35.1
Haul Truck	3,750	38.9	40%	35.0
Excavator	3,750	43.2	40%	39.2
Front-End Loader	3,750	45.9	40%	41.9
Generator	3,750	43.1	50%	40.1
Grader	3,750	47.5	40%	43.5
Pickup Truck	3,750	37.5	40%	33.5
Utility Truck / Pile Driver (Drill Rig Truck)	3,750	41.6	20%	34.6
Vibratory Roller	3,750	42.5	20%	35.5
Water Truck	3,750	37.5	40%	33.5

Source: Federal Highway Administration Roadway Construction Noise Model, v1.1
Key: dB(A) = A-weighted decibel L_{eq} = equivalent noise level L_{max} = maximum noise level

A worst-case condition for each construction task would assume all noise-generating equipment were operating at the same time and at the same distance from the closest noise-sensitive receptor. Using this assumption, the RCNM program calculated the following combined L_{eq} and L_{max} noise levels for each construction task as shown in Table 10.

Table 10. Calculated Noise Level for Each Construction Task

Construction Task	Distance to Closest Residential Receptor, feet	Calculated Lmax, dB(A)	Calculated Leq, dB(A)
Civil Work	3,750	56.4	52.4
Facility Construction	3,750	56.0	51.3
Testing and Commissioning	3,750	57.5	53.2

Key:
db(A) = A-weighted decibel
L_{eq} = equivalent noise level
L_{max} = maximum noise level

Noise levels generated from the construction of the project that are received by the closest neighboring properties are expected to be below the 80 dB(A) threshold guideline listed in Table 7-3 in the September 2018 FTA Transit Noise and Vibration Impact Assessment Manual. Noise levels generated from the construction of the project that are received by sensitive receptors located further away would be even lower.

Additionally, any increase in noise levels from construction activities would be temporary and intermittent, and construction activities would generally be limited to daytime hours in accordance with Section 10.60.030.B.5 in the Merced County Code (Merced County 2005). Construction would occur between 7 a.m. and 6 p.m., Monday through Saturday. Additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities in accordance with applicable Merced County standards. Construction activities would take place six days per week for 10 hours per day. Some activities may continue 24 hours per day, seven days per week. Low-level noise activities may potentially occur between the hours of 10 p.m. and 6 a.m. Nighttime activities could potentially include but are not limited to refueling equipment, staging material for the following day's construction activities, quality assurance and control, and commissioning. These activities do not involve heavy construction equipment and therefore are much quieter than daytime construction work. Accordingly, noise levels generated from construction would not result in any increase in nighttime noise and would also comply with the 70 dB(A) nighttime threshold guideline listed in Table 7-3 in the FTA Transit Noise and Vibration Impact Assessment Manual. Therefore, impacts from construction noise would be less than significant.

Finally, traffic noise from daily trips by construction workers commuting to the site would contribute to the traffic noise levels along access routes. Construction-generated vehicle traffic would include a mix of light-duty automobiles and trucks and heavy-duty trucks. However, the project's construction vehicle traffic would not result in a substantial increase in average-daily vehicle traffic noise levels. Therefore, impacts from construction noise would be less than significant.

2.5.3 GROUNDBORNE VIBRATION

During construction of the Project, equipment such as trucks, drill rig trucks, and rollers may be used as close as about 270 feet from the existing aqueduct and berm.

Based on the PPV_{ref} presented in Table 5 and the distance to the nearest receptor, equipment used during Project construction could generate vibration levels between 0.002 PPV (in/sec) and 0.006 PPV (in/sec) at 270 feet, as shown below in Table 11. All estimated vibration levels would be below the FTA vibration threshold for potential building damage as defined in Tables 3 and 4. Therefore, the Project would not result in the generation of excessive groundborne vibration or groundborne noise levels and impacts from construction vibration would be less than significant.

Table 11. Estimated Vibration Levels for Construction Equipment

Type of Equipment	PPV (in/sec) at 270 Feet	Threshold which Building Damage Could Occur	Exceed Threshold for Building Damage?
Loaded Trucks	0.002	0.50	No
Caisson Drilling	0.003	0.50	No
Vibratory Roller	0.006	0.50	No

Source: Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual (FTA 2018).
Key:
in/sec = inches per second
PPV = peak particle velocity

Groundborne vibration is not anticipated to occur during Project operations. In addition, any vibration generated during decommissioning would be similar to what is presented in Table 11 and would be considered less than significant.

