APPENDIX F

NOISE AND GROUNDBORNE VIBRATION IMPACT ASSESSMENT

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NOISE & GROUNDBORNE VIBRATION IMPACT ASSESSMENT

FOR THE PROPOSED

SEVILLE SOLAR FARM COMPLEX

COUNTY OF IMPERIAL, CA

DECEMBER 2013

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LIST OF COMMON TERMS AND ACRONYMS

Caltrans	California Department of Transportation
CALVENO	California Vehicle Reference Noise Emission Levels
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dB	Decibels
dBA	A-Weighted Decibels
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
in/sec	Inches per Second
L_{dn}	Day-Night Level
L_{eq}	Equivalent Sound Level
L_{max}	Maximum Sound Level
OPR	California Office of Planning & Research
ppv	Peak Particle Velocity
SR	State Route
US EPA	United States Environmental Protection Agency

INTRODUCTION

This report discusses the existing noise setting and identifies potential noise impacts associated with implementation of the proposed project. Noise mitigation measures are recommended where the predicted noise levels would exceed applicable noise standards.

PROJECT DESCRIPTION SUMMARY

The Applicant is proposing to build, operate and decommission a solar farm complex on approximately 1,238 acres located in west-central Imperial County, California. The Project area is located approximately eight miles west of the junction of State Route (SR) 78 and SR 86, and approximately three miles east of the San Diego County line (EGI 2013).

EXISTING SETTING

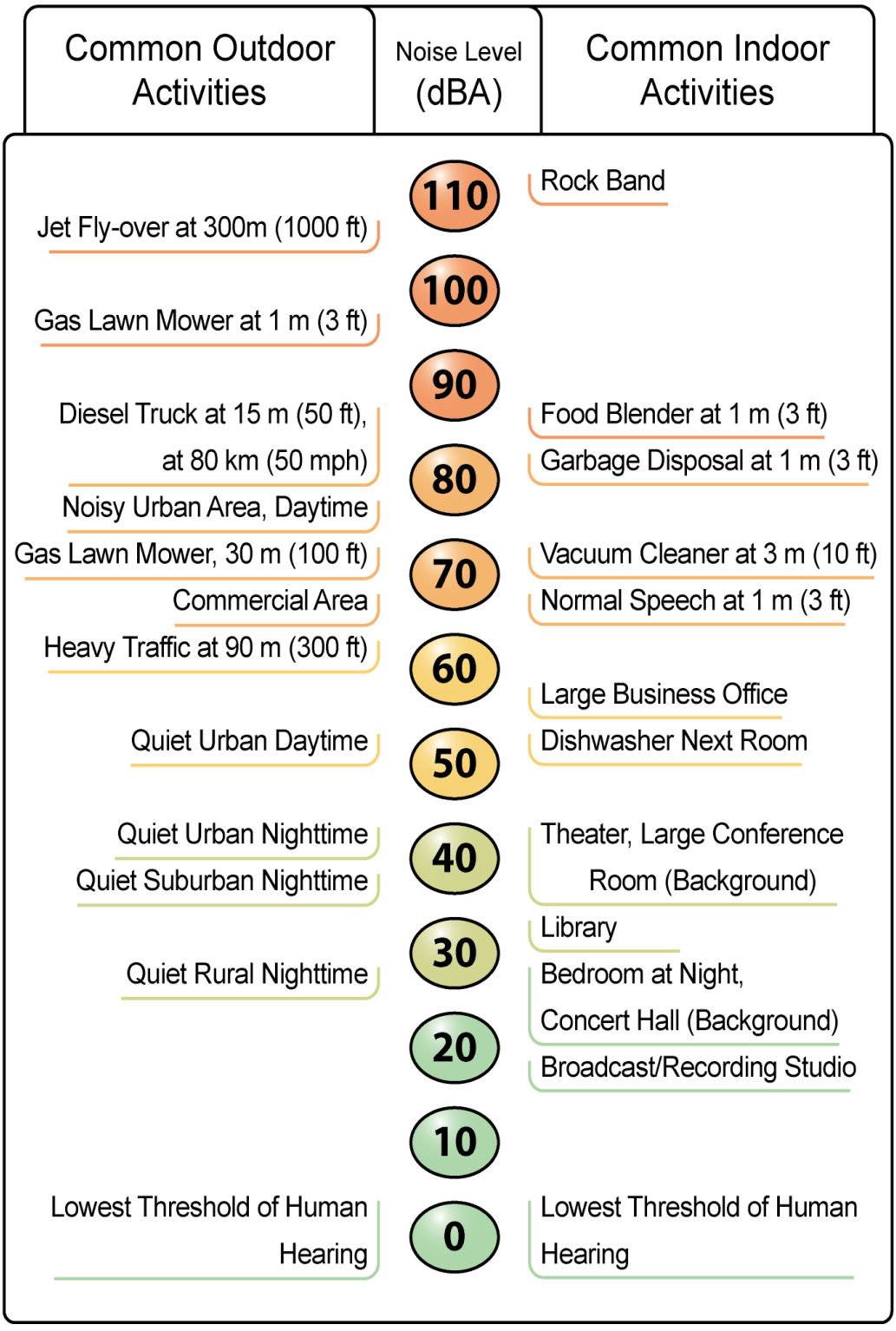
ACOUSTIC FUNDAMENTALS

Noise is generally defined as sound that is loud, disagreeable, or unexpected. Sound is mechanical energy transmitted in the form of a wave because of a disturbance or vibration. Sound levels are described in terms of both amplitude and frequency. Amplitude is defined as the difference between ambient air pressure and the peak pressure of the sound wave. Amplitude is measured in decibels (dB) on a logarithmic scale. 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 3 dB). Amplitude is interpreted by the ear as corresponding to different degrees of loudness. Laboratory measurements correlate a 10 dB increase in amplitude with a perceived doubling of loudness and establish a 3 dB change in amplitude as the minimum audible difference perceptible to the average person.

The frequency of a sound is defined as the number of fluctuations of the pressure wave per second (defined in Hertz). The human ear is not equally sensitive to sound of different frequencies. For instance, the human ear is more sensitive to sound in the higher portion of this range than in the lower and sound waves below 16 Hz or above 20,000 Hz cannot be heard at all. To approximate the sensitivity of the human ear to changes in frequency, environmental sound is usually measured in what is referred to as "A-weighted decibels" (dBA). On this scale, the normal range of human hearing extends from about 10 dBA to about 140 dBA. Common community noise sources and associated noise levels, in dBA, are depicted in **Figure 1**.

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. Noise generated by mobile sources typically attenuates at a rate between 3.0 to 4.5 dBA per doubling of distance. The rate depends on the ground surface and the number or type of objects between the noise source and the receiver. For mobile transportation sources, such as highways, hard and flat surfaces, such as concrete or asphalt, have an attenuation rate of 3.0 dBA per doubling of distance. Soft surfaces, such as uneven or vegetated terrain, have an attenuation rate of about 4.5 dBA per doubling of distance from the source. Noise generated by stationary sources typically attenuates at a rate of approximately 6.0 to 7.5 dBA per doubling of distance from the source.

Figure 1
Common Noise Levels



Source: Caltrans 2013

Sound levels can be reduced by placing barriers between the noise source and the receiver. In general, barriers contribute to decreasing noise levels only when the structure breaks the "line of sight" between the source and the receiver. Buildings, concrete walls, and berms can all act as effective noise barriers. Wooden fences or broad areas of dense foliage can also reduce noise, but are less effective than solid barriers.

Noise Descriptors

The intensity of environmental noise fluctuates over time, and several descriptors of time-averaged noise levels are used. The three most commonly used descriptors are L_{eq}, L_{dn}, and CNEL. The energy-equivalent noise level, L_{eq}, is a measure of the average energy content (intensity) of noise over any given period. Many communities use 24-hour descriptors of noise levels to regulate noise. The day-night average noise level, L_{dn}, is the 24-hour average of the noise intensity, with a 10-dBA "penalty" added for nighttime noise (10 p.m. to 7 a.m.) to account for the greater sensitivity to noise during this period. CNEL, the community equivalent noise level, is similar to L_{dn} but adds an additional 5-dBA penalty for evening noise (7 p.m. to 10 p.m.). Another descriptor that is commonly discussed is the single-event noise exposure level (SENEL), also referred to as the sound exposure level (SEL). The SENEL/SEL describes a receiver's cumulative noise exposure from a single noise event, which is defined as an acoustical event of short duration, such as a backup beeper, the sound of an airplane traveling overhead, or a train whistle. Noise analyses may also depend on measurements of L_{max}, the maximum instantaneous noise level during a specific period of time, and L_{min}, the minimum instantaneous noise level during a specific period. Common noise level descriptors are summarized in **Table 1**.

