Noise Impact Assessment

Vega SES Complex Solar Energy Storage Project

County of Imperial, California

Prepared For:

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LIST OF ACRONYMS AND ABBREVIATIONS

A-3-RE	Heavy Agriculture with a Renewable Energy Overlay
A-2-RE	General Agriculture with a Renewable Energy Overlay
CEQA	California Environmental Quality Act

CNEL	Community Noise Equivalent Level
dB	Decibel
dBA	Decibel is A-weighted
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
IID	Imperial Irrigation District
L_{eq}	Measure of ambient noise
HSAT	Horizontal single-axis tracker
MW	Megawatts
OPR	Office of Planning and Research
OSHA	Federal Occupational Safety and Health Administration
OSHPD	Office of State Health Planning and Development
PPV	Peak particle velocity
Project	Vega SES Complex Solar Energy Storage Facilities
RMS	Root mean square
S-2-RE	Open Space Preservation Zone with a Renewable Energy Overlay
SR	State Route
WEAL	Western Electro-Acoustic Laboratory, Inc.

1.0 INTRODUCTION

This report documents the results of a Noise Impact Assessment completed for the Vega Complex Solar Energy Storage Project (Project), which includes the construction of up to a nominal 240-megawatt (MW) alternating current solar photovoltaic (PV) energy generation system with an integrated 240 MW battery storage system (known as Vega 2), a nominal 60 MW alternating current PV energy generation system with an integrated 60 MW battery storage system (known as Vega 3), and a nominal 50 MW alternating current solar PV energy generation system with an integrated 50 MW battery storage system (known as Vega 5), all spanning approximately 1,963 acres of land in the County of Imperial, California. This report was prepared as a comparison of predicted Project noise levels to noise standards promulgated by the County of Imperial General Plan Noise Element. The purpose of this report is to estimate Project-generated noise and to determine the level of impact the Project would have on the environment.

1.1 Project Overview

The Project proposes to construct a cluster of alternating current solar PV energy generation systems totaling 350 Megawatts (MWs) with accompanying battery storage. The Project consists of three individual site locations which make up the Vega SES Complex. Vega 2 is located on three non-contiguous parcels totaling 1,323 acres, Vega 3 is located on a 640-acre parcel but only compromising 230 acres, and Vague 5 is located on three parcels totaling 410 acres. It is proposed that Vega 2 & 3 will be constructed together beginning in early 2023 with Vega 5 being constructed in 2024.

All systems would be utilizing either thin film or crystalline solar PV technology modules mounted either on fixed frames or horizontal single-axis tracker (HSAT) systems. The fixed frame PV module arrays would be mounted on racks that would be supported by driven piles. The individual PV systems would be arranged in large arrays by placing them in columns spaced approximately ten feet apart to maximize operational performance and to allow access for panel cleaning and maintenance.

1.2 Project Location and Description

The total combined Project Site area spans approximately 1,963 acres and is located 5.67 miles southeast of the unincorporated community of Niland between the unincorporated communities of Iris and Slab City (see Figure 1. Project Vicinity). The Site is transected by the Coachella and East Highline Canals and the Union Pacific Railway in northcentral Imperial County, California.

1.3 Applicable Land Use Regulations

All Project parcels for Vega 2 & 3 are designated as “Recreation/Open Space” in the Imperial County General Plan and are zoned S-2-RE (Open Space/Preservation with a Renewable Energy overlay). Pursuant to Section 91703.02 (CONDITIONAL USE PERMITS), Renewable Energy Projects must be located within the Renewable Energy Overlay Zone and may be permitted only through the issuance of a Conditional Use Permit (CUP) as approved by the Approving Authority unless otherwise allowed by applicable law. All Project parcels in Vega 5 are designated as “Recreation/Open Space” in the Imperial County General Plan. Two of the Vega 5 properties are zoned S-2-RE (areas with intent to preserve the cultural, biological, and open spaces that are rich and natural as well as cultural resources). The third Vega 5 property is zoned A-

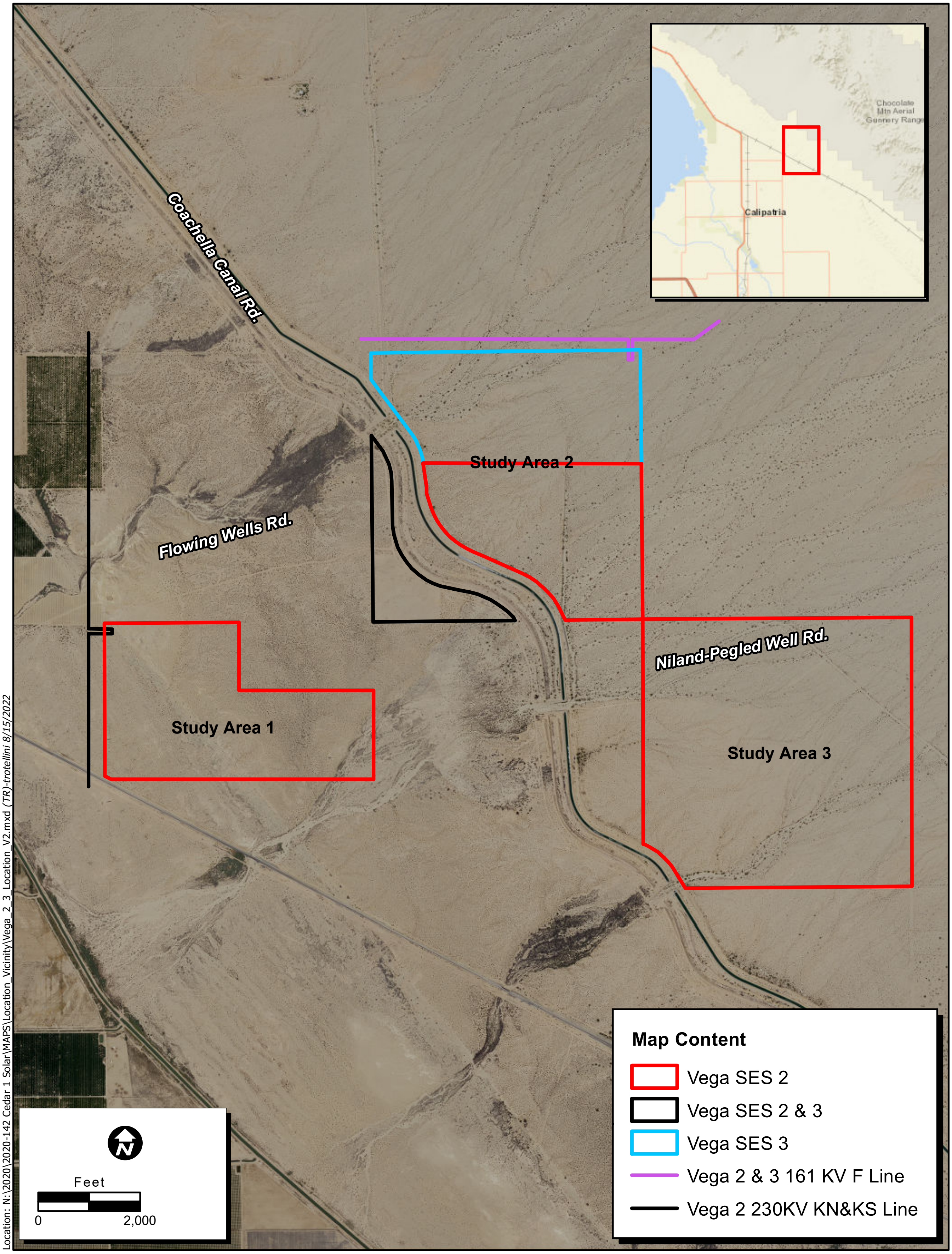
2-RE (areas that are suitable and intended primarily for agricultural uses [limited] and agricultural related compatible uses), A-3-RE (areas that are suitable for agricultural land uses; to prevent the encroachment of incompatible uses onto and within agricultural lands; and to prohibit the premature conversion of such lands to non-agricultural uses) and S-2-RE (see above). At present, all portions of the proposed Project (Vega 2 & 3, and 5) are located within the Renewable Energy Zone.

1.4 Project Site Access

The Project Area would be accessible from McDonald Road, a paved road off State Route 111. The Vega 5 Project Site is located at the eastern end of McDonald Road. Access to the Vega 2 and 3 Project Site would require an additional 1.65 miles of travel on Wiest Road and Flowing Wells Road. Both of which are unpaved.

1.5 Project Construction

Construction activities would involve demolition and grubbing, grading of the Project Site to establish access roads and pads for electrical equipment (inverters and step–up transformers), trenching for underground electrical collection lines, and the installation of solar equipment and security fencing. The construction of each Project component (Vega 2 & 3 and Vega 5) is estimated to take 12-18 months each and would begin in early 2023. A temporary, portable construction supply container would be located at the Project Site at the beginning of construction and removed at the end of construction. The number of on–site construction workers for Vega 2 and 3 solar facility is not expected to exceed 150 workers at any one time. The number of on-site construction workers for the Vega 2 and 3 battery storage facility and substations is not expected to exceed 100 workers at any one time. The number of on–site construction workers for the Vega 5 solar facility is not expected to exceed 75 workers at any one time. The number of on-site construction workers for the Vega 5 battery storage facility and substation is not expected to exceed 50 workers at any one time. Onsite parking would be provided for all construction workers.