2.5.4 OPERATIONAL NOISE

During operations, rows of solar modules mounted in rows on single-axis trackers and racking equipment would occupy most of the Project site. The modules would extend up to 12 feet above the ground at maximum tracker tilt. The project would also include an underground DC collector system; up to 21 electrical equipment pads, each with inverter and transformer equipment; a 15-acre BESS area with regularly spaced battery units; and an approximately 3.5-acre switchyard and/or substation with riser equipment in the northwest part of the project. The BESS area will be the main source of noise generated from the operation of the Project. Noise generated from all on-site BESS equipment would radiate from the Project site. Twenty-six outdoor battery containers/collectors, up to 21 electrical equipment pads with inverters and transformers were included in the operational noise analysis of the project. The location and the configuration of the project's equipment is shown in Figure 3 below.

2.5.4.1 Analysis Conditions and Results

The following conditions and assumptions were included in the operational noise analysis of the proposed Project equipment:

- The predicted noise levels were calculated using the SoundPLAN acoustic modeling software. SoundPLAN uses standardized prediction techniques (per ISO 9613) and accounts for distance, topography, vegetation, and the effect of shielding and reflections produced by buildings and acoustic barriers.

- All topography (such as berms or hills), ground conditions (soft vs paved ground) and shielding elements (such as buildings) associated with the Project were taken directly from Google Earth.

- Since there are no noise-sensitive residential dwellings located in proximity to the location of the proposed solar equipment, operational noise levels were calculated at each of the project's property lines (shown as black dots in Figure 3 below). All receptors were positioned at 5 feet above ground level.

- The Project would include a solar array area surrounded by an up to 8-foot-tall chain-link security fence, which has no acoustic benefit.

- Inverter units were modeled as a point source and the exterior battery module sources were modeled as an area source.

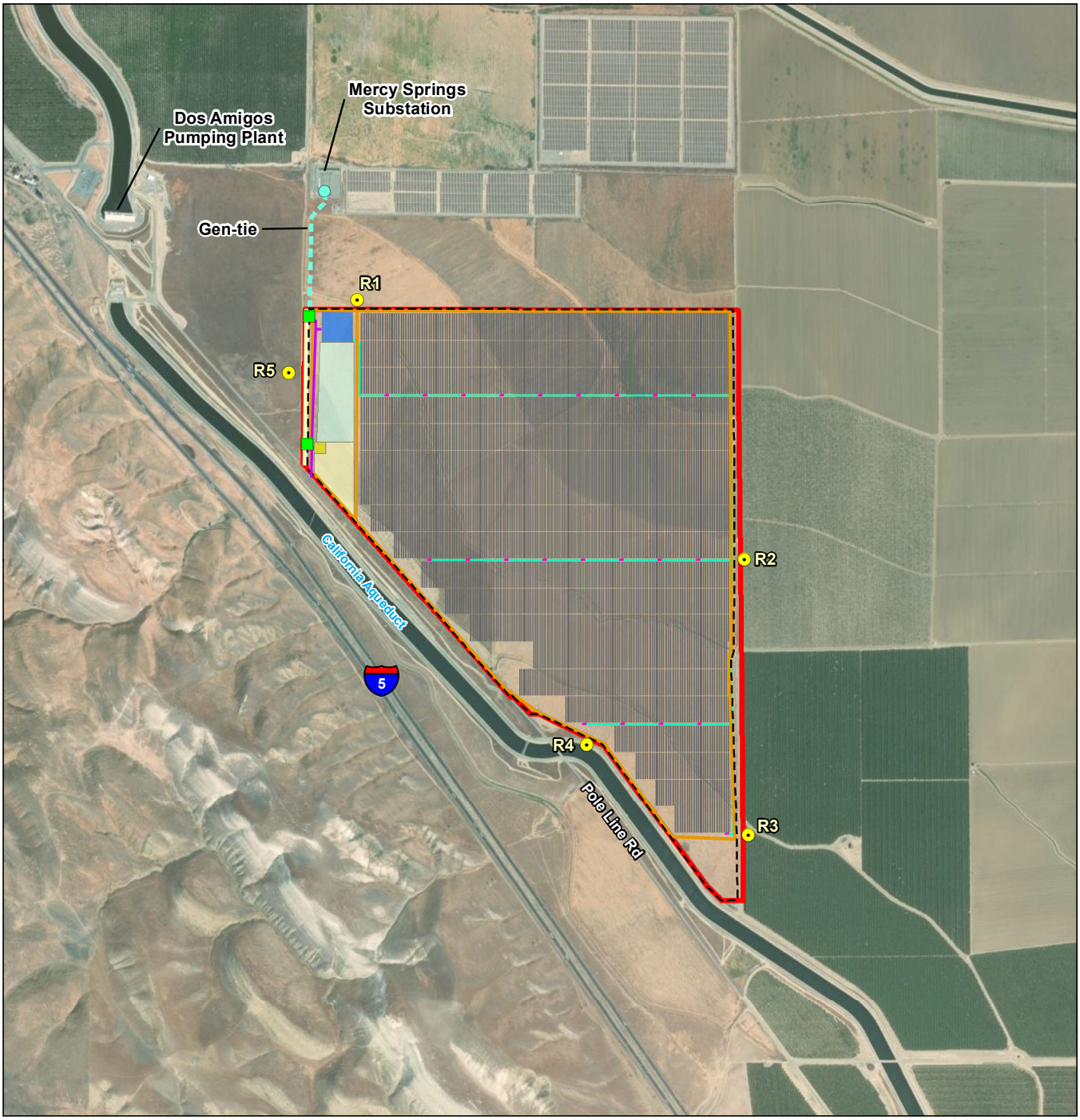
- Noise data for the battery segments and inverters used in the SoundPLAN model are shown in Table 12. The noise data were provided by the Applicant via email on October 14, 2022.