Table 1
Common Acoustical Descriptors

Descriptor	Definition
Energy Equivalent Noise Level (L_{eq})	The energy mean (average) noise level. The instantaneous noise levels during a specific period of time in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value (in dBA) is calculated.
Minimum Noise Level (L_{min})	The minimum instantaneous noise level during a specific period of time.
Maximum Noise Level (L_{max})	The maximum instantaneous noise level during a specific period of time.
Day-Night Average Noise Level (DNL or L_{dn})	The 24-hour L_{eq} with a 10 dBA "penalty" for noise events that occur during the noise-sensitive hours between 10:00 p.m. and 7:00 a.m. In other words, 10 dBA is "added" to noise events that occur in the nighttime hours to account for increases sensitivity to noise during these hours.
Community Noise Equivalent Level (CNEL)	The CNEL is similar to the Ldn described above, but with an additional 5 dBA "penalty" added to noise events that occur between the hours of 7:00 p.m. to 10:00 p.m. The calculated CNEL is typically approximately 0.5 dBA higher than the calculated L_{dn}.
Single Event Level (SEL)	The level of sound accumulated over a given time interval or event. Technically, the sound exposure level is the level of the time-integrated mean square A-weighted sound for a stated time interval or event, with a reference time of one second.

Sound Propagation & Attenuation

Geometric Spreading

Sound from a localized source (i.e., a point source) propagates uniformly outward in a spherical pattern. The sound level decreases (attenuates) at a rate of approximately 6 decibels (dB) for each doubling of distance from a point source. Highways consist of several localized noise sources on a defined path, and hence can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of approximately 3 dB for each doubling of distance from a line source (i.e., roadways, rail lines, etc.), depending on ground surface characteristics. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receiver, such as a parking lot or body of water,), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between the source and the receiver, such as soft dirt, grass, or scattered bushes and trees), an excess ground-attenuation value of 1.5 dB per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation for soft surfaces results in an overall attenuation rate of 4.5 dB per doubling of distance from the source.

Atmospheric Effects

Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels. Sound levels can be increased at large distances (e.g., more than 500 feet) from the highway due to atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors such as air temperature, humidity, and turbulence can also have significant effects.

Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receiver specifically to reduce noise. A barrier that breaks the line of sight between a source and a receiver will typically result in minimum 5 dB of noise reduction. Taller barriers provide increased noise reduction.

Noise reductions afforded by building construction can vary depending on construction materials and techniques. Standard construction practices typically provide approximately 15 dB exterior-to-interior noise reductions for building facades, with windows open, and approximately 20-25 dB, with windows closed. With compliance with current Title 24 energy efficiency standards, which require increased building insulation and inclusion of an interior air ventilation system to allow windows on noise-impacted façades to remain closed, exterior-to-interior noise reductions typically average approximately 25 dB. The absorptive characteristics of interior rooms, such as carpeted floors, draperies and furniture, can result in further reductions in interior noise.

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. When community noise interferes with human activities or contributes to stress, public annoyance with the noise source increases. The acceptability of noise and the threat to public well-being are the basis for land use planning policies preventing exposure to excessive community noise levels.

Unfortunately, there is no completely satisfactory way to measure the subjective effects of noise or of the corresponding reactions of annoyance and dissatisfaction. This is primarily because of the wide variation in individual thresholds of annoyance and habituation to noise over differing individual experiences with noise. Thus, an important way of determining a person's subjective reaction to a new noise is the comparison of it to the existing environment to which one has adapted: the so-called "ambient" environment. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged. Regarding increases in A-weighted noise levels, knowledge of the following relationships will be helpful in understanding this analysis:

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

Effects of Noise on Human Activities

The extent to which environmental noise is deemed to result in increased levels of annoyance, activity interference, and sleep disruption varies greatly from individual to individual depending on various factors, including the loudness or suddenness of the noise, the information value of the noise (e.g., aircraft overflights, child crying, fire alarm), and an individual's sleep state and sleep habits. Over time, adaptation to noise events and increased levels of noise may also occur. In terms of land use compatibility, environmental noise is often evaluated in terms of the potential for noise events to result in increased levels of annoyance, sleep disruption, or interference with speech communication, activities, and learning. Noise-related effects on human activities are discussed in more detail, as follows:

Speech Communication

For most noise-sensitive land uses, an interior noise level of 45 dB L_{eq} is typically identified for the protection of speech communication in order to provide for 100-percent intelligibility of speech sounds. Assuming an average 20-dB reduction in sound level between outdoors and indoors (which is an average amount of sound attenuation that assumes windows are closed), this

interior noise level would equates to an exterior noise level of 65 dBA L_{eq}. For outdoor voice communication, an exterior noise level of 60 dBA L_{eq} allows normal conversation at distances up to 2 meters with 95 percent sentence intelligibility (U.S. EPA 1974.) Based on this information, speech interference begins to become a problem when steady noise levels reach approximately 60 to 65 dBA. Within more noise-sensitive interior environments, such as educational facilities and places of worship, an average-hourly background noise level of 45 dBA L_{eq} is typically recommended.

Annoyance & Sleep Disruption

With regard to potential increases in annoyance, activity interference, and sleep disruption, land use compatibility determinations are typically based on the use of the cumulative noise exposure metrics (i.e., CNEL or L_{dn}). Perhaps the most comprehensive and widely accepted evaluation of the relationship between noise exposure and the extent of annoyance was one originally developed by Theodore J. Schultz in 1978. In 1978 the research findings of Theodore J. Schultz provided support for Ldn as the descriptor for environmental noise. Research conducted by Schultz identified a correlation between the cumulative noise exposure metric and individuals who were highly annoyed by transportation noise. The Schultz curve, expressing this correlation, became a basis for noise standards. When expressed graphically, this relationship is typically referred to as the Schultz curve. The Schultz curve indicates that approximately 13 percent of the population is highly annoyed at a noise level of 65 dBA L_{dn}. It also indicates that the percent of people describing themselves as being highly annoyed accelerates smoothly between 55 and 70 dBA L_{dn}. A noise level of 65 dBA L_{dn} is a commonly referenced dividing point between lower and higher rates of people describing themselves as being highly annoyed.

The Schultz curve and associated research became the basis for many of the noise criteria subsequently established for federal, state, and local entities. Most federal and state of California regulations and policies related to transportation noise sources establish a noise level of 65 dBA CNEL/L_{dn} as the basic limit of acceptable noise exposure for residential and other noise-sensitive land uses. For instance, with respect to aircraft noise, both the Federal Aviation Administration (FAA) and the State of California have identified a noise level of 65 dBA L_{dn} as the dividing point between normally compatible and normally incompatible residential land use generally applied for determination of land use compatibility. For noise-sensitive land uses exposed to aircraft noise, noise levels in excess of 65 dBA CNEL/L_{dn} are typically considered to result in a potentially significant increase in levels of annoyance.

Allowing for an average exterior-to-interior noise reduction of 20 dB, an exterior noise level of 65 dBA CNEL/L_{dn} would equate to an interior noise level of 45 dBA CNEL/L_{dn}. An interior noise level of 45 dB CNEL/L_{dn} is generally considered sufficient to protect against long-term sleep interference (U.S. EPA, 1974.) Within California, the California Building Code establishes a noise level of 45 dBA CNEL as the maximum acceptable interior noise level for residential uses (other than detached single-family dwellings). Use of the 45 dBA CNEL threshold is further supported by recommendations provided in the State of California Office of Planning and Research's *General Plan Guidelines*, which recommend an interior noise level of 45 dB CNEL/L_{dn} as the maximum allowable interior noise level sufficient to permit "normal residential activity" (OPR 2003.)