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Map Date: 8/15/2022

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Figure 1. Project Location

2020-144/2020-199/2020-209 Vega SES 2 and Vega SES 3

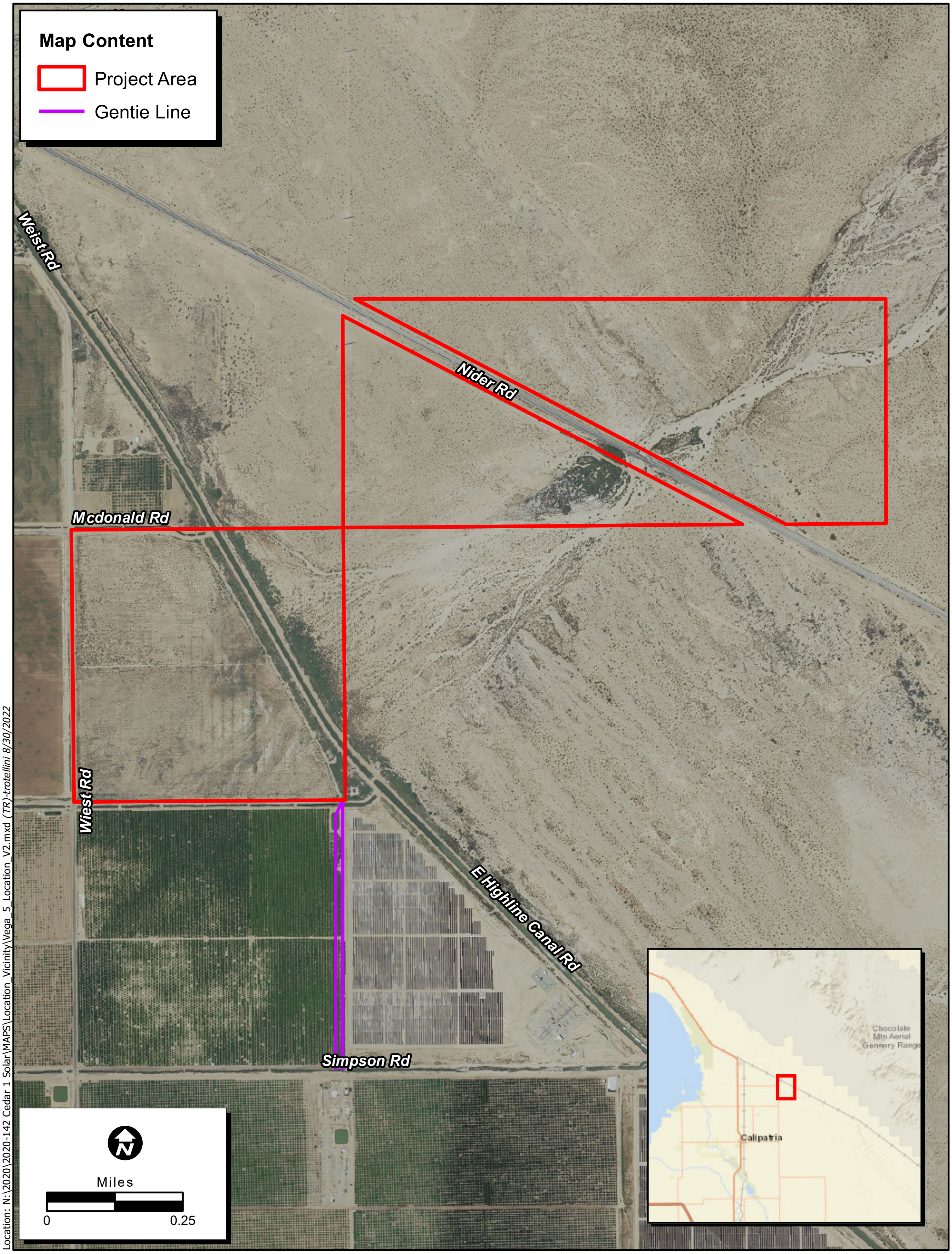

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Figure 1. Project Location

2020-144 Vega SES 5

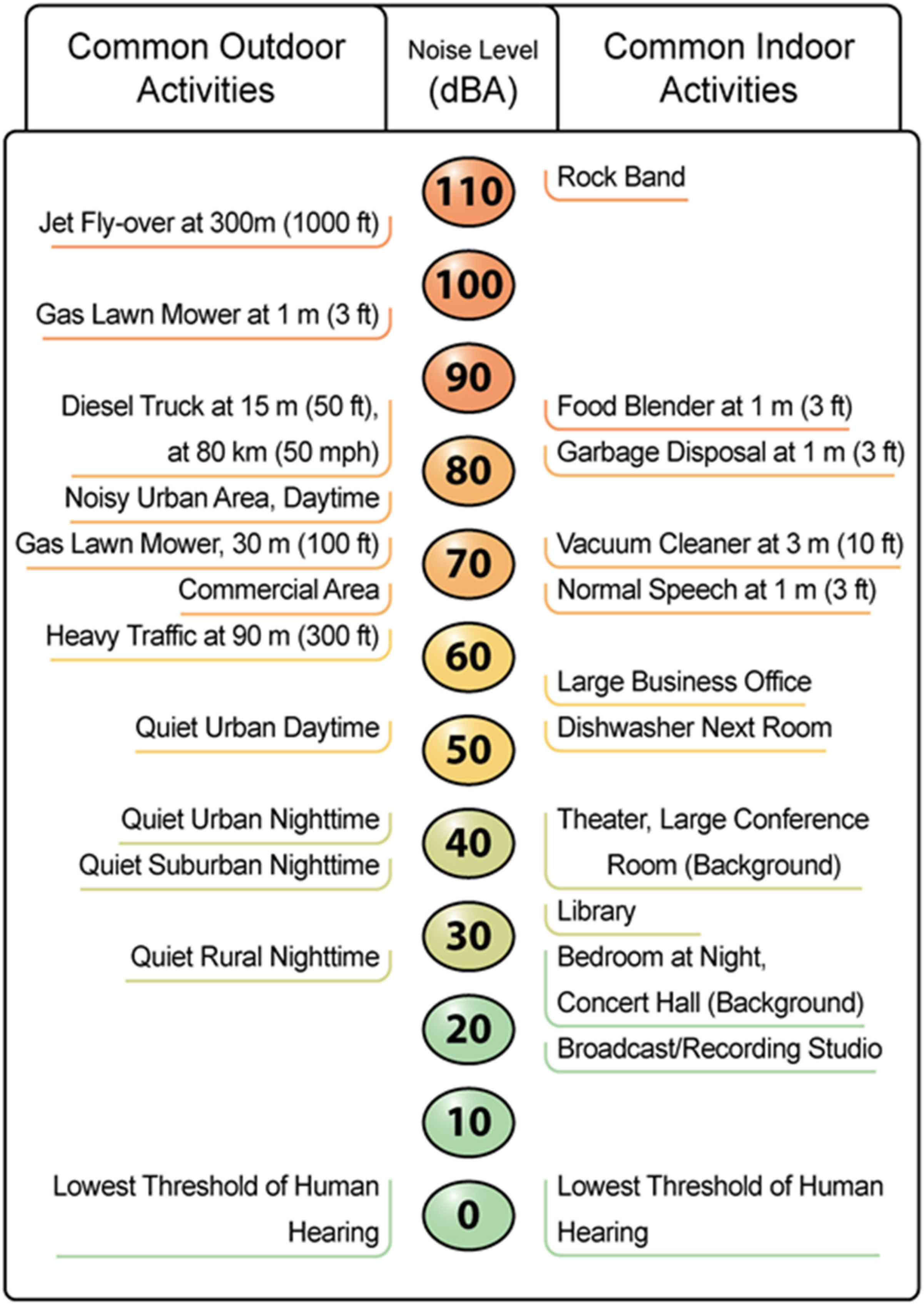
2.0 ENVIRONMENTAL NOISE AND GROUNDBORNE VIBRATION ANALYSIS

2.1 Fundamentals of Noise and Environmental Sound

2.1.1 Addition of Decibels

The decibel (dB) scale is logarithmic, not linear, and therefore sound levels cannot be added or subtracted through ordinary arithmetic. Two sound levels 10 dB apart differ in acoustic energy by a factor of 10. When the standard logarithmic decibel is A-weighted (dBA), an increase of 10 dBA is generally perceived as a doubling in loudness. For example, a 70-dBA sound is half as loud as an 80-dBA sound and twice as loud as a 60-dBA sound. When two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be three dB higher than one source under the same conditions (Federal Transit Administration [FTA] 2018). For example, a 65-dB source of sound, such as a truck, when joined by another 65 dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by three dB). Under the decibel scale, three sources of equal loudness together would produce an increase of five dB.

Typical noise levels associated with common noise sources are depicted in Figure 2. *Common Noise Levels.*



Source: California Department of Transportation (Caltrans) 2020a

Figure 2. Common Noise Levels

Vega SES Complex Project

2.1.2 Sound Propagation and Attenuation

Noise can be generated by a number of sources, including mobile sources such as automobiles, trucks and airplanes, and stationary sources such as construction sites, machinery, and industrial operations. Sound spreads (propagates) uniformly outward in a spherical pattern, and the sound level decreases (attenuates) at a rate of approximately six dB for each doubling of distance from a stationary or point source. Sound from a line source, such as a highway, propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of approximately three dB for each doubling of distance from a line source, such as a roadway, depending on ground surface characteristics (Federal Highway Administration [FHWA] 2011). No excess attenuation is assumed for hard surfaces like a parking lot or a body of water. Soft surfaces, such as soft dirt or grass, can absorb sound, so an excess ground-attenuation value of 1.5 dB per doubling of distance is normally assumed. For line sources, an overall attenuation rate of three dB per doubling of distance is assumed (FHWA 2011).

Noise levels may also be reduced by intervening structures; generally, a single row of detached buildings between the receptor and the noise source reduces the noise level by about five dBA (FHWA 2006), while a solid wall or berm generally reduces noise levels by 10 to 20 dBA (FHWA 2011). However, noise barriers or enclosures specifically designed to reduce site-specific construction noise can provide a sound reduction 35 dBA or greater (Western Electro-Acoustic Laboratory, Inc. [WEAL] 2000). To achieve the most potent noise-reducing effect, a noise enclosure/barrier must physically fit in the available space, must completely break the "line of sight" between the noise source and the receptors, must be free of degrading holes or gaps, and must not be flanked by nearby reflective surfaces. Noise barriers must be sizable enough to cover the entire noise source and extend lengthwise and vertically as far as feasibly possible to be most effective. The limiting factor for a noise barrier is not the component of noise transmitted through the material, but rather the amount of noise flanking around and over the barrier. In general, barriers contribute to decreasing noise levels only when the structure breaks the "line of sight" between the source and the receiver.