Table 12. Noise Data for Battery Segments and Inverters

Equipment	Sound Pressure Level Assumption (per unit)
Battery Segments/Collection Longroad	67 dB measured at 2 meters
Inverter	67 dB(A) measured at 10 meters

Source: Longroad Development Company, LLC (Applicant), via e-mail October 14, 2022
Key:
dB = decibel
dB(A) = A-weighted decibel

- All units were assumed to be operating at full capacity, continuously.



Notes
1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources:
3. Background: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

- Project Site Boundary
- Receptor Calculation Point
- Gen-tie
- Point of Interconnection
- Zeta Substation
- Panel Layout
- Inverters
- O&M Building
- Laydown Yard
- BESS
- Mv Collectors
- Fence
- Access Road
- Perimeter Road
- Utility Lines
- Gate

0 0.25 0.5 Miles
(At original document size of 8.5x11)
1:24,000

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Stantec

Project Location
Merced County, CA

Prepared by PG on 2024-07-26
TR by TF on 2024-07-29

Client/Project
Longroad Energy Management, LLC
Zeta Solar and Battery Energy Storage System Project

Figure 1

Title
Configuration of the Zeta Solar Proposed Equipment and Location of Property Line Receptor Calculation Points

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Using the provided sound level data, the configuration of the on-site equipment shown in Figure 1, and the assumptions above, the modeled noise levels at the receptors are shown in Table 13. Noise contour maps are included in Figure 2 below.

Table 13. Modeled Receptor Noise Levels

Receptor Location	Estimated Ambient Noise Level, dB(A) Ldn	Predicted Sound Pressure Level, dB(A)	Calculated Ldn, dB(A)	Merced County Code Limits, Ldn, dB(A)	Merced County General Plan Limits, Leq, dB(A)	Exceed Merced County Noise Codes?
R1 North	73	37	43	65 Residential 70 Non-Residential	55 Daytime 50 Nighttime	No
R2 East	65	30	36	65 Residential 70 Non-Residential	55 Daytime 50 Nighttime	No
R3 Southeast	65	35	41	65 Residential 70 Non-Residential	55 Daytime 50 Nighttime	No
R4 South	74	39	45	65 Residential 70 Non-Residential	55 Daytime 50 Nighttime	No
R5 West	74	41	47	65 Residential 70 Non-Residential	55 Daytime 50 Nighttime	No

Key:
db(A) = A-weighted decibel
Ldn = day-night noise level
L_{eq} = equivalent noise level

As shown in Table 13 above and in Figure 2, the estimated noise levels at the Project's property lines are estimated to be below the limits set forth in Chapter 10.60 in the Merced County Code (Merced County 2005) and Table HS-2 (Table 7) in the 2030 General Plan (Merced County 2013). In addition, operational noise generated by the Project would be below the estimated ambient noise levels present in the area. Also, maintenance vehicle trips to the site would be intermittent and generate a negligible increase in traffic noise levels. Therefore, the Project would not result in the generation of a substantial permanent increase in ambient noise levels in the vicinity of the Project, and the impact of operational fixed-source noise and traffic noise to the neighboring properties would be less than significant.