The cumulative noise exposure metric is currently the only noise metric for which there is a substantial body of research data and regulatory guidance defining the relationship between noise exposure, people's reactions, and land use compatibility. However, when evaluating environmental noise impacts involving intermittent noise events, such as aircraft overflights and train passbys, the use of cumulative noise metrics may not provide a thorough understanding of the resultant impact. The general public often finds it difficult to understand the relationship

between intermittent noise events and cumulative noise exposure metrics. In such instances, supplemental use of other noise metrics, such as the L_{eq} or L_{max} descriptor, are sometimes used as a means of increasing public understanding regarding the relationship between these metrics and the extent of the resultant noise impact.

AFFECTED ENVIRONMENT

Noise-Sensitive Receptors

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 parks, historic sites, cemeteries, and recreation areas are also 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.

Nearby noise-sensitive land uses consist predominantly of rural residential land uses, generally located west of the project site. The nearest residential land uses are located adjacent to the northwestern boundary of proposed Lot 6 and approximately 5,200 feet northwest of Lot 1. The Blu In RV Park is located approximately 1.85 miles west of the northwestern boundary of the project site. Nearby land uses are depicted in **Figure 2**.

Ambient Noise Environment

The noise environment in the proposed project area is defined primarily by vehicular traffic on SR 78. To a lesser extent, occasional aircraft overflights also contribute on to ambient noise levels in the project area. In addition, the Ocotillo Wells State Vehicular Recreation Area (OWSVRA) is located north of SR 78. No off-highway vehicles were in operation during the noise monitoring survey period. However, off-highway vehicle operations within the OWSVRA also contribute, on an occasional and intermittent basis, to the ambient noise environment.

The project site is not located within two miles of a public airport or private airstrip. The nearest airport is Ocotillo Airport, which is located approximately 5.7 miles northwest of the project site. As a result, the project site is not subject to high levels of aircraft noise. No major commercial or industrial noise sources were identified within the project area.

To document existing ambient noise levels at the project site, short-term ambient noise measurements were conducted on September 18th and 19th, 2013. A long-term (24-hour) noise measurement survey was also conducted to document vehicle traffic noise on SR 78. Noise measurements were conducted using a Larson Davis Laboratories, Type I, Model 820 integrating sound-level meter positioned at a height of approximately 5 feet above ground level. Measured ambient noise levels are summarized in **Table 2**. Calculated existing traffic noise levels and distances to existing average-daily noise contours (in CNEL/L_{dn}) for SR 78 are summarized in **Table 3**. Existing noise contours are also depicted in **Figure 2**.

Based on the measurements conducted, average-daily traffic noise levels were determined to be roughly equivalent (within approximately 2 dB) of the peak-hour traffic noise levels. As depicted, existing traffic noise levels at the nearest residences to the project site can range from approximately 50 dBA at locations nearest SR 78 to less than 40 dBA at residences located furthest from SR 78.

Table 2
Summary of Measured Ambient Noise Levels

Location	Monitoring Period		Noise Levels (dBA)		
	Start Date & Time	Duration	L_{eq}	L_{max}	CNEL
M1: Blu In Café, Approximately 50 feet from SR 78 Centerline	09/18/13, 13:30 p.m.	15 minutes	62.3	80.9	--
	09/19/13, 10:07 a.m.	18 minutes	62.7	81.6	--
M2: SR 78, Approximately 95 feet from Road Centerline	09/18/13, 15:30 p.m.	30 minutes	55.3	74.0	--
	09/19/13, 8:00 a.m.	60 minutes	59.1	78.1	--
	09/19/13, 9:00 a.m.	60 minutes	58.2	77.4	--
M3: SR 78, Approximately 85 feet from Road Centerline	09/19/13, 6:30 a.m.	15 minutes	59.2	77.8	--
	09/19/13, 10:40 a.m.	15 minutes	58.4	78.5	--
	09/18/13-09/19/13	24 hours	--	--	61

Ambient noise measurements were conducted on September 18-19, 2013 using a Larson Davis Laboratories, Type I, Model 820 integrating sound-level meter placed at a height of approximately 5 feet above ground level. Noise monitoring locations are depicted in ***Figure 2****. Average-daily noise levels are depicted in* ***Figure 3****.*

Table 3
Existing Traffic Noise Levels

Roadway	CNEL/L_{dn} at 50 Feet from Near-Travel-Lane Centerline[1]	Predicted Distance From Road Centerline to CNEL Contour (feet)				
		60	55	50	45	40
SR 78	64	107	231	497	1,060	2,300

Traffic noise levels were calculated using the FHWA roadway noise prediction model. Refer to Appendix A for noise modeling assumptions and results.

REGULATORY FRAMEWORK

Noise

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.

Figure 2
Project Site Location, Nearby Land Uses, and Noise Monitoring Locations

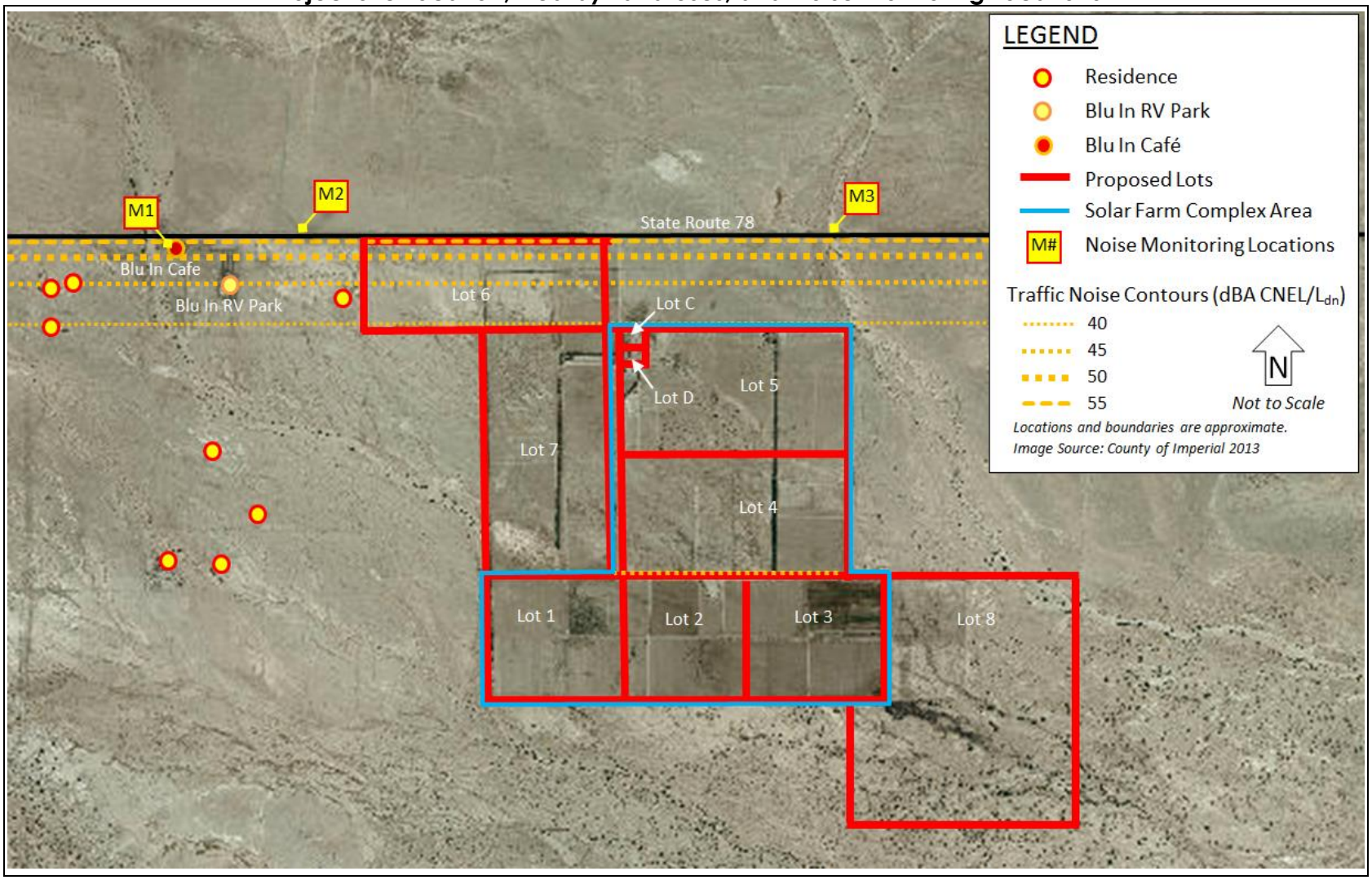
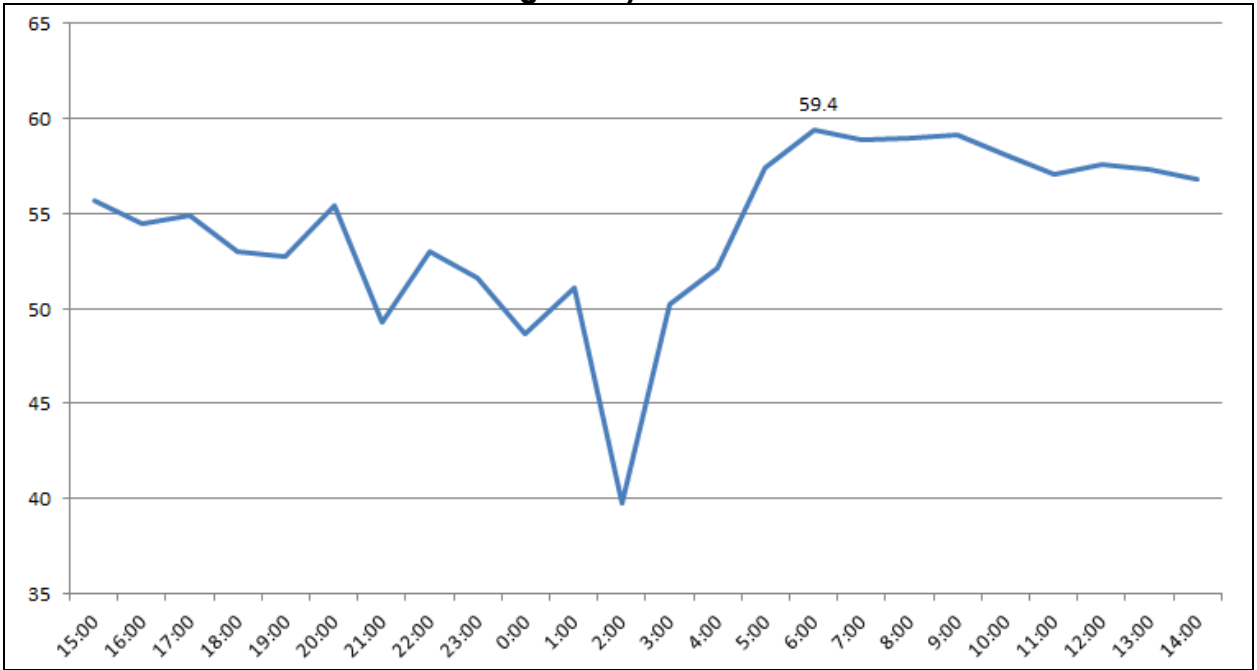