The manner in which older homes in California were constructed generally provides a reduction of exterior-to-interior noise levels of about 20 to 25 dBA with closed windows (Caltrans 2002). The exterior-to-interior reduction of newer residential units is generally 30 dBA or more (Harris Miller, Miller & Hanson Inc. [HMMH] 2006). Generally, in exterior noise environments ranging from 60 dBA Community Noise Equivalent Level (CNEL) to 65 dBA CNEL, interior noise levels can typically be maintained below 45 dBA, a typically residential interior noise standard, with the incorporation of an adequate forced air mechanical ventilation system in each residential building, and standard thermal-pane residential windows/doors with a minimum rating of Sound Transmission Class (STC) 28. (STC is an integer rating of how well a building partition attenuates airborne sound. In the U.S., it is widely used to rate interior partitions, ceilings, floors, doors, windows, and exterior wall configurations.) In exterior noise environments of 65 dBA CNEL or greater, a combination of forced-air mechanical ventilation and sound-rated construction methods is often required to meet the interior noise level limit. Attaining the necessary noise reduction from exterior to interior spaces is readily achievable in noise environments less than 75 dBA CNEL with proper wall construction techniques following California Building Code methods, the selections of proper windows and doors, and the incorporation of forced-air mechanical ventilation systems.

2.1.3 Noise Descriptors

The decibel scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Several rating scales have been developed to analyze the adverse effect of community noise on people. Because environmental noise fluctuates over time, these scales consider that the effect of noise on people is largely dependent on the total acoustical energy content of the noise, as well as the time of day when the noise occurs. The L_{eq} is a measure of ambient noise, while the L_{dn} and CNEL (Community Noise Equivalent Level) are measures of community noise. Each is applicable to this analysis and defined in Table 2-1.

Table 2-1. Common Acoustical Descriptors

Descriptor	Definition
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 micropascals (or 20 micronewtons 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 micropascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hertz (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, L_{eq}	The average acoustic energy content of noise for a stated period of time. Thus, the Leq of a time-varying noise and that of a steady noise are the same if they deliver the same acoustic energy to the ear during exposure. For evaluating community impacts, this rating scale does not vary, regardless of whether the noise occurs during the day or the night.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	A 24-hour average Leq with a 10 dBA "weighting" added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity in the nighttime. The logarithmic effect of these additions is that a 60 dBA 24-hour Leq would result in a measurement of 66.4 dBA Ldn.
Community Noise Equivalent Level, CNEL	A 24-hour average Leq with a 5 dBA "weighting" during the hours of 7:00 p.m. to 10:00 p.m. and a 10 dBA "weighting" added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity in the evening and nighttime, respectively. The logarithmic effect of these additions is that a 60 dBA 24-hour Leq would result in a measurement of 66.7 dBA CNEL.
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.
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.

The A weighted decibel sound level scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about ±1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends on the distance between the receptor and the noise source. Close to the noise source, the models are accurate to within about ±1 to 2 dBA.

2.1.4 Human Response to Noise

The human response to environmental noise is subjective and varies considerably from individual to individual. Noise in the community has often been cited as a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from interference with human activities, including sleep, speech, recreation, and tasks that demand concentration or coordination. Hearing loss can occur at the highest noise intensity levels.

Noise environments and consequences of human activities are usually well represented by median noise levels during the day or night or over a 24-hour period. Environmental noise levels are generally considered low when the CNEL is below 60 dBA, moderate in the 60 to 70 dBA range, and high above 70 dBA. Examples of low daytime levels are isolated, natural settings with noise levels as low as 20 dBA and quiet, suburban, residential streets with noise levels around 40 dBA. Noise levels above 45 dBA at night can disrupt sleep. Examples of moderate-level noise environments are urban residential or semi-commercial areas (typically 55 to 60 dBA) and commercial locations (typically 60 dBA). People may consider louder environments adverse, but most will accept the higher levels associated with noisier urban residential or residential-commercial areas (60 to 75 dBA) or dense urban or industrial areas (65 to 80 dBA). Regarding increases in A-weighted noise levels (dBA), the following relationships should be noted in understanding this analysis:

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived by humans.
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference.
- A change in level of at least 5 dBA is required before any noticeable change in community response would be expected. An increase of 5 dBA is typically considered substantial.
- A 10-dBA change is subjectively heard as an approximate doubling in loudness and would almost certainly cause an adverse change in community response.

2.1.5 Effects of Noise on People

Hearing Loss

While physical damage to the ear from an intense noise impulse is rare, a degradation of auditory acuity can occur even within a community noise environment. Hearing loss occurs mainly due to chronic exposure to excessive noise but may be due to a single event such as an explosion. Natural hearing loss associated with aging may also be accelerated from chronic exposure to loud noise.

The Occupational Safety and Health Administration (OSHA) has a noise exposure standard that is set at the noise threshold where hearing loss may occur from long-term exposures. The maximum allowable level is 90 dBA averaged over eight hours. If the noise is above 90 dBA, the allowable exposure time is correspondingly shorter.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. For ground vehicles, a noise level of about 55 dBA L_{dn} is the threshold at which a substantial percentage of people begin to report annoyance.

2.2 Fundamentals of Environmental Groundborne Vibration

2.2.1 Vibration Sources and Characteristics

Sources of earthborne vibrations include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) or manmade causes (explosions, machinery, traffic, trains, construction equipment, etc.). Vibration sources may be continuous (e.g., factory machinery) or transient (e.g., explosions).

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One is the peak particle velocity (PPV); another is the root mean square (RMS) velocity. The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. The RMS velocity is defined as the average of the squared amplitude of the signal. The PPV and RMS vibration velocity amplitudes are used to evaluate human response to vibration.

PPV is generally accepted as the most appropriate descriptor for evaluating the potential for building damage. For human response, however, an average vibration amplitude is more appropriate because it takes time for the human body to respond to the excitation (the human body responds to an average vibration amplitude, not a peak amplitude). Because the average particle velocity over time is zero, the RMS amplitude is typically used to assess human response. The RMS value is the average of the amplitude squared over time, typically a 1- sec. period (FTA 2018).

Table 2-2 displays the reactions of people and the effects on buildings produced by continuous vibration levels. The annoyance levels shown in the table should be interpreted with care since vibration may be found to be annoying at much lower levels than those listed, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage. In high-noise environments, which are more prevalent where groundborne vibration approaches perceptible levels, this rattling phenomenon may also be produced by loud airborne environmental noise causing induced vibration in exterior doors and windows.

Ground vibration can be a concern in instances where buildings shake, and substantial rumblings occur. However, it is unusual for vibration from typical urban sources such as buses and heavy trucks to be perceptible. For instance, heavy-duty trucks generally generate groundborne vibration velocity levels of 0.006 PPV at 50 feet under typical circumstances, which as identified in Table 2-2 is considered very unlikely to cause damage to buildings of any type. Common sources for groundborne vibration are planes, trains, and construction activities such as earth-moving which requires the use of heavy-duty earth moving equipment.

Table 2-2. Human Reaction and Damage to Buildings for Continuous or Frequent Intermittent Vibration Levels

Peak Particle Velocity (inches/second)	Approximate Vibration Velocity Level (VdB)	Human Reaction	Effect on Buildings
0.006–0.019	64–74	Range of threshold of perception	Vibrations unlikely to cause damage of any type
0.08	87	Vibrations readily perceptible	Recommended upper level to which ruins and ancient monuments should be subjected
0.1	92	Level at which continuous vibrations may begin to annoy people, particularly those involved in vibration sensitive activities	Virtually no risk of architectural damage to normal buildings
0.2	94	Vibrations may begin to annoy people in buildings	Threshold at which there is a risk of architectural damage to normal dwellings
0.4–0.6	98–104	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Architectural damage and possibly minor structural damage

Source: Caltrans 2020b

3.0 EXISTING ENVIRONMENTAL NOISE SETTING

3.1 Noise-Sensitive Land Uses

Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Additional land uses such as hospitals, historic sites, cemeteries, and certain recreation areas are considered sensitive to increases in exterior noise levels. Schools, churches, hotels, libraries, and other places where low interior noise levels are essential are also considered noise-sensitive land uses.

The nearest existing noise-sensitive land use to the Project Site is a single-family residence located 523 feet from the southwestern corner of the Vega 5 Project component boundary.

3.2 Existing Ambient Noise Environment

The Project site is bound mostly by vacant undisturbed land, with the exception of agricultural lands and county roadways adjacent to the Vega 5 property. Noffsinger Road and Union Pacific Railway traverse the Vega 5 parcels, and the Coachella Canal crosses and runs adjacent to the Vega 2 properties. In order to quantify existing ambient noise levels in the Project area, ECORP Consulting, Inc. conducted four short-term noise measurements on January 12th, 2021. The noise measurement sites were representative of typical existing noise exposure within and adjacent to the Project Site during the daytime (see Attachment A for a visual depiction of the Noise Measurement Locations). The 15-minute measurements were taken between 11:35 a.m. and 12:54 p.m. Short-term (L_{eq}) measurements are considered representative of the noise levels throughout the day. As shown in Table 3-1, the existing noise levels (Baseline) in the Project-vicinity ranges from 45.5 to 48.1 dBA L_{eq}.

Table 3-1. Existing (Baseline) Noise Measurements

Location Number	Location	L_{eq} dBA	L_{min} dBA	L_{max} dBA	Time
1	W Schrimpf Road and Wiest Road	**45.5**	43.1	52.0	11:35 a.m. - 11:50 p.m.
2	Wiest Road and McDonald Road	**47.5**	37.2	61.9	11:57 a.m. - 11:12 p.m.
3	McDonald Road, ~700ft W of Wiest Road	**45.8**	31.6	70.7	12:16 p.m. - 12:31 p.m.
4	Wiest Rd ~1,000ft South of Wiest Road/Noffsinger Road Intersection	**48.1**	32.2	69.1	12:39 p.m. – 12:54 p.m.

Source: Measurements were taken by ECORP with a Larson Davis LxT SE precision sound level meter, which satisfies the American National Standards Institute for general environmental noise measurement instrumentation. See Attachment A for noise measurement outputs.

The most common noise in the Project vicinity is produced by automotive vehicles (e.g., cars, trucks, buses, motorcycles) traversing county roads adjacent to the Project Site. Traffic moving along streets produces a sound level that remains relatively constant and is part of the minimum ambient noise level in the Project vicinity. Vehicular noise varies with the volume, speed and type of traffic. Slower traffic produces less noise than fast-moving traffic. Trucks typically generate more noise than cars. Infrequent or intermittent noise is also associated with vehicles, including sirens, vehicle alarms, slamming of doors, trains, garbage and construction vehicle activity and honking of horns. These noises add to urban noise and are regulated by a variety of agencies.