Project Location
Merced County, CA

Prepared by PG on 2024-08-16
TR by JDLR on 2024-08-16

Client/Project
Longroad Energy Management, LLC
Zeta Solar and Battery Energy Storage System Project

Figure 2

Title
Noise Contour Map of Zeta Solar BESS Site to Adjacent Receptors

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2.5.5 AIRPORT NOISE

The Project is not within two miles of a public airport or public use airport. The closest airports or private airstrip to the Project site are the Dos Palos Airport, over 10 miles northeast of the Project, and the Los Banos Municipal Airport, over 11 miles north of the Project. Therefore, the Project would not expose people residing or working in the Project area to excessive noise levels from airports, and impacts would be less than significant.

2.5.6 PG&E INTERCONNECTION INFRASTRUCTURE

As noted in Section 1.2, Project Description, the Project's proposed 70 kV gen-tie line would extend approximately 1,700 feet north from the Project substation to the Mercy Springs Substation, which is the Project point of interconnection to the grid. As part of the interconnection process, PG&E would install gen-tie line terminal equipment and the termination of the Project's fiber optic line and install one circuit breaker. The Applicant will work with PG&E to install the improvements, which would occur within areas previously disturbed and occupied by existing electrical facilities. Substation improvements would include installation of terminal equipment for the gen-tie line and fiber optic line plus one circuit breaker during the second year of Project construction.

The Mercy Springs substation is approximately 3,750 feet from the closest residential property at 25001 Poleline Road. This distance is approximately the same as the distance used to evaluate construction noise from the main Project to the residence. According to the calculation results presented in Table 8, construction noise levels at the pumping plant are in compliance with the 2018 FTA guidelines. Assuming the construction equipment used for the interconnection infrastructure is similar to that used for the main project and again assuming the same distance between the residence and the construction activity, noise levels from the construction of the interconnection infrastructure may increase noise levels at the closest receptor by a maximum of 3 dB(A). Therefore, noise levels generated from the construction of the interconnection infrastructure in addition to the main project would still be below the 2018 FTA guideline limits.

With regard to traffic noise levels during the construction of the interconnection infrastructure, the limited daily truck trips that would be required to deliver the materials for the work would not be expected to result in a traffic noise level that would exceed the ambient daytime or nighttime noise level at the closest residences.

Additionally, any increase in noise levels from construction activities would be temporary and intermittent, and construction activities would generally be limited to daytime hours in accordance with Section 10.60.030.B.5 in the Merced County Code (Merced County 2005). Accordingly, noise levels generated from construction would not result in any increase in nighttime noise and would also comply with the 70 dB(A) nighttime threshold guideline listed in Table 7-3 in the FTA Transit Noise and Vibration Impact Assessment Manual. Therefore, impacts from construction noise from the interconnection infrastructure would be less than significant.

Since the gen-tie line typically consists of low-noise emitting elements, such as power line towers, conductors, insulators, cables, and safety equipment, the operation of the gen-tie terminal equipment and

the circuit breaker would not be as loud as the BESS equipment. At 3,750 feet, the noise level associated with the transmission line connection would not be audible. Consequently, there would be no operational impact of the PG&E interconnection infrastructure.

3.0 Cumulative Impacts

As effects of noise are highly localized, the geographic scope for considering cumulative noise impacts comprises related projects within 0.25 mile of the project. Construction, operation, and decommissioning of the Project would result in less-than-significant impacts with respect to generation of noise levels in excess of standards. The Project would have less-than-significant impacts to excessive groundborne vibration, and an increase in permanent and temporary ambient noise levels.

Cumulative noise impacts could occur from multiple projects resulting in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or exposure to groundborne vibration and groundborne noise.

There are no planned projects within 0.25 miles of the Project. Therefore, the cumulative noise impacts would be less than significant, and the contribution from the Project would not be cumulatively considerable.

4.0 Conclusion

Noise and vibration associated with the project is primarily generated by construction activities and operational noise from the fixed-source solar and BESS equipment on the project site.