Figure 3
Average-Daily Noise Levels



*Based on measurements conducted at monitoring site M3. Refer to **Table 2** and **Figure 2**.*

County of Imperial General Plan

Land Use Compatibility Noise Criteria

The Noise Element of the County's General Plan identifies goals, objectives, and policies to reduce noise-related impacts and land use compatibility conflicts. For determination of land use compatibility the Noise Element identifies noise criteria for various land-use designations, based on the average-daily noise descriptor (i.e., CNEL). Land use compatibility noise standards are summarized in **Table 4**.

For industrial, manufacturing, utilities, and agriculture land uses, exterior noise levels up to 70 dBA CNEL are considered "normally acceptable." Between 70 and 75 dBA CNEL such land uses are considered "conditionally acceptable" provided necessary noise-reduction measures have been incorporated. Industrial land uses are considered "normally unacceptable" between 75 and 80 dB CNEL and ""clearly unacceptable" where exterior noise levels exceed 80 dBA CNEL. For residential land uses, exterior noise levels of 55 dBA CNEL, or less, are considered "normally acceptable."

Property Line Noise Standards

The County's General Plan also establishes maximum allowable average-hourly noise limits for various land use designations (refer to **Table 5**). 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}. It is important to note that these standards imply the existence of a sensitive receptor on the

adjacent, or receiving, property. In the absence of a sensitive receptor, an exception or variance to the standards may be appropriate. These standards do not apply to construction noise.

Table 4
County of Imperial Land Use Compatibility Noise Criteria

Land Use Category	Average-Daily Noise Level (dBA CNEL)			
	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Residential	<60	60-70	70-75	>75
Transient Lodging-Motels, Hotels	<60	60-75	70-80	>80
Schools, Libraries, Churches, Hospitals, Nursing Homes	<60	60-70	70-80	>80
Auditoriums, Concert Halls, Amphitheaters	--	<70	--	>70
Sports Arena, Outdoor Spectator Sports	--	<70	70-75	>75
Playgrounds, Neighborhood Parks	<70	--	70-75	>75
Golf Courses, Riding Stables, Water Recreation, Cemeteries	<70	--	70-80	>80
Office Buildings, Business Commercial and Professional	<65	65-75	75-80	>80
Industrial, Manufacturing, Utilities, Agriculture	<70	70-75	75-80	>80

Notes:
***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.*

Source: County of Imperial, General Plan, Noise Element 1997

Table 5
County of Imperial Property Line Noise Standards

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

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 Leq.
Source: County of Imperial, General Plan, Noise Element 1997

Construction Noise Standards

The County General Plan Noise Element also establishes noise limitations pertaining to construction-related activities. For short-term activities, construction equipment noise levels are limited to 75 dB L_{eq}, averaged over an eight (8) hour period. In instances where construction activities would occur for an extended duration (more than a few weeks) a more restrictive noise standard of 75 dB L_{eq} averaged over a one (1) hour period, is applied. These standards are applied at the nearest noise-sensitive receptor. To minimize potential nuisance impacts to nearby receptors, the General Plan also establishes hourly restrictions for noise-generating construction activities. The County's General Plan noise limitations for construction activities are summarized in **Table 6**.

Table 6
County of Imperial Construction Noise Limitations

Duration	Noise Level (dBA Leq)	Averaging Period	Hourly Restrictions
Short-term (days or weeks)	75	8 hours	7:00 a.m. – 7:00 p.m., Monday – Friday 9:00 a.m. – 5:00 p.m., Saturdays No commercial construction allowed on Sundays or holidays
Extended Duration	75	1 hour	
Source: County of Imperial, General Plan, Noise Element 1997			

Significant Increase of Ambient Noise Levels

The County General Plan Noise Element also establishes guidelines for the evaluation of project-generated increases in ambient noise levels. Projects resulting in increases in ambient noise levels, as identified below, would typically be considered to have a potentially significant noise impact (County of Imperial 1997):

a. If the future noise level after the 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.

b. If the future noise level after the 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.

County of Imperial Noise Abatement and Control Ordinance

The County of Imperial Noise Abatement and Control Ordinance (Title 9, Division 7) identifies property line noise limitations that are consistent with those identified in the County's General Plan Noise Element (refer to **Table 5**). As noted above, the noise limits are 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 (County of Imperial 1998).

Groundborne Vibration

There are no federal, state, or local regulatory standards for ground-borne vibration. However, various criteria have been established to assist in the evaluation of vibration impacts. For instance, the California Department of Transportation (Caltrans) has developed vibration criteria based on potential structural damage risks and human annoyance.

At the highest levels of vibration, damage to structures is primarily architectural (e.g., loosening and cracking of plaster or stucco coatings) and rarely result in structural damage. For most structures, a peak particle velocity (ppv) threshold of 0.5 inches per second (in/sec) is sufficient to avoid structure damage, with the exception of fragile historic structures or ruins. For the protection of fragile, historic, and residential structures, the California Department of Transportation recommends a more conservative threshold of 0.2 inches per second ppv. This same threshold would represent the level at which vibrations would be potentially annoying to people in buildings (FTA 2006, Caltrans 2002).