4.0 REGULATORY FRAMEWORK

4.1 Federal

4.1.1 Occupational Safety and Health Act of 1970

OSHA regulates onsite noise levels and protects workers from occupational noise exposure. To protect hearing, worker noise exposure is limited to 90 decibels with A-weighting (dBA) over an eight-hour work shift (29 Code of Regulations 1910.95). Employers are required to develop a hearing conservation program when employees are exposed to noise levels exceeding 85 dBA. These programs include provision of hearing protection devices and testing employees for hearing loss on a periodic basis.

4.2 State

4.2.1 State of California General Plan Guidelines

The State of California regulates vehicular and freeway noise affecting classrooms, sets standards for sound transmission and occupational noise control, and identifies noise insulation standards and airport noise/land-use compatibility criteria. The State of California General Plan Guidelines (State of California 2003), published by the Governor's Office of Planning and Research (OPR), also provides guidance for the acceptability of projects within specific CNEL/L_{dn} contours. The guidelines also present adjustment factors that may be used in order to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

4.2.2 State Office of Planning and Research Noise Element Guidelines

The State OPR *Noise Element Guidelines* include recommended exterior and interior noise level standards for local jurisdictions to identify and prevent the creation of incompatible land uses due to noise. The Noise Element Guidelines contain a Land Use Compatibility table that describes the compatibility of various land uses with a range of environmental noise levels in terms of the CNEL.

4.3 Local

4.3.1 Imperial County General Plan Noise Element

The County of Imperial General Plan Noise Element establishes maximum allowable average-hourly noise limits for various land use designations (refer to Table 4-1). These noise standards are to be applied at the property line of the noise-generating land use. In instances where the adjoining land use designations differ from that of the noise-generating land use, the more restrictive noise standard shall apply. Where the ambient noise level is equal to or exceeds the property line noise standard, the increase of the existing or proposed noise shall not exceed 3 dBA L_{eq}, which is just-perceivable increase in noise. L_{eq} is defined as the average acoustic energy content of noise for a stated period of time. Thus, the L_{eq} of a time-varying noise and that of a steady noise are the same if they deliver the same acoustic energy to the ear during exposure.

Table 4-1 County of Imperial Property Line Noise Standards

Land Use Zone	Time Period	Average-Hourly Noise Level (dBA L_{eq})
Residential	7 a.m. - 10 p.m. 10 p.m. - 7 a.m.	50 45
Multi-residential	7 a.m. - 10 p.m. 10 p.m. - 7 a.m.	55 50
Commercial	7 a.m. -10 p.m. 10 p.m. - 7 a.m.	60 55
Light Industrial/Industrial Park	Any time	70
General Industrial	Any time	75

Source: Imperial County 2015.

Notes: When the noise-generating property and the receiving property have different uses, the more restrictive standard shall apply. When the ambient noise level is equal to or exceeds the Property Line noise standard, the increase of the existing or proposed noise shall not exceed 3 dBA L_{eq}.

Construction Noise Standards

Construction noise, from a single piece of equipment or a combination of equipment, shall not exceed 75 dB L_{eq}, when averaged over an eight (8) hour period, and measured at the nearest sensitive receptor. This standard assumes a construction period, relative to an individual sensitive receptor of days or weeks. In cases of extended length construction times, the standard may be tightened so as not to exceed 75 dB L_{eq} when averaged over a one (1) hour period.

Construction equipment operations are required to be limited to the hours of 7:00 a.m. to 7:00 p.m., Monday through Friday, and 9:00 a.m. to 5:00 p.m. Saturday. No commercial construction operations are permitted on Sunday or holidays. In cases of a person constructing or modifying a residence for himself/herself, and if the work is not being performed as a business, construction equipment operations may be performed on Sundays and holidays between the hours of 9:00 a.m. and 5:00 p.m. Such non-commercial construction activities may be further restricted where disturbing, excessive, or offensive noise causes discomfort or annoyance to reasonable persons of normal sensitivity residing in an area.

Significant Increase of Ambient Noise Levels

The increase of noise levels generally results in an adverse impact to the noise environment. The Noise/Land Use Compatibility Guidelines are not intended to allow the increase of ambient noise levels up to the maximum without consideration of feasible noise reduction measures. The following guidelines are established by the County of Imperial for the evaluation of significant noise impact.

- If the future noise level after a project is completed will be within the "normally acceptable" noise levels shown in the Noise/Land Use Compatibility Guidelines, but will result in an increase of 5 dB CNEL or greater, the project will have a potentially significant noise impact and mitigation measures must be considered.
- If the future noise level after a project is completed will be greater than the "normally acceptable" noise levels shown in the Noise/Land Use Compatibility Guidelines, a noise increase of 3 dB CNEL or greater shall be considered a potentially significant noise impact and mitigation measures must be considered.

Noise/Land Use Compatibility

The Imperial County General Plan Noise Element Noise/Land Use Compatibility Standards defines the acceptability of a land use in a specified noise environment. Table 4-2 provides the County of Imperial Noise/Land Use Compatibility Guidelines. When an acoustical analysis is performed, conformance of a proposed project with the Noise/Land Use Compatibility Guidelines is used to evaluate potential noise impacts and to provide criteria for environmental impact findings and conditions for project approval.

Table 4-2. County of Imperial Noise/Land Use Compatibility Guidelines		
Land Use Category	**Community Noise Exposure L_{dn} or CNEL, dB**	**Acceptability**
Residential	< 60	Normally Acceptable
	60 - 70	Conditionally Acceptable
	70 - 75	Normally Unacceptable
	> 75	Clearly Unacceptable
Transient Lodging-Motels, Hotels	< 60	Normally Acceptable
	60 - 75	Conditionally Acceptable
	75 - 80	Normally Unacceptable
	> 80	Clearly Unacceptable
Schools, Libraries, Churches, Hospitals, Nursing Homes	< 60	Normally Acceptable
	60 - 70	Conditionally Acceptable
	70 - 80	Normally Unacceptable
	> 80	Clearly Unacceptable
Auditoriums, Concert Halls, Amphitheaters	< 70	Conditionally Acceptable
	> 70	Clearly Unacceptable
Sports Arenas, Outdoor Spectator Sports	< 70	Conditionally Acceptable
	70 - 75	Normally Unacceptable
	> 75	Clearly Unacceptable
Playgrounds, Neighborhood Parks	< 70	Normally Acceptable
	70 - 75	Normally Unacceptable
	> 75	Clearly Unacceptable
Golf Courses, Riding Stables, Water Recreation, Cemeteries	< 70	Normally Acceptable
	70 - 80	Normally Unacceptable
	> 80	Clearly Unacceptable
Office Buildings, Business Commercial and Professional	< 65	Normally Acceptable
	65 - 75	Conditionally Acceptable
	75 - 80	Normally Unacceptable
	> 80	Clearly Unacceptable
Industrial, Manufacturing Utilities, Agriculture	< 70	Normally Acceptable
	70 - 75	Conditionally Acceptable
	75 - 80	Normally Unacceptable
	> 80	Clearly Unacceptable

Source: Imperial County 2015.

Notes: Interpretation (For Land Use Planning Purposes):

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

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

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

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

5.0 IMPACT ASSESSMENT

5.1 Thresholds of Significance

The impact analysis provided below is based on the following California Environmental Quality Act Guidelines Appendix G thresholds of significance. The project would result in a significant noise-related impact if it would produce:

1) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

2) Generation of excessive groundborne vibration or groundborne noise levels.

3) 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 purposes of this analysis, Project construction noise is compared to the County's construction noise standard of 75 dBA, when averaged over an eight (8) hour period and measured at the nearest sensitive receptor. Noise generated onsite is compared against the County's property line standards identified in Table 4-1.

5.2 Methodology

This analysis of the existing and future noise environments is based on empirical observations. Predicted construction noise levels were calculated utilizing the FHWA's Roadway Construction Model (see Attachment B). Groundborne vibration levels associated with construction-related activities for the Project have been evaluated utilizing typical groundborne vibration levels associated with construction equipment. Potential groundborne vibration impacts related to structural damage and human annoyance were evaluated, taking into account the distance from construction activities to nearby structures and typically applied criteria for structural damage and human annoyance.

In order to estimate the worst-case operational noise levels that may occur at the nearest noise-sensitive receptor, onsite operational noise levels have been calculated with the SoundPLAN 3D noise model (which predicts noise propagation from a noise source based on the location, noise level, and frequency spectra of the noise sources as well as the geometry and reflective properties of the local terrain, buildings, and barriers), coupled with reference noise measurements that were taken by ECORP Consulting, Inc. (ECORP) at an existing solar energy generation facility (see Attachment C).

5.3 Impact Analysis

5.3.1 Project Construction Noise

Would the Project Result in Short-Term Construction-Generated Noise in Excess of Standards?

Onsite Construction Noise

Construction noise associated with the proposed Project would be temporary and would vary depending on the nature of the activities being performed. Noise generated would primarily be associated with the operation of off-road equipment for onsite construction activities as well as construction vehicle traffic on area roadways. Construction noise typically occurs intermittently and varies depending on the nature or phase of construction (e.g., land clearing, grading, excavation, paving). Noise generated by construction equipment, including earth movers, material handlers, and portable generators, can reach high levels. Typical operating cycles for these types of construction equipment may involve one or two minutes of full power operation followed by three to four minutes at lower power settings. Other primary sources of acoustical disturbance would be random incidents, which would last less than one minute (such as dropping large pieces of equipment or the hydraulic movement of machinery lifts). During construction, exterior noise levels could negatively affect sensitive land uses in the vicinity of the construction site. The nearest existing noise-sensitive land use to the Project Site is a single-family residence located 523 feet from the southwestern corner of the Vega 5 Project component boundary. However, Vega 2 and 3 are located on a different set of parcels than Vega 5. Therefore, the closest residence to Vega 2 and 3 is approximately 3,154 feet west of the Vega 2 boundary.