Based on the FHWA RCNM, the project will generate construction noise that is temporary and would not exceed the limits set forth in Table HS-2 (Table 7) in the 2030 Merced County General Plan. While the noise levels presented are a “worst-case” scenario, the construction noise levels are not expected to be continuous. Moreover, all construction activities will be limited to the restrictions set by Section 10.60.030.B.5 in the Merced County Code (Merced County 2005).

Operational noise from fixed equipment on the site is not expected to exceed the limits set forth in Section 10.60 in the Merced County Code (Merced County 2005) or Table HS-2 (Table 7) in the 2030 Merced County General Plan.

The project would follow all requirements of the 2030 Merced County General Plan and the Merced County Code (Merced County 2005). The noise generated from construction and operation of the project would not significantly alter the existing acoustic environment in the area. Therefore, the project would have a less-than-significant impact on the neighboring receptors.

5.0 References

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APPENDIX A

Construction Noise Calculations

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/19/2024
Case Description: Zeta Solar - Civil Work

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
25001 Poleline Road	Residential	60	55	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Pickup Truck	No	40		75	3750	0
Pickup Truck	No	40		75	3750	0
Pickup Truck	No	40		75	3750	0
Pickup Truck	No	40		75	3750	0
Pickup Truck	No	40		75	3750	0
Pickup Truck	No	40		75	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Front End Loader	No	40		79.1	3750	0
Front End Loader	No	40		79.1	3750	0
Grader	No	40	85		3750	0
Grader	No	40	85		3750	0
Haul Truck	No	40		76.5	3750	0
Excavator	No	40		80.7	3750	0
Excavator	No	40		80.7	3750	0
Pickup Truck	No	40		75	3750	0

Results

Calculated (dBA)

Equipment	Lmax	Leq
Pickup Truck	37.5	33.5
Pickup Truck	37.5	33.5
Pickup Truck	37.5	33.5
Pickup Truck	37.5	33.5
Pickup Truck	37.5	33.5
Pickup Truck	37.5	33.5
Water Truck	39	35
Water Truck	39	35
Water Truck	39	35
Water Truck	39	35
Water Truck	39	35
Water Truck	39	35
Front End Loader	41.6	37.6
Front End Loader	41.6	37.6
Grader	47.5	43.5
Grader	47.5	43.5
Haul Truck	38.9	35
Excavator	43.2	39.2
Excavator	43.2	39.2
Pickup Truck	37.5	33.5
Total	**54.4**	**50.5**

Report date: 7/19/2024
Case Description: Zeta Solar - Facility Construction - Non Truck

		Baselines (dBA)		---- Receptor #1 ----
Description	Land Use	Daytime	Evening	Night
25001 Poleline Road	Residential	60	55	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Roller	No	20		80	3750	0
Front End Loader	No	40		79.1	3750	0
Front End Loader	No	40		79.1	3750	0
Crane	No	16		80.6	3750	0

Results

	Calculated (dBA)	
Equipment	Lmax	Leq
Roller	42.5	35.5
Front End Loader	41.6	37.6
Front End Loader	41.6	37.6
Crane	43	35.1
Total	**48.2**	**42.6**

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/19/2024
Case Description: Zeta Solar - Facility Construction - Truck

				---- Receptor #1 ----			
		Baselines (dBA)					
Description	Land Use	Daytime	Evening	Night			
25001 Poleline Road	Residential	60	55	50			

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Pickup Truck	No	40		75	3750	0
Pickup Truck	No	40		75	3750	0
Pickup Truck	No	40		75	3750	0
Pickup Truck	No	40		75	3750	0
Pickup Truck	No	40		75	3750	0
Pickup Truck	No	40		75	3750	0
Pickup Truck	No	40		75	3750	0
Drill Rig Truck	No	20		79.1	3750	0
Drill Rig Truck	No	20		79.1	3750	0
Drill Rig Truck	No	20		79.1	3750	0
Drill Rig Truck	No	20		79.1	3750	0
Drill Rig Truck	No	20		79.1	3750	0
Drill Rig Truck	No	20		79.1	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0