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

Criteria for determining the significance of noise impacts were developed based on information contained in the California Environmental Quality Act Guidelines (CEQA Guidelines, Appendix G). According to the guidelines, a project may have a significant effect on the environment if it would result in the following conditions:

a) Exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or of applicable standards of other agencies;

b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

e) For a project located within an airport land use plan area or, where such a plan has not been adopted, within two miles of a public airport or a public use airport, would the project expose people residing or working in the project area to excessive noise levels;

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

As noted earlier in this report, the project site is not located within two miles of a public airport or private airstrip. The nearest airport is Ocotillo Airport, which is located approximately 5.7 miles northwest of the project site. As a result, the project site is not subject to high levels of aircraft noise. As a result, the project site is not subject to high levels of aircraft noise. Implementation of the proposed project would not affect airport operations nor result in increased exposure of noise-sensitive receptors to aircraft noise. For these reasons, exposure to aircraft noise levels would be considered less than significant and is not discussed further in this report.

Temporary noise impacts associated with the proposed project would be associated with short-term construction-related activities. Long-term permanent increases in noise levels would occur associated with onsite operational activities, as well as, potential increases in traffic noise levels along area roadways. Potential increases in groundborne vibration levels would be primarily associated with short-term construction-related activities. For purposes of this analysis and where applicable, the County of Imperial noise standards were used for evaluation of project-related noise impacts. Thresholds of significance used in this analysis are discussed below:

Short-term Construction Noise

Short-term construction noise impacts would be considered significant if the proposed project would exceed applicable County noise standards (**Table 6**). Construction activities would also be considered to have a significant impact if construction would result in substantial increases in ambient noise levels at the nearest noise-sensitive land uses during the more noise-sensitive evening and nighttime hours (i.e., 7 a.m. to 7 p.m.). For purposes of this analysis, a substantial increase is defined as an increase of 3 dBA, or greater.

Long-term Operational Traffic Noise

Long-term operational noise impacts would be considered significant if the proposed project would result in a substantial increase in ambient noise levels that would exceed the County noise standards for land use compatibility (**Table 4)**. For assessment of transportation impacts, a substantial increase in noise levels is typically defined as an increase of 5.0, or greater, where the noise levels, without project implementation, are less than the applicable noise standard. Where the noise level, without project implementation, equals or exceeds applicable noise standards, an increase of 3.0 dBA, or greater, would be considered a substantial increase. As noted in **Figure 2**, exterior noise levels at nearby existing residential land uses are not projected to exceed the County's "normally acceptable" noise standard of 55 dBA CNEL. As a result, a substantial increase in noise levels at these locations would typically be defined as an increase of 5.0, or greater. However, for purposes of this analysis and to be conservative, a substantial increase is defined as an increase of 3 dBA, or greater.

Long-term Operational Non-Transportation Noise

Long-term operational noise impacts would be considered significant if the proposed project would result in non-transportation noise levels that would exceed applicable County noise standards at nearby noise-sensitive land uses. The County of Imperial noise limitations for stationary sources are summarized in **Table 5**. When the ambient noise level is equal to or exceeds the Property Line noise standard, the applicable noise standard is the ambient noise level (in dBA L_{eq}) plus 3 dB. In instances where the adjoining land use designations differs from that of the noise-generating land use, the more restrictive noise standard shall apply (County of Imperial 1998).

The project site is currently zoned Agriculture (EGI 2013). Based on this zoning designation, the "General Industrial" land use designation, as identified in **Table 4**, is considered most closely representative of the proposed land use. As a result, project-generated noise levels that would exceed 75 dBA L_{eq} at the property line of the proposed project would be considered to have a potentially significant impact. To ensure a conservative analysis, irrespective of existing zoning designation, operational noise levels that would exceed the County's applicable daytime and nighttime noise standards at the nearest residential land use (i.e., 50 and 45 dBA L_{eq}) would also be considered to have a potentially significant impact. This more conservative noise standard is used to ensure that occupants of these existing dwelling units are adequately protected from project-generated operational noise levels.

Exposure to Groundborne Vibration

Groundborne vibration levels would be considered significant if predicted short-term construction or long-term operational groundborne vibration levels attributable to the proposed project would exceed 0.2 inches per second ppv at the nearest offsite existing structure.

METHODOLOGY

A combination of existing literature, noise level measurements, and application of accepted noise prediction and sound propagation algorithms were used for the prediction of short-term construction and long-term non-transportation and transportation source noise levels, as well as, for the evaluation of groundborne vibration impacts.

Short-Term Construction Noise

Predicted noise levels at nearby noise-sensitive land uses were calculated utilizing typical noise levels and usage rates associated with construction equipment, derived from the U.S. Department of Transportation, Federal Highway Administration's *Roadway Construction Noise Model* (version 1.1) and representative data obtained from similar construction projects. Construction noise levels were predicted assuming an average noise attenuation rate of 6 dB per doubling of distance from the source and an excess noise-attenuation rate of 1.5 dB per 1,000 feet. Modeling assumptions and calculations are included in **Appendix A**.

Long-term Operational Stationary-Source Noise

Predicted noise levels associated with onsite stationary noise sources and activities were calculated based on representative data obtained from existing literature and noise assessments prepared for similar projects. Operational noise levels were predicted assuming an average noise-attenuation rate of 6 dB per doubling of distance from the source and an excess noise-attenuation rate of 1.5 dB per 1,000 feet. Operational noise levels were calculated at the project site property lines and nearby land uses for comparison to the County noise standards. Modeling assumptions and calculations are included in **Appendix A**.

Long-term Traffic Noise

Traffic noise levels were calculated using the FHWA roadway noise prediction model (FHWA-RD-77-108) based on California vehicle reference noise emission factors and traffic data obtained from the traffic analysis prepared for this project. Additional input data included vehicle speeds, ground attenuation factors, and roadway widths. Predicted noise levels were calculated at a distance of 50 feet from the near-travel-lane centerline, as well as distances to the predicted noise contours. Increases in traffic noise levels attributable to the proposed project were determined based on a comparison of predicted noise levels, with and without project implementation. Modeling assumptions and calculations are included in **Appendix A**.

Groundborne Vibration

No major existing sources of groundborne vibration have been identified in the proposed project area. Groundborne vibration levels associated with construction-related activities were evaluated utilizing typical groundborne vibration levels rates associated with construction equipment, obtained from the U.S. Department of Transportation, Federal Transit Administration's *Transit Noise and Vibration Impact Assessment Guidelines* (2006). Groundborne vibration impacts related to structural damage and human annoyance were evaluated taking into account the distance from construction activities to nearby land uses and typically applied criteria for structural damage and human annoyance.

IMPACT 1 ***Short-term Exposure to Construction-Generated Noise****. Activities associated with project construction and decommissioning could result in a substantial temporary increase in ambient noise levels, particularly during the quieter nighttime hours. Construction* activities occurring during the nighttime hours, if required, may result in increased nuisance and potential sleep disruption to occupants of nearby residential dwellings. *This impact is considered* ***potentially significant.***

Construction noise associated with the proposed project would be temporary and would vary depending on the nature of the construction activities being performed. Noise generated during construction would be primarily associated with the operation of off-road equipment for onsite construction activities, as well as, construction vehicle traffic on area roadways. Short-term construction-generated noise levels associated with onsite activities and offsite vehicle traffic are discussed in more detail, as follows:

Onsite Construction Activities

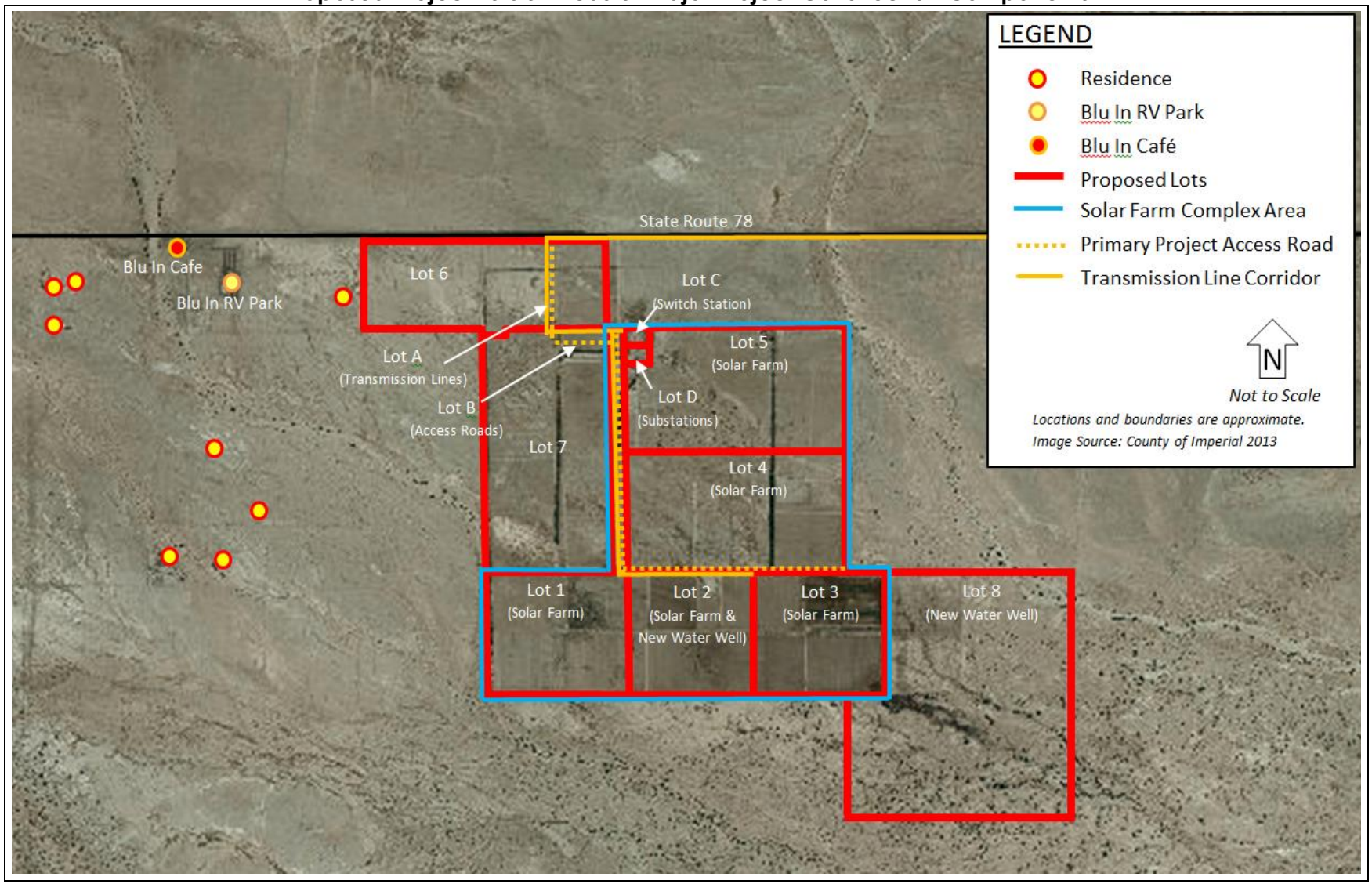
The proposed project includes development of 5 lots (Lots 1 through 5) as individual solar farm projects. Lots 6 through 8 are not proposed for development. Development of Lots 1 through 5 would largely involve site preparation, grading, and solar panel installation. In addition, an operations and maintenance (O&M) building would be constructed within each of the proposed solar farms. Lots A, C and D would be developed specifically for the benefit of all five solar farm projects. Lot A includes the solar development transmission lines to the solar energy project substations, Lot C would house the IID electrical switch station, and Lot D would include the five solar energy project substations. Lot B would consist of the internal property road system. Demolition of existing structures would also be required. Lots 6 through 8 are not proposed to be developed. Two new water wells would be constructed, including one on Lot 2 and one on Lot 8. Construction periods for the individual solar farm projects are not expected to overlap. However, there is the potential for some construction activities to overlap. Major project construction components are summarized in **Table 7.** Refer to **Figure 4** for lot locations.

Table 7
Summary of Proposed Project Lots and Major Project Construction Components

Proposed Lot	Major Project Construction Components
Lot 1	Solar Farm
Lot 2	Solar Farm and Water Well
Lot 3	Solar Farm
Lot 4	Solar Farm
Lot 5	Solar Farm
Lot 6	No Development
Lot 7	No Development
Lot 8	*Water Well, No Additional Development*
Lot A	*Solar energy projects transmission line corridors within the Property*
Lot B	*Common access road corridors within the Property*
Lot C	*IID switch station*
Lot D	*Five Solar Energy Project Substations*

Lot locations are depicted in **Figure 3**.
Source: Regenerate 2013.

Figure 4
Proposed Project Lots & Areas of Major Project Construction Components



Off-road construction equipment associated with onsite construction activities are summarized in **Table 8**. **Table 8** also lists typical noise levels generated by individual pieces of construction equipment, including instantaneous noise levels (L_{max}) and average energy-equivalent noise levels (L_{eq}). Noise generated by onsite construction activities would vary depending on the specific activities being conducted and equipment used. Estimated construction-generated noise levels at the nearest residential land uses for major onsite construction activities are summarized in **Table 9**. To be consistent with County of Imperial noise standards, construction-generated noise levels were calculated for both the highest hour and eight-hour averages (in dBA L_{eq}).

As indicated in **Table 9**, noise levels generated by onsite construction activities would range from approximately 12 to 38 dBA L_{eq} over a 1-hour period and from approximately 12 to 37 dBA L_{eq} averaged over an 8-hour period. The highest noise levels would be associated with post-driving activities. Based on the preliminary construction schedule, some construction activities could potentially occur concurrently (EMA 2013). Noise levels associated with concurrent construction activities were also calculated and are summarized in **Table 9**. Assuming that multiple construction activities could potentially occur simultaneously, construction-generated noise levels at the nearest residences could reach levels of approximately 43 dBA L_{eq} over a 1-hour period and 42 dBA L_{eq} over an 8-hour period. It is important to note that the noise levels presented in **Table 9** are based on distances from the nearest existing residences to the nearest areas of onsite construction activities, including the proposed solar development within Lot 1. Because noise levels decrease with increased distance, construction-generated noise levels associated with subsequent solar development projects (i.e., Lots 2 through 5), as perceived at the nearest existing residences, would be less. Noise generated during the decommissioning of the proposed project would be similar to predicted construction noise levels.

As noted above, predicted noise levels associated with the various onsite construction activities would not exceed the County of Imperial noise standards. However, the proposed project does not identify hourly restrictions for proposed construction activities. In the event that construction and decommissioning activities would be required during the more noise-sensitive nighttime hours, such activities may result in increased nuisance and potential sleep disruption to occupants of nearby residential dwellings. As a result, potential onsite noise-generating construction and decommissioning activities occurring during the nighttime hours, if required, would be considered to have a **potentially significant** impact.

Construction Vehicle Traffic

Construction-generated vehicle traffic would include a mix of light-duty automobiles and trucks, medium-duty trucks, and heavy-duty trucks. According to the traffic analysis prepared for this project, approximately 14 vendor trucks and 14 haul trucks would arrive at and depart from the project site at staggered times throughout the day. Project construction would require a maximum of 150 workers on-site at any given time. Assuming that construction employees were to drive their own vehicles, construction worker trips would total a maximum of approximately 300 trips per day (CRA 2013).

Predicted traffic noise levels for area roadways, with and without the contribution of construction-generated vehicle traffic, are summarized in **Table 10**. As indicated, construction activities would not result in a substantial increase in average-daily vehicle traffic noise levels along area roadways. However, in the event that construction activities were to occur during the more noise-sensitive evening and nighttime hours, substantial increases in average-hourly noise levels during these quieter periods of the day could potentially occur. As noted above,

noticeable increases in ambient noise levels during these more noise-sensitive periods of the day would be considered to have a **potentially significant** impact.

Table 8
Estimated Construction Equipment Inventory & Noise Levels

Construction Phase/Type of Equipment	Estimated Quantity	Individual Equipment Noise Levels (dBA) @ 50 Feet [1]	
		L_{max}	L_{eq}
Water Well Drilling			
Drilling Rig	1	85	81
Off-Highway Truck	1	84	80
Tractor/Loader/Backhoe	1	80	76
New Access Road Construction			
Grader	2	85	81
Off-Highway Truck	1	84	80
Roller	2	85	78
Crawler Tractor/Dozer	1	82	78
Scraper	1	85	81
Switch Station Construction			
Aerial Lift	2		
Crane	1	85	77
Grader	1	85	81
Tractor/Loader/Backhoe	1	80	76
Transmission Line Construction			
Aerial Lift	3		
Crawler Tractor/Dozer	2	82	78
Internal Road Construction			
Grader	1	85	81
Off-Highway Truck	1	84	80
Roller	2	85	78
Tractor/Loader/Backhoe	1	80	76
Demolition of Onsite Structures			
Tractor/Loader/Backhoe	2	80	76
Site Preparation			
Tractor/Loader/Backhoe	3	80	76
Grading			
Grader	2	85	81
Off-Highway Truck	2	84	80
Crawler Tractor/Dozer	1	82	78
Scraper	2	85	81
Tractor/Loader/Backhoe	2	80	76
Solar Panel Installation			
Generator Set	5	81	78
Off-Highway Truck	1	84	80
Trencher	2	85	82
Track-Mounted Post Drivers[2]	2	88	81

Table 10 is continued on the following page.

Table 8
Estimated Construction Equipment Inventory & Noise Levels

Construction Phase/Type of Equipment	Estimated Quantity	Individual Equipment Noise Levels (dBA) @ 50 Feet [1]	
		L_{max}	L_{eq}
Building Construction			
Aerial Lift	2	75	68
Concrete Pump	1	81	78
Crane	1	85	77
Roller	1	80	73
Tractor/Loader/Backhoe	1	80	76
Substation Construction			
Aerial Lift	2	75	68
Crane	1	85	77
Tractor/Loader/Backhoe	1	80	76
General Tie Line			
Aerial Lift	3	75	68
Crawler Tractor/Dozer	2	82	78

1. Based on estimated major noise-generating construction equipment requirements derived from the air quality analysis prepared for this project. Not all equipment may be represented.
2. Based on measurements conducted at Topaz Solar Farm 2012.
Refer to Appendix A for noise modeling assumptions and results.
Sources: EMA 2013; FTA 2006

Table 9
Predicted Construction Noise Levels at the Nearest Noise-Sensitive Receptor

Construction Activity	Average Energy-Equivalent Noise Level (dBA L_{eq}) [1]	
	1-Hour	8-Hour
Water Well Drilling	12	12
New Access Road Construction	41	41
Internal Road Construction	35	35
Demolition of Onsite Structures	34	34
Site Preparation	32	27
Grading	36	32
Combined Noise Levels for Above Activities at Nearest Receptor [2]:	43	42
Switch Station Construction	34	33
Transmission Line Construction	34	34
Solar Panel Installation without Post Driving	35	34
Post Driving	38	37
O&M Building Construction	29	29
Substation Construction	27	27
Gen Tie Line	30	30
Combined Noise Levels for Above Activities at Nearest Receptor [2]:	41	40
County of Imperial Noise Standards [3]:	75	75
Exceeds Noise Standards?	No	No

*1. Based on estimated distance to construction activity source center and equipment noise levels identified in **Table 9**.*
2. Based on activities that could potentially occur concurrently derived from the preliminary construction schedule identified in the air quality analysis prepared for this project (EMA 2013).
3. For short-term activities, construction equipment noise levels are limited to 75 dB L_{eq}, averaged over an eight (8) hour period. In instances where construction activities would occur for an extended duration (more than a few weeks) a more restrictive noise standard of 75 dB L_{eq} averaged over a one (1) hour period, is applied.
*Refer to **Appendix A** for noise modeling assumptions and results.*

Table 10
Predicted Short-term Increases in Traffic Noise Levels

Roadway	CNEL/L_{dn} at 50 Feet from Near-Travel-Lane Centerline[1]		Predicted Increase	Substantial Increase?[2]
	Without Project	With Project		
SR 78	64.26	65.50	1.24	No

1. *Traffic noise levels were calculated using the FHWA roadway noise prediction model based on data obtained from the traffic analysis prepared for this project (CRA 2013).*
2. *For purposes of this analysis, a substantial increase in noise levels is defined as an increase of 5.0, or greater, where the noise levels, without project implementation, are less than the County's "normally acceptable" noise standard. Where the noise level, without project implementation, equals or exceeds applicable noise standards, an increase of 3.0 dBA, or greater, would be considered a substantial increase. These criteria are intended to apply to long-term project operation, but are used in this analysis in the absence of applicable criteria for short-term activities.*

Mitigation Measure Noise-1

The following mitigation measures shall be implemented during construction and decommissioning of the proposed project:

a. Noise-generating construction and decommissioning activities (excluding activities that would result in a safety concern to the public or construction workers) shall be limited to between the hours of 7:00 a.m. and 7:00 p.m., Monday through Friday, and between 9:00 a.m. and 5:00 p.m. on Saturdays. Construction activities shall be prohibited on Sundays and holidays.

b. Construction equipment shall be properly maintained and equipped with noise-reduction intake and exhaust mufflers and shrouds, in accordance with manufacturers' recommendations.

c. All motorized construction equipment and vehicles shall be turned off when not in use.

Significance After Mitigation

Implementation of the above mitigation measures would limit construction and decommissioning activities to the less noise-sensitive periods of the day. Use of manufacturer-recommended noise control devices, such as exhaust mufflers and engine shrouds, would further reduce individual equipment noise levels and potential increases in ambient noise levels. With implementation of the above mitigation measures, noise-generating construction activities would be considered **less than significant**.

IMPACT 2 ***Long-Term Exposure to Increased Traffic Noise****. Long-term operation of the proposed project would not result in a substantial increase in traffic noise levels. This impact would be considered* ***less than significant.***

Implementation of the proposed project would result in increased traffic volumes along SR-78. The increase in traffic volumes resulting from implementation of the proposed project would, therefore, contribute to predicted increases in traffic noise levels. The FHWA Highway Traffic Noise Prediction Model (FHWA RD77-108), utilizing California vehicle noise emission factors, was used to predict traffic noise levels along SR-78, with and without implementation of the proposed project. The Project's contribution to traffic noise levels along these roadways was determined by comparing the predicted noise levels with and without project-generated operational traffic.

Predicted traffic noise levels, with and without development of the proposed project, are summarized in **Table 11**. In comparison to existing conditions, the proposed project would result in predicted increases in traffic noise levels along SR 78 of approximately 0.09 dBA CNEL/L_{dn}. The project's contribution to SR 78 traffic noise levels in future years are projected to decline to approximately 0.08 dBA by year 2015 and 0.02 dBA by year 2020. Implementation of the proposed project would not contribute to a substantial increase in traffic noise levels. As a result, this impact would be considered **less than significant**.

Table 11
Predicted Increases in SR-78 Traffic Noise Levels
Long-Term Operational Conditions

Year	CNEL/L_{dn} at 50 Feet from Near-Travel-Lane Centerline[1]		Predicted Noise Level Increase	Substantial Noise Level Increase?[2]
	Without Project	With Project		
Existing Conditions	64.26	64.35	0.09	No
Near-Term Year 2015	64.47	64.55	0.08	No
Long-Term Year 2025	73.34	73.36	0.02	No

1. *Traffic noise levels were calculated using the FHWA roadway noise prediction model based on data obtained from the traffic analysis prepared for this project (Chen Ryan Associates 2013).*
2. *For purposes of this analysis, a substantial increase in noise levels is defined as an increase of 5.0, or greater, where the noise levels, without project implementation, are less than the County's "normally acceptable" noise standard. Where the noise level, without project implementation, equals or exceeds applicable noise standards, an increase of 3.0 dBA, or greater, would be considered a substantial increase.*

IMPACT 3 ***Long-Term Exposure to Increased Stationary-Source Noise****. Long-term operation of the proposed project may result in operational noise levels that could exceed applicable noise standards at the project site property line. This impact would be considered* ***potentially significant.***

The proposed project would operate continuously, seven days per week. Noise generated by project operations would be predominantly associated with the onsite operation of transformers, inverters, substations, and power conversion stations. The solar farms may also be equipped with horizontal single-axis tracker (HSAT) systems or dual-axis tracker (DAT) systems, to orient the solar panels toward the sun, which would generate intermittent noise associated with the operation of the electrical motors used to power the HSATs and/or DATs. In addition, given the low background noise levels, Corona discharge may be somewhat detectable in the immediate vicinity of the proposed transmission lines, particularly during high humidity conditions. Additional operational noise sources would include onsite vehicle operations and intermittent maintenance activities. Other potential noise sources at the project site, including wind noise from the solar panels, would be minimal and not projected to result in a significant contribution to overall operational noise levels. The potential for wind noise generally occurs in situations where the solar panels are mounted close to another large surface, such as a roof. In some instances, the air moving through the gap between the surfaces has been reported to generate intermittent noise in the vicinity of the panels. However, this would not be the case for the proposed solar farm because the panels are mounted well above the ground surface. Based on noise measurement surveys conducted under varying meteorological and wind conditions at a similar facility, no detectable increases in ambient noise levels due to wind noise were noted.

Representative noise levels for onsite stationary noise sources were obtained from noise studies and measurement data obtained from similar solar farm projects and related equipment. Representative operational noise levels for onsite noise sources are summarized in **Table 12**.

Table 12
Summary of Onsite Stationary Equipment Noise Levels

Source	Distance (feet)	Noise Level (dBA L_{eq})
Substation Transformer Noise Levels [1]	3	70
Power Conversion Stations (PCS) [2]	10	70
Transmission Line Corona Discharge [3]	25	25
Horizontal Single-Axis Tracker (HSAT) & Dual-Axis Tracker (DAT) Systems [4]	400	37
Onsite Maintenance [5]	50	70

1. *Substation transformers noise based on data obtained from the Panoche Valley Solar Farm Project Draft Environmental Impact Report (San Benito County 2010)*
2. *PCS noise levels are based on full-load (daytime) conditions, including noise generated by two inverters located within an enclosed structure, one transformer mounted at the exterior of the structure, exterior mounted HVAC system and an exhaust fan. Based on data obtained from the Topaz Solar Farm Project Draft Environmental Impact Report (San Luis Obispo County 2011).*
3. *Transmission Line Corona Discharge is conservatively based on a 230 kV line. Corona discharge noise generated by lower-rated lines would be less.*
4. *HSAT & DAT noise levels based on T20 Tracker System. Includes the simultaneous operation of 6 tracker motors.(ICF 2010)*
5. *Assumes 70 dBA L_{eq} at 50 feet based on typical operational noise levels for portable equipment (e.g., portable generators and compressors)(FTA 2006).*

Substation Transformers

Transformer noise is typically described as a "humming" or "buzzing" noise, which is caused by mechanical movement of the laminations located within the transformer core. Expansion of the core laminations occurs when the transformer is under load. When the transformer is not under load the core laminations return to their original state. Because movement of the core laminations occurs during both load and non-load conditions, transformers typically generate audible noise under both load and non-load conditions. During non-load conditions, the highest audible noise levels are typically approximately 2 dB less than noise generated while under load.

As noted in **Table 12**, operational noise levels associated with the proposed substation transformers would be approximately 70 dBA at 3 feet, while under load. Based on this noise level, predicted noise levels at the nearest the existing residential land use, located west of proposed Lot 6, would be less than 5 dBA and would not result in a detectable increase in ambient noise levels, nor would operational noise levels exceed the County's exterior daytime or nighttime noise standards of 50 and 45 dBA L_{eq}, respectively. However, depending on the number, type and location of the substation equipment installed, operational noise levels at the boundary of the solar farm complex could potentially exceed the County's property line noise standard of 75 dBA L_{eq}.

Power Conversion Stations

Power conversion stations would be constructed within each of the proposed solar farms (i.e., Lots 1 through 5). Each PCS would include two inverters and one transformer. The inverters would be housed within an enclosed structure, which would help to reduce operational noise from the inverters. The transformer would be located at the exterior of the PCS enclosures. In addition, each of the PCSs would also be anticipated to include an exhaust fan; as well as, a

heating, ventilation, and air conditioning (HVAC) system, which is typically mounted to the exterior of the enclosure.

Each of the proposed PCSs would operate only during the daytime hours. During the daytime hours, noise would be associated with the operation of the inverters, which would be located within the enclosure, the transformer, exhaust fans, and HVAC systems. As noted in **Table 12**, combined operational noise levels associated with each PCS would be approximately 70 dBA L_{eq} at 10 feet. During the nighttime hours, operational noise levels would be limited to non-load noise generated by the transformers, which typically average approximately 55 dBA L_{eq} at 10 feet, or less. Based on these noise levels the highest predicted noise levels at the nearest residential dwellings would be approximately 8 dBA L_{eq}, or less, under full-load daytime conditions with all equipment operating. Although actual noise levels may vary somewhat, depending on final design, operation of the proposed PCSs would not result in a detectable increase in ambient noise levels at the nearest residential land use, nor would predicted operational noise levels exceed the County's exterior daytime or nighttime noise standards of 50 and 45 dBA L_{eq}, respectively. However, the location of the PCSs within each of the proposed solar farm lots has not yet been identified. Depending on the equipment installed and the location of the PCS units, operational noise levels at the boundary of the solar farm complex could potentially exceed the County's property line noise standard of 75 dBA L_{eq}.

Electrical Transmission Lines

One of the phenomena associated with high-voltage transmission lines, is corona discharge. Corona is the electrical breakdown of the air into charged particles, which may result in audible noise. During corona activity, transmission lines can generate a small amount of sound energy. This audible noise can increase during high humidity weather conditions, when water drops may collect on the surface of the conductors and increase corona activity. Audible noise generated by corona discharge is typically described as a crackling or humming sound. Corona discharge is typically associated with transmission lines rated at 230 kV and above. For lines rated less than 230 kV, the conductor size is typically of sufficient diameter so that little or no corona activity would exist under most operating conditions. For example, audible corona noise levels for a typical 230 kV line is about 25 dBA at locations directly below or near the power line corridor.

The proposed project would include construction of approximately three miles of new IID 92 kV transmission line for the interconnection of the new IID switch station to the existing Anza Substation located east of the project site on the south side of SR-78. Approximately 0.75 miles of new 92 kV transmission line would be constructed on the project site. Given the low power rating of the proposed transmission line, audible noise associated with corona discharge along the power line corridor would be minimal (i.e., less than 25 dBA L_{eq}), which would not exceed applicable County noise standards nor result in a detectable increase in ambient noise levels at the nearest existing residences.

Horizontal Single-Axis & Dual-Axis Tracker Systems

Noise generated by the HSAT and DAT systems would be associated with small electrically-powered motors, which would be used to orient the solar panels to the sun's position. The tracking system motors would operate intermittently throughout the daytime hours.

Noise levels generated by the tracking systems average approximately 48 dBA at 50 feet. Based on this noise level and assuming up to 6 motors operating simultaneously, the resultant combined noise level would be 37 dBA at approximately 400 feet (Kern County 2010). Based on these same assumptions, predicted operational noise levels at the nearest residential land use would be approximately 7 dBA Leq, or less, and would not result in a detectable increase in

ambient noise levels. Predicted operational noise levels at the project site property line would be approximately 65 dBA L_{eq}, or less, and would not exceed applicable County noise standards.

Onsite Maintenance & Security Activities

Onsite maintenance activities would also generate periodic noise levels. Such activities may include occasional washing/cleaning of solar panels, solar panels repairs, and security patrols. The highest noise levels would be associated with the cleaning and repair of the solar panels, which may involve the intermittent use of portable equipment, such as power washers, compressors and portable generators. Small portable equipment typically generates noise levels of approximately 70 dBA, or less, at 50 feet (FTA 2006). Based on this noise level predicted noise levels at the nearest residential dwellings would be approximately 22 dBA L_{eq}, or less. As a result, operation of the proposed PCSs would not result in a significant increase in daytime ambient noise levels at the nearest residential land use, nor exceed the County's exterior daytime or nighttime noise standards of 50 and 45 dBA L_{eq}, respectively. However, activities occurring during the nighttime hours could potentially be detectable at the nearest residential land uses.

The operation of onsite motor vehicles for maintenance and security purposes would also generate intermittent noise. Onsite vehicles used for routine maintenance and security patrols would