As previously described, the County's General Plan Noise Element states construction equipment operation shall be limited to the hours of 7:00 a.m. to 7:00 p.m., Monday through Friday, and 9:00 a.m. to 5:00 p.m. on Saturdays. No commercial construction operations are permitted on Sundays or holidays. Construction noise, from a single piece of equipment or a combination of equipment, shall not exceed 75 dB L_{eq}, when averaged over an eight (8) hour period, and measured at the nearest sensitive receptor. This standard assumes a construction period, relative to an individual sensitive receptor of days or weeks. In cases of extended length construction times, the standard may be tightened so as not to exceed 75 dB L_{eq} when averaged over a one (1) hour period. The anticipated short-term construction noise levels generated for the necessary construction equipment for Vega 2 and 3 are presented in Table 5-1. The anticipated short-term construction noise levels generated for the necessary construction equipment for Vega 5 are presented in Table 5-2.

Table 5-1. Vega 2 and 3 Construction Average (dBA) Noise Levels at Nearest Receptors			
Combined Equipment	**Estimated Exterior Construction Noise Level at Existing Residences (dBA L_{eq})**	**Construction Noise Standards (dBA L_{eq})**	**Exceeds Standards?**
Demolition and Grubbing	50.4	*75*	**No**
Grading	52.2	*75*	**No**
Construction and Paving	54.6	*75*	**No**

Source: Construction noise levels were calculated by ECORP Consulting using the FHWA Roadway Noise Construction Model (FHWA 2006). Refer to Attachment B for Model Data Outputs.

Notes: The nearest residence is located approximately 3,154 feet from the Project's Vega 2 and 3 western boundaries.

L_{eq} = The equivalent energy noise level, is the average acoustic energy content of noise for a stated period of time. Thus, the L_{eq} of a time-varying noise and that of a steady noise are the same if they deliver the same acoustic energy to the ear during exposure. For evaluating community impacts, this rating scale does not vary, regardless of whether the noise occurs during the day or the night.

As shown in Table 5-1, the individual or cumulative pieces of construction equipment during the construction of Vega 2 and 3 would not exceed the 75 dBA County construction noise standard at the nearby noise-sensitive receptors.

Table 5-2. Vega 5 Construction Average (dBA) Noise Levels at Nearest Receptors			
Combined Equipment	**Estimated Exterior Construction Noise Level at Existing Residences (dBA L_{eq})**	**Construction Noise Standards (dBA L_{eq})**	**Exceeds Standards?**
Demolition and Grubbing	66.0	*75*	**No**
Grading	67.8	*75*	**No**
Construction and Paving	70.2	*75*	**No**

Source: Construction noise levels were calculated by ECORP Consulting using the FHWA Roadway Noise Construction Model (FHWA 2006). Refer to Attachment B for Model Data Outputs.
Notes: The nearest residence is located approximately 523 feet from the Project's Vega 5 southwestern boundary.
L_{eq} = The equivalent energy noise level, is the average acoustic energy content of noise for a stated period of time. Thus, the L_{eq} of a time-varying noise and that of a steady noise are the same if they deliver the same acoustic energy to the ear during exposure. For evaluating community impacts, this rating scale does not vary, regardless of whether the noise occurs during the day or the night.

As shown in Table 5-2, no individual or cumulative pieces of construction equipment during the construction of Vega 5 would exceed the 75 dBA County construction noise standard at the nearby noise-sensitive receptors.

Offsite Construction Worker Traffic Noise

Project construction would result in additional traffic on adjacent roadways over the time period that construction occurs. As previously stated, the number of on–site construction workers for the solar project facilities are not expected to exceed 150 workers at any one time. The number of on-site construction workers for the battery storage facility and the substation is not expected to exceed 100 workers at any one time. Onsite parking would be provided for all construction workers. According to KOA Corporation (2021), a maximum of 510 daily automobile trips would be generated during Project construction, accounting for construction worker commutes and equipment deliveries. The majority of these trips are expected to be accommodated on State Route (SR) 78, SR 111, and SR 115. Construction workers would access the Vega 5 Project Site from SR 111 onto east on McDonald Road. The Vega 2 and 3 Project Site require an additional 1.65 miles of travel on Wiest Road and Flowing Wells Road.

According to the California Department of Transportation (Caltrans) *Technical Noise Supplement to the Traffic Noise Analysis Protocol* (2013), doubling of traffic on a roadway is required to result in an increase of 3 dB (outside of the laboratory, a 3-dBA change is considered a just-perceivable difference). According to the Caltrans Traffic Census Program (2018), the roadway segment of SR 111 closest to the Project Site currently accommodates 3,500 average daily traffic trips (ADT). The County General Plan Circulation and Scenic Highways Element (2008) designates the roadway segments of McDonald Road and Weist Road as Minor (Local) Collector, which on average can accommodate 1,900 to 16,200 ADT. Flowing Wells Road does not have a designation within the General Plan, but there are no sensitive receptors along Flowing Wells Road that would experience any sound changes along this roadway. Additionally, construction is temporary and once Project construction is completed, all construction-related traffic noise would cease.

Thus, the estimated 510 daily trips during Project construction would typically not result in a doubling of traffic on these facilities, and its contribution to existing traffic noise would not be perceptible.

5.3.2 Project Operational Noise

Would the Project Result in a Substantial Permanent Increase in Ambient Noise Levels in Excess of County or City Standards During Operations?

As previously described, noise-sensitive land uses are locations where people reside or where the presence of unwanted sound could adversely affect the use of the land. Residences, schools, hospitals, guest lodging, libraries, and some passive recreation areas would each be considered noise-sensitive and may warrant unique measures for protection from intruding noise. The nearest existing noise-sensitive land use to the Project Site is a single-family residence located 523 feet from the southwestern corner of the Vega 5 Project component boundary.

Operational Offsite Traffic Noise

Project operations would result in minimal additional traffic on adjacent roadways. The only visitors to the site would be that of repair or maintenance workers, whose presence at the site would be only be necessary infrequently and inconsistently. According to the California Department of Transportation (Caltrans) *Technical Noise Supplement to the Traffic Noise Analysis Protocol* (2013), doubling of traffic on a roadway is required to result in an increase of 3 dB (outside of the laboratory, a 3-dBA change is considered a just-perceivable difference). The proposed Project would not result in a doubling of traffic, and therefore its contribution to existing traffic noise would not be perceptible.

Project Land Use Compatibility

The County land use compatibility standards presented in the General Plan Noise Element provides the County with a tool to gauge the compatibility of new land uses relative to existing noise levels. This table, presented as Table 4-2, identifies acceptable noise levels for various land uses. In the case that the noise levels identified at the proposed Project Site fall within the "acceptable" levels presented in the General Plan, the Project is considered compatible with the existing noise environment.

As previously stated, the Project Site is proposing to develop an up to nominal 240, 60 and 50 MW alternating current PV solar energy generation and storage facilities. The proposed Project site is zoned A-3-RE (Heavy Agriculture with a Renewable Energy Overlay), A-2-RE (General Agriculture with a Renewable Energy Overlay) and S-2-RE (Open Space Preservation Zone with a Renewable Energy Overlay). As shown in Table 4-2, a normally acceptable noise standard for agricultural land uses is 69 dBA CNEL or under. In order to quantify existing ambient noise levels in the Project area, ECORP conducted four short-term noise measurements on January 12th, 2021. The noise measurement sites were representative of typical existing noise exposure in the Project vicinity and are considered representative of the noise levels throughout the day. As shown in Table 3-1, the ambient noise level recorded in the vicinity of the Project site ranges from 45.5 dBA to 66.1 dBA. However, it is noted that these short-term measurements were each conducted over 1,000 feet from the Vega 5 parcel center and adjacent to Wiest Rd and McDonald Rd, both substantial noise sources. Thus, the ambient noise levels experienced on the actual Project Site would most likely be less. As these noise levels fall below the County General Plan Noise Element (2015) standards for agricultural land uses as found in Table 4-2 above, the Project Site is considered an appropriate noise environment to locate the proposed land use.

Project Operations-Onsite Noise Sources

As previously stated, noise sensitive land uses are locations where people reside or where the presence of unwanted sound could adversely affect the use of the land. Residences, schools, hospitals, guest lodging, libraries, and some passive recreation areas would each be considered noise-sensitive and may warrant unique measures for protection from intruding noise. The nearest existing noise-sensitive land use to the Project Site is a single-family residence located 523 feet from the southwestern corner of the Vega 5 Project component boundary.

The main stationary operational noise associated with the Project would be from the proposed transformers, inverters, substation, and transmission lines. Onsite Project operations have been calculated using the SoundPLAN 3D noise model. As previously stated, a noise level of 47.1 dBA was employed as the reference noise level in the SoundPLAN 3D noise model to determine noise-level propagation associated with the Project operations. The results of this model can be found in Appendix C. Table 5-2 shows the predicted Project noise levels at the nearest noise-sensitive land use in the Project vicinity, as predicted by SoundPLAN.

Table 5-3. Modeled Operational Noise Levels at Nearest Sensitive Receptor

Location	Modeled Operational Noise Attributed to Project (L_{eq} dBA)	County Daytime Standard (L_{eq}, dB)	County Nighttime Standard (L_{eq} dB)	Exceed Standard?
Property line of the nearest residence	**36.7**	50.0	45.0	**No**

Source: Stationary source noise levels were modeled by ECORP using SoundPLAN 3D noise model. Refer to Appendix C for noise modeling assumptions and results.

Note: Reference noise measurement used to calculate Project onsite noise propagation identified at 47.1 dBA, per 30-minute measurements taken at a Vega SES Complex solar generation facility in Imperial County.

As shown in Table 5-3, Project operational noise would not exceed County daytime or nighttime standards.

5.3.3 Project Construction Groundborne Vibration

Would the Project Expose Structures to Substantial Groundborne Vibration During Construction?

Excessive groundborne vibration impacts result from continuously occurring vibration levels. Increases in groundborne vibration levels attributable to the Project would be primarily associated with short-term construction-related activities. Construction on the Project Site would have the potential to result in varying degrees of temporary groundborne vibration, depending on the specific construction equipment used and the operations involved. Ground vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance.

Construction-related ground vibration is normally associated with impact equipment such as pile drivers, jackhammers, and the operation of some heavy-duty construction equipment, such as dozers and trucks. It is noted that pile drivers would not be necessary during Project construction. Vibration decreases rapidly with distance and it is acknowledged that construction activities would occur throughout the Project Site and would not be concentrated at the point closest to sensitive receptors. Groundborne vibration levels associated with typical construction equipment at 25 feet distance are summarized in Table 5-4.

Table 5-4. Representative Vibration Source Levels for Construction Equipment

Equipment Type	Peak Particle Velocity at 25 Feet (inches per second)
Large Bulldozer	0.089
Caisson Drilling	0.089
Loaded Trucks	0.076
Hoe Ram	0.089
Jackhammer	0.035
Small Bulldozer/Tractor	0.003
Vibratory Roller	0.210

Source: FTA 2018; Caltrans 2020b

The County of Imperial does not regulate vibrations associated with construction. However, a discussion of construction vibration is included for full disclosure purposes. For comparison purposes, the Caltrans (2020b) recommended standard of 0.3 inch per second PPV with respect to the prevention of structural damage for older residential buildings is used as a threshold. This is also the level at which vibrations may begin to annoy people in buildings. Consistent with FTA recommendations for calculating construction vibration, construction vibration was measured from the center of the Project Site (FTA 2018). The nearest structure of concern to the construction site, with regard to groundborne vibrations, is the Coachella

Canal located within the proposed Project Site boundary and approximately 30 feet across the Coachella Canal Access Road.

Based on the representative vibration levels presented for various construction equipment types in Table 5-3 and the construction vibration assessment methodology published by the FTA (2018), it is possible to estimate the potential project construction vibration levels. The FTA provides the following equation:

$$[PPVequip = PPVref \times (25/D)^{1.5}]$$

Table 5-5 presents the expected Project related vibration levels at a distance of 30 feet.

Table 5-5. Construction Vibration Levels at 30 Feet

Receiver PPV Levels (in/sec)[1]					Peak Vibration	Threshold	Exceed Threshold
Large Bulldozer, Caisson Drilling & Hoe Ram	Loaded Trucks	Jackhammer	Small Bulldozer	Vibratory Roller			
0.068	0.058	0.027	0.002	0.160	**0.160**	*0.3*	**No**

Notes: [1]Based on the Vibration Source Levels of Construction Equipment included on Table 5-4 (FTA 2018). Distance to the nearest structure of concern is approximately 30 feet measured from Project Site boundary.

As shown in Table 5-5, vibration as a result of construction activities would not exceed 0.3 PPV at the nearest structure. Thus, project construction would not exceed the recommended threshold.

5.3.4 Project Operational Groundborne Vibration

Would the Project Expose Structures to Substantial Groundborne Vibration During Operations?

Project operations would not include the use of any large-scale stationary equipment that would result in excessive vibration levels. Therefore, the project would not result groundborne vibration impacts during operations.

5.3.5 Excess Airport Noise

Would the Project Expose People Residing or Working in the Project area to Excessive Airport Noise?

The Project Site center is located approximately 8.39 miles northeast of the Calipatria Municipal Airport . The Imperial County Airport Land Use Commission has established a set of land use compatibility criteria for lands surrounding the airports in Imperial County in the Imperial County Airport Land Use Compatibility Plan (1996). Figure 3-C of the Imperial County Airport Land Use Compatibility Maps shows that the proposed Project Site lays outside of the noise contours of the Calipatria Municipal Airport. Thus, the Project would not expose residents to excessive airport noise.

5.3.6 Cumulative Noise

Would the Project Contribute to Cumulatively Considerable Noise During Construction?

Construction activities associated with the proposed Project and other construction projects in the area may overlap, resulting in construction noise in the area. However, construction noise impacts primarily affect the areas adjacent to the construction site. Construction noise for the proposed Project was determined to be less than significant following compliance with County noise standards. Cumulative development in the vicinity of the Project Site could result in elevated construction noise levels at sensitive receptors in the Project area. However, each project would be required to comply with the applicable noise limitations on construction. Therefore, the Project would not contribute to cumulative impacts during construction.

Would the Project Contribute to Cumulatively Considerable Noise from Offsite Traffic?

As described previously, Project operations would result in extremely minimal additional traffic on adjacent roadways. The only visitors to the site would be that of repair or maintenance work that would be done very infrequently. Thus, any cumulative noise impacts from Project-related traffic would be minimal.

Would the Project Contribute to Cumulatively Considerable Noise from Stationary Sources?

Cumulative noise impacts would primarily be associated with the transformers, inverters, substation, and transmission lines from the solar facility. Long-term noise sources associated with development at the Project, combined with other cumulative projects, could cause local noise-level increases. Noise levels associated with the proposed Project and related cumulative projects together could result in higher noise levels than considered separately. However, noise increase as a result of the Project would not be perceivable and thus would not exceed County standards.

6.0 REFERENCES

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OPR. 2003. State of California General Plan Guidelines.

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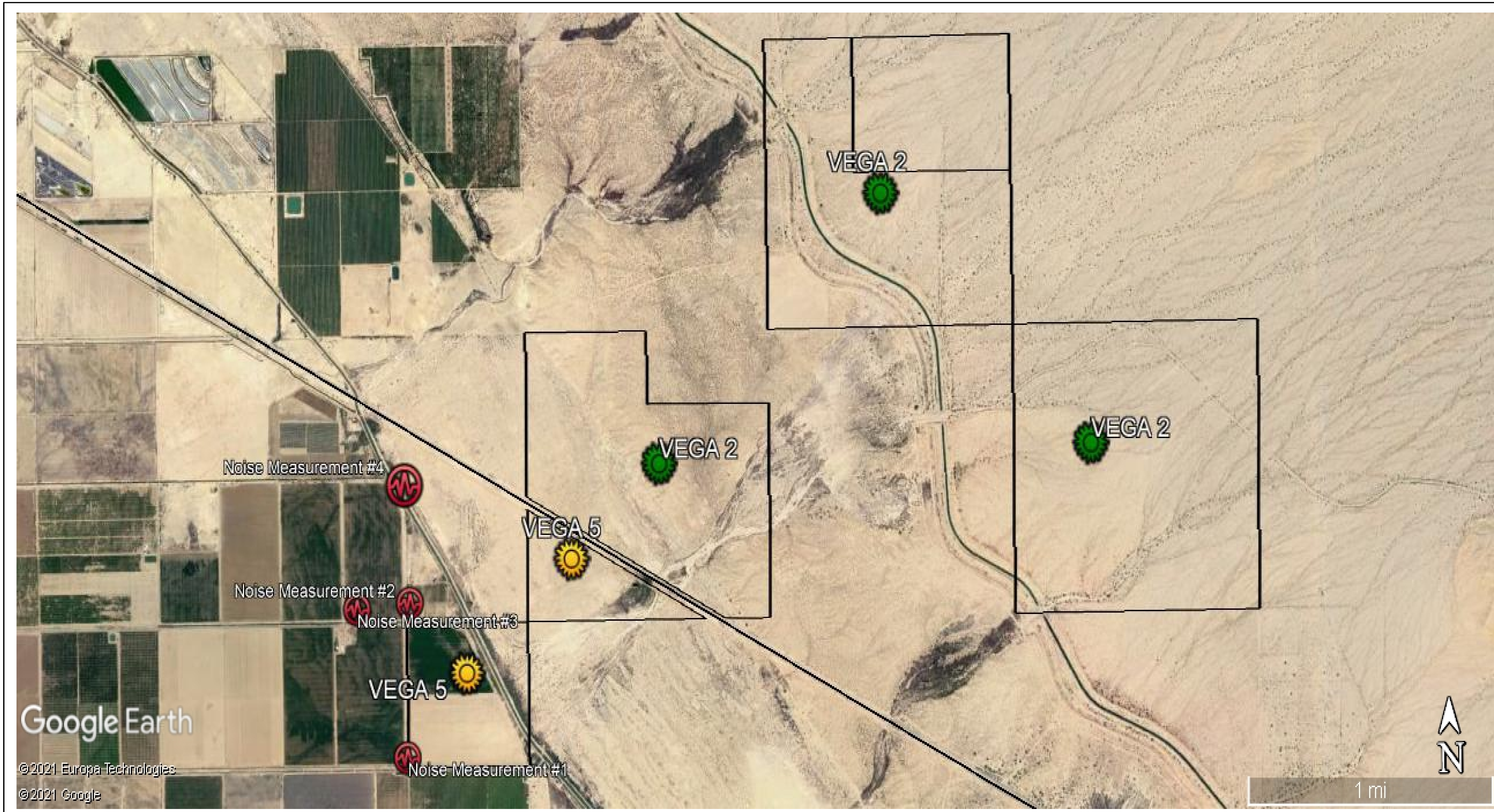
LIST OF ATTACHMENTS

ATTACHMENT A

Baseline (Existing) Noise Measurements – Project Site and Vicinity



Map Date: *12/14/2020*
Photo (or Base) Source: *Google Earth Pro*

VEGA Complex Baseline Noise Measurement Locations

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Vega SES Complex

Site Number: V2&3 - 1			
Recorded By: Jessie Beckman			
Job Number: 2020 – 144			
Date: 1/12/21			
Time: 11:35 am – 11:50 am			
Location: W Schrimpf Rd and Weist Rd			
Source of Peak Noise: Distant traffic, vehicles on access rd south of Schrimpf rd			
Noise Data			
Leq (dB)	**Lmin (dB)**	**Lmax (dB)**	**Peak (dB)**
45.5	43.1	52.0	94.9

Equipment						
Category	**Type**	**Vendor**	**Model**	**Serial No.**	**Cert. Date**	**Note**
Sound	Sound Level Meter	**Larson Davis**	**LxT SE**	**0005120**	**9/14/2020**	
	Microphone	**Larson Davis**	**377B02**	**174464**	**9/14/2020**	
	Preamp	**Larson Davis**	**PRMLxT1L**	**042852**	**9/14/2020**	
	Calibrator	**Larson Davis**	**CAL200**	**14105**	**9/10/2020**	

Weather Data			
Est.	**Duration: 15 minutes**		**Sky: 10% CC**
	Note: dBA Offset = 0.01 Calibration Δ = - 0.11		**Sensor Height (ft): 3.5**
	Wind Ave Speed (mph)	**Temperature (degrees Fahrenheit)**	**Barometer Pressure (hPa)**
	0-1	66	30.31Hg

Photo of Measurement Location

Measurement Report

Report Summary

Meter's File Name	LxT_Data.352	Computer's File Name	SLM_0005120_LxT_Data_352.00.ldbin
Meter	LxT SE		
Firmware	2.404		
User	Lindsay Liegler	Location	
Description			
Note			

Start Time	2021-01-12 11:34:24	Duration	0:15:00.0		
End Time	2021-01-12 11:49:24	Run Time	0:15:00.0	Pause Time	0:00:00.0

Results

Overall Metrics

LA_{eq}	45.5 dB		
LAE	75.1 dB	SEA	--- dB
EA	3.6 µPa²h		
LZ_{peak}	94.9 dB	2021-01-12 11:38:03	
LAS_{max}	52.0 dB	2021-01-12 11:46:13	
LAS_{min}	43.1 dB	2021-01-12 11:42:44	
LA_{eq}	45.5 dB		
LC_{eq}	59.0 dB	LC_{eq} - LA_{eq}	13.5 dB
LAI_{eq}	46.8 dB	LAI_{eq} - LA_{eq}	1.2 dB

Exceedances

Exceedances	Count	Duration
LAS > 85.0 dB	0	0:00:00.0
LAS > 115.0 dB	0	0:00:00.0
LZpeak > 135.0 dB	0	0:00:00.0
LZpeak > 137.0 dB	0	0:00:00.0
LZpeak > 140.0 dB	0	0:00:00.0

Community Noise

LDN	LDay	LNight	
45.5 dB	45.5 dB	0.0 dB	
LDEN	**LDay**	**LEve**	**LNight**
45.5 dB	45.5 dB	--- dB	--- dB

Any Data

	A		C		Z	
	Level	Time Stamp	Level	Time Stamp	Level	Time Stamp
L_{eq}	45.5 dB		59.0 dB		--- dB	
$Ls_{(max)}$	52.0 dB	2021-01-12 11:46:13	--- dB		--- dB	
$LS_{(min)}$	43.1 dB	2021-01-12 11:42:44	--- dB		--- dB	
$L_{Peak(max)}$	--- dB		--- dB		94.9 dB	2021-01-12 11:38:03

Overloads

Count	Duration	OBA Count	OBA Duration
0	0:00:00.0	0	0:00:00.0

Statistics

LAS 5.0	46.8 dB
LAS 10.0	46.4 dB
LAS 33.3	45.7 dB
LAS 50.0	45.4 dB
LAS 66.6	45.0 dB
LAS 90.0	44.4 dB

Site Number: V2&3 - 2			
Recorded By: Jessie Beckman			
Job Number: 2020 – 144			
Date: 1/12/21			
Time: 11:57 am – 11:12 am			
Location: Weist Rd and McDonald Rd			
Source of Peak Noise: Channel parallel to McDonald Rd, vehicles on McDonald Rd			
Noise Data			
Leq (dB)	**Lmin (dB)**	**Lmax (dB)**	**Peak (dB)**
47.5	37.2	61.9	94.8

Equipment						
Category	**Type**	**Vendor**	**Model**	**Serial No.**	**Cert. Date**	**Note**
Sound	Sound Level Meter	**Larson Davis**	**LxT SE**	**0005120**	**9/14/2020**	
	Microphone	**Larson Davis**	**377B02**	**174464**	**9/14/2020**	
	Preamp	**Larson Davis**	**PRMLxT1L**	**042852**	**9/14/2020**	
	Calibrator	**Larson Davis**	**CAL200**	**14105**	**9/10/2020**	
Weather Data						
Est.	**Duration: 15 minutes**		**Sky: 10% CC**			
	Note: dBA Offset = 0.01 Calibration ∆ = - 0.11		**Sensor Height (ft): 3.5**			
	Wind Ave Speed (mph)	**Temperature (degrees Fahrenheit)**	**Barometer Pressure (hPa)**			
	0-1	66	30.29Hg			

Photo of Measurement Location

Measurement Report

Report Summary

Meter's File Name	LxT_Data.353	Computer's File Name	SLM_0005120_LxT_Data_353.00.ldbin
Meter	LxT SE		
Firmware	2.404		
User	Lindsay Liegler	Location	
Description			
Note			

Start Time	2021-01-12 11:57:57	Duration	0:15:00.0		
End Time	2021-01-12 12:12:57	Run Time	0:15:00.0	Pause Time	0:00:00.0

Results

Overall Metrics

LA_{eq}	47.5 dB		
LAE	77.0 dB	SEA	--- dB
EA	5.6 µPa²h		
LZ_{peak}	94.8 dB	2021-01-12 12:04:32	
LAS_{max}	61.9 dB	2021-01-12 12:08:04	
LAS_{min}	37.2 dB	2021-01-12 12:04:32	
LA_{eq}	47.5 dB		
LC_{eq}	63.8 dB	LC_{eq} - LA_{eq}	16.4 dB
LAI_{eq}	49.3 dB	LAI_{eq} - LA_{eq}	1.8 dB

Exceedances

Exceedances	Count	Duration
LAS > 85.0 dB	0	0:00:00.0
LAS > 115.0 dB	0	0:00:00.0
LZpeak > 135.0 dB	0	0:00:00.0
LZpeak > 137.0 dB	0	0:00:00.0
LZpeak > 140.0 dB	0	0:00:00.0

Community Noise

LDN	LDay	LNight	
47.5 dB	47.5 dB	0.0 dB	
LDEN	**LDay**	**LEve**	**LNight**
47.5 dB	47.5 dB	--- dB	--- dB

Any Data

	A		C		Z	
	Level	Time Stamp	Level	Time Stamp	Level	Time Stamp
L_{eq}	47.5 dB		63.8 dB		--- dB	
$Ls_{(max)}$	61.9 dB	2021-01-12 12:08:04	--- dB		--- dB	
$LS_{(min)}$	37.2 dB	2021-01-12 12:04:32	--- dB		--- dB	
$L_{Peak(max)}$	--- dB		--- dB		94.8 dB	2021-01-12 12:04:32

Overloads

Count	Duration	OBA Count	OBA Duration
0	0:00:00.0	1	0:00:02.0

Statistics

LAS 5.0	53.3 dB
LAS 10.0	49.4 dB
LAS 33.3	43.8 dB
LAS 50.0	42.4 dB
LAS 66.6	40.5 dB
LAS 90.0	38.4 dB

Site Number: V2&3 - 3			
Recorded By: Jessie Beckman			
Job Number: 2020 – 144			
Date: 1/12/21			
Time: 12:16 pm – 12:31 pm			
Location: McDonald Rd, ~700ft W of Wiest Rd			
Source of Peak Noise: Traffic on McDonald Rd			
Noise Data			
Leq (dB)	**Lmin (dB)**	**Lmax (dB)**	**Peak (dB)**
45.8	31.6	70.7	92.4

Equipment						
Category	**Type**	**Vendor**	**Model**	**Serial No.**	**Cert. Date**	**Note**
Sound	Sound Level Meter	**Larson Davis**	**LxT SE**	**0005120**	**9/14/2020**	
	Microphone	**Larson Davis**	**377B02**	**174464**	**9/14/2020**	
	Preamp	**Larson Davis**	**PRMLxT1L**	**042852**	**9/14/2020**	
	Calibrator	**Larson Davis**	**CAL200**	**14105**	**9/10/2020**	

Weather Data			
Est.	**Duration: 15 minutes**		**Sky: 10% CC**
	Note: dBA Offset = 0.01 Calibration ∆ = - 0.11		**Sensor Height (ft): 3.5**
	Wind Ave Speed (mph)	**Temperature (degrees Fahrenheit)**	**Barometer Pressure (hPa)**
	0-1	66	30.29Hg

Photo of Measurement Location

Measurement Report

Report Summary

Meter's File Name	LxT_Data.354	Computer's File Name	SLM_0005120_LxT_Data_354.00.ldbin
Meter	LxT SE		
Firmware	2.404		
User	Lindsay Liegler	Location	
Description			
Note			

Start Time	2021-01-12 12:16:44	Duration	0:15:00.0		
End Time	2021-01-12 12:31:44	Run Time	0:15:00.0	Pause Time	0:00:00.0

Results

Overall Metrics

LA_{eq}	45.8 dB		
LAE	75.3 dB	SEA	--- dB
EA	3.8 µPa²h		
LZ_{peak}	92.4 dB	2021-01-12 12:22:33	
LAS_{max}	70.7 dB	2021-01-12 12:23:40	
LAS_{min}	31.6 dB	2021-01-12 12:31:33	
LA_{eq}	45.8 dB		
LC_{eq}	60.2 dB	LC_{eq} - LA_{eq}	14.5 dB
LAI_{eq}	48.3 dB	LAI_{eq} - LA_{eq}	2.6 dB

Exceedances

Exceedances	Count	Duration
LAS > 85.0 dB	0	0:00:00.0
LAS > 115.0 dB	0	0:00:00.0
LZpeak > 135.0 dB	0	0:00:00.0
LZpeak > 137.0 dB	0	0:00:00.0
LZpeak > 140.0 dB	0	0:00:00.0

Community Noise

LDN	LDay	LNight	
45.8 dB	45.8 dB	0.0 dB	
LDEN	**LDay**	**LEve**	**LNight**
45.8 dB	45.8 dB	--- dB	--- dB

Any Data

	A		C		Z	
	Level	Time Stamp	Level	Time Stamp	Level	Time Stamp
L_{eq}	45.8 dB		60.2 dB		--- dB	
$Ls_{(max)}$	70.7 dB	2021-01-12 12:23:40	--- dB		--- dB	
$LS_{(min)}$	31.6 dB	2021-01-12 12:31:33	--- dB		--- dB	
$L_{Peak(max)}$	--- dB		--- dB		92.4 dB	2021-01-12 12:22:33

Overloads

Count	Duration	OBA Count	OBA Duration
0	0:00:00.0	0	0:00:00.0

Statistics

LAS 5.0	42.1 dB
LAS 10.0	40.7 dB
LAS 33.3	37.2 dB
LAS 50.0	36.0 dB
LAS 66.6	34.7 dB
LAS 90.0	33.4 dB

Site Number: V2&3 - 4			
Recorded By: Jessie Beckman			
Job Number: 2020 – 199			
Date: 1/12/21			
Time: 12:39 pm – 12:54 pm			
Location: Wiest Rd ~1000ft south of Wiest/Noffsinger Intersection			
Source of Peak Noise: Traffic on Wiest Rd			
Noise Data			
Leq (dB)	**Lmin (dB)**	**Lmax (dB)**	**Peak (dB)**
48.1	32.2	69.1	93.7

Equipment						
Category	**Type**	**Vendor**	**Model**	**Serial No.**	**Cert. Date**	**Note**
Sound	Sound Level Meter	**Larson Davis**	**LxT SE**	**0005120**	**9/14/2020**	
	Microphone	**Larson Davis**	**377B02**	**174464**	**9/14/2020**	
	Preamp	**Larson Davis**	**PRMLxT1L**	**042852**	**9/14/2020**	
	Calibrator	**Larson Davis**	**CAL200**	**14105**	**9/10/2020**	

Weather Data			
Est.	**Duration: 15 minutes**		**Sky: 10% CC**
	Note: dBA Offset = 0.01 Calibration Δ = - 0.11		**Sensor Height (ft): 3.5**
	Wind Ave Speed (mph)	**Temperature (degrees Fahrenheit)**	**Barometer Pressure (hPa)**
	0-1	66	30.28Hg

Photo of Measurement Location

Measurement Report

Report Summary

Meter's File Name	LxT_Data.355	Computer's File Name	SLM_0005120_LxT_Data_355.00.ldbin
Meter	LxT SE		
Firmware	2.404		
User	Lindsay Liegler	Location	
Description			
Note			

Start Time	2021-01-12 12:39:35	Duration	0:15:00.0		
End Time	2021-01-12 12:54:35	Run Time	0:15:00.0	Pause Time	0:00:00.0

Results

Overall Metrics

LA_{eq}	48.1 dB		
LAE	77.6 dB	SEA	--- dB
EA	6.5 µPa²h		
LZ_{peak}	93.7 dB	2021-01-12 12:43:12	
LAS_{max}	69.1 dB	2021-01-12 12:43:12	
LAS_{min}	32.2 dB	2021-01-12 12:45:36	
LA_{eq}	48.1 dB		
LC_{eq}	62.1 dB	LC_{eq} - LA_{eq}	14.0 dB
LAI_{eq}	52.3 dB	LAI_{eq} - LA_{eq}	4.2 dB

Exceedances

Exceedances		Count	Duration
LAS >	85.0 dB	0	0:00:00.0
LAS >	115.0 dB	0	0:00:00.0
LZpeak >	135.0 dB	0	0:00:00.0
LZpeak >	137.0 dB	0	0:00:00.0
LZpeak >	140.0 dB	0	0:00:00.0

Community Noise

LDN	LDay	LNight	
48.1 dB	48.1 dB	0.0 dB	
LDEN	**LDay**	**LEve**	**LNight**
48.1 dB	48.1 dB	--- dB	--- dB

Any Data

	A		C		Z	
	Level	Time Stamp	Level	Time Stamp	Level	Time Stamp
L_{eq}	48.1 dB		62.1 dB		--- dB	
$Ls_{(max)}$	69.1 dB	2021-01-12 12:43:12	--- dB		--- dB	
$LS_{(min)}$	32.2 dB	2021-01-12 12:45:36	--- dB		--- dB	
$L_{Peak(max)}$	--- dB		--- dB		93.7 dB	2021-01-12 12:43:12

Overloads

Count	Duration	OBA Count	OBA Duration
0	0:00:00.0	1	0:00:02.0

Statistics

LAS 5.0	49.8 dB
LAS 10.0	44.3 dB
LAS 33.3	38.5 dB
LAS 50.0	35.8 dB
LAS 66.6	34.4 dB
LAS 90.0	33.5 dB

ATTACHMENT B

Federal Highway Administration Highway Roadway Construction Noise Outputs – Project Construction Noise

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/1/2022
Case Description: Vega 2/3 Demolition and Grubbing

Description	**Land Use**
Demolition and Grubbing	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**
Concrete Saw	No	20		89.6	3154
Excavator	No	40		80.7	3154
Excavator	No	40		80.7	3154
Excavator	No	40		80.7	3154
Dozer	No	40		81.7	3154
Dozer	No	40		81.7	3154

Calculated (dBA)

Equipment		***Lmax**	**Leq**
Concrete Saw		53.6	46.6
Excavator		44.7	40.7
Excavator		44.7	40.7
Excavator		44.7	40.7
Dozer		45.7	41.7
Dozer		45.7	41.7
	Total	**53.6**	**50.4**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/1/2022
Case Description: Vega 2/3 Grading

Description	**Land Use**
Grading	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**
Grader	No	40	85		3154
Excavator	No	40		80.7	3154
Excavator	No	40		80.7	3154
Dozer	No	40		81.7	3154
Scraper	No	40		83.6	3154
Scraper	No	40		83.6	3154
Tractor	No	40	84		3154
Tractor	No	40	84		3154

Calculated (dBA)

Equipment		***Lmax**	**Leq**
Grader		49	45
Excavator		44.7	40.7
Excavator		44.7	40.7
Dozer		45.7	41.7
Scraper		47.6	43.6
Scraper		47.6	43.6
Tractor		48	44
Tractor		48	44
	Total	**49**	**52.2**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date:	12/1/2022
Case Description:	Vega 2/3 Construction and Paving

Description	**Land Use**
Construction and Paving	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**
Paver	No	50		77.2	3154
Paver	No	50		77.2	3154
Pavement Scarafier	No	20		89.5	3154
Pavement Scarafier	No	20		89.5	3154
Roller	No	20		80	3154
Roller	No	20		80	3154
Crane	No	16		80.6	3154
Gradall	No	40		83.4	3154
Gradall	No	40		83.4	3154
Gradall	No	40		83.4	3154
Generator	No	50		80.6	3154
Tractor	No	40	84		3154
Tractor	No	40	84		3154
Tractor	No	40	84		3154
Slurry Trenching Machine	No	50		80.4	3154
Welder / Torch	No	40		74	3154

Calculated (dBA)

Equipment	***Lmax**	**Leq**
Paver	41.2	38.2
Paver	41.2	38.2
Pavement Scarafier	53.5	46.5
Pavement Scarafier	53.5	46.5
Roller	44	37
Roller	44	37
Crane	44.6	36.6
Gradall	47.4	43.4
Gradall	47.4	43.4
Gradall	47.4	43.4
Generator	44.6	41.6
Tractor	48	44
Tractor	48	44

Tractor	48	44
Slurry Trenching Machine	44.4	41.4
Welder / Torch	38	34
Total	**53.5**	**54.6**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date:	12/1/2022
Case Description:	Vega 2 & 3 Demolition and Grubbing

Description	**Land Use**
Demolition and Grubbing	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**
Concrete Saw	No	20		89.6	523
Excavator	No	40		80.7	523
Excavator	No	40		80.7	523
Excavator	No	40		80.7	523
Dozer	No	40		81.7	523
Dozer	No	40		81.7	523

Calculated (dBA)

Equipment		***Lmax**	**Leq**
Concrete Saw		69.2	62.2
Excavator		60.3	56.3
Excavator		60.3	56.3
Excavator		60.3	56.3
Dozer		61.3	57.3
Dozer		61.3	57.3
	Total	**69.2**	**66**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/1/2022
Case Description: Vega 2 & 3 Grading

Description	**Land Use**
Grading	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**
Grader	No	40	85		523
Excavator	No	40		80.7	523
Excavator	No	40		80.7	523
Scraper	No	40		83.6	523
Scraper	No	40		83.6	523
Dozer	No	40		81.7	523
Tractor	No	40	84		523
Tractor	No	40	84		523

Calculated (dBA)

Equipment		***Lmax**	**Leq**
Grader		64.6	60.6
Excavator		60.3	56.3
Excavator		60.3	56.3
Scraper		63.2	59.2
Scraper		63.2	59.2
Dozer		61.3	57.3
Tractor		63.6	59.6
Tractor		63.6	59.6
	Total	**64.6**	**67.8**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/1/2022
Case Description: Vega 2/3 Construction and Paving

Description	**Land Use**
Construction and Paving	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**
Paver	No	50		77.2	523
Paver	No	50		77.2	523
Pavement Scarafier	No	20		89.5	523
Pavement Scarafier	No	20		89.5	523
Roller	No	20		80	523
Roller	No	20		80	523
Crane	No	16		80.6	523
Gradall	No	40		83.4	523
Gradall	No	40		83.4	523
Gradall	No	40		83.4	523
Generator	No	50		80.6	523
Tractor	No	40	84		523
Tractor	No	40	84		523
Tractor	No	40	84		523
Slurry Trenching Machine	No	50		80.4	523
Welder / Torch	No	40		74	523

Calculated (dBA)

Equipment	***Lmax**	**Leq**
Paver	56.8	53.8
Paver	56.8	53.8
Pavement Scarafier	69.1	62.1
Pavement Scarafier	69.1	62.1
Roller	59.6	52.6
Roller	59.6	52.6
Crane	60.2	52.2
Gradall	63	59
Gradall	63	59
Gradall	63	59
Generator	60.2	57.2
Tractor	63.6	59.6

Tractor	63.6	59.6
Tractor	63.6	59.6
Slurry Trenching Machine	60	57
Welder / Torch	53.6	49.6
Total	**69.1**	**70.2**

*Calculated Lmax is the Loudest value.

ATTACHMENT C

SoundPLAN 3-D Noise Model Outputs – Project Onsite Noise

SoundPLAN
Output Source Information

Number	Reciever Name	Floor	Level at Receiver
1	Vega SES Complex-5C Receptor #1	Ground Floor	37 dBA
2	Vega SES Complex-5C Receptor #2	Ground Floor	36.7 dBA
3	Vega SES Complex-5C Receptor #3	Ground Floor	37.4 dBA

Number	Noise Source Information	Citation	Level at Source
1	Noise Activity at Solar Facility	ECORP Consulting	47.1 dBA