		Results Calculated (dBA)	
Equipment		Lmax	Leq
Pickup Truck		37.5	33.5
Pickup Truck		37.5	33.5
Pickup Truck		37.5	33.5
Pickup Truck		37.5	33.5
Pickup Truck		37.5	33.5
Pickup Truck		37.5	33.5
Pickup Truck		37.5	33.5
Drill Rig Truck		41.6	34.6
Drill Rig Truck		41.6	34.6
Drill Rig Truck		41.6	34.6
Drill Rig Truck		41.6	34.6
Drill Rig Truck		41.6	34.6
Drill Rig Truck		41.6	34.6
Water Truck		39	35
Water Truck		39	35
Water Truck		39	35
Water Truck		39	35
Water Truck		39	35
Water Truck		39	35
	Total	**52.4**	**47.2**

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/19/2024

Case Description: Zeta Solar - Testing and Commissioning - Non Truck

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
25001 Poleline Road	Residential	60	55	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Front End Loader	No	40		79.1	3750	0
Front End Loader	No	40		79.1	3750	0
Front End Loader	No	40		79.1	3750	0
Front End Loader	No	40		79.1	3750	0
Front End Loader	No	40		79.1	3750	0
Front End Loader	No	40		79.1	3750	0
Front End Loader	No	40		79.1	3750	0
Front End Loader	No	40		79.1	3750	0
Front End Loader	No	40		79.1	3750	0
Front End Loader	No	40		79.1	3750	0
Excavator	No	40		80.7	3750	0
Generator	No	50		80.6	3750	0
Excavator	No	40		80.7	3750	0
Generator	No	50		80.6	3750	0

Results

Equipment		Calculated (dBA) Lmax	Leq
Front End Loader		41.6	37.6
Front End Loader		41.6	37.6
Front End Loader		41.6	37.6
Front End Loader		41.6	37.6
Front End Loader		41.6	37.6
Front End Loader		41.6	37.6
Front End Loader		41.6	37.6
Front End Loader		41.6	37.6
Front End Loader		41.6	37.6
Front End Loader		41.6	37.6
Excavator		43.2	39.2
Generator		43.1	40.1
Excavator		43.2	39.2
Generator		43.1	40.1
	Total	**53.6**	**49.8**

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/19/2024
Case Description: Zeta Solar - Testing and Commissioning - Truck

		---- Receptor #1 ----		
		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
25001 Poleline Road	Residential	60	55	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Pickup Truck	No	40		75	3750	0
Pickup Truck	No	40		75	3750	0
Pickup Truck	No	40		75	3750	0
Pickup Truck	No	40		75	3750	0
Pickup Truck	No	40		75	3750	0
Pickup Truck	No	40		75	3750	0
Pickup Truck	No	40		75	3750	0
Drill Rig Truck	No	20		79.1	3750	0
Drill Rig Truck	No	20		79.1	3750	0
Drill Rig Truck	No	20		79.1	3750	0
Drill Rig Truck	No	20		79.1	3750	0
Drill Rig Truck	No	20		79.1	3750	0
Drill Rig Truck	No	20		79.1	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0

	Results Calculated (dBA)	
Equipment	Lmax	Leq
Pickup Truck	37.5	33.5
Pickup Truck	37.5	33.5
Pickup Truck	37.5	33.5
Pickup Truck	37.5	33.5
Pickup Truck	37.5	33.5
Pickup Truck	37.5	33.5
Pickup Truck	37.5	33.5
Drill Rig Truck	41.6	34.6
Drill Rig Truck	41.6	34.6
Drill Rig Truck	41.6	34.6
Drill Rig Truck	41.6	34.6
Drill Rig Truck	41.6	34.6
Drill Rig Truck	41.6	34.6
Water Truck	39	35
Water Truck	39	35
Water Truck	39	35
Water Truck	39	35
Water Truck	39	35
Water Truck	39	35
Total	**52.4**	**47.2**

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/19/2024
Case Description: Zeta Solar - Water Trucks (20)

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
25001 Poleline Road	Residential	60	55	50

			Equipment			
			Spec	Actual	Receptor	Estimated
	Impact		Lmax	Lmax	Distance	Shielding
Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0
Water Truck	No	40		76.5	3750	0

Results

		Calculated (dBA)	
Equipment		Lmax	Leq
Water Truck		39	35
Water Truck		39	35
Water Truck		39	35
Water Truck		39	35
Water Truck		39	35
Water Truck		39	35
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Water Truck		39	35
Water Truck		39	35
Water Truck		39	35
Water Truck		39	35
Water Truck		39	35
Water Truck		39	35
	Total	**52**	**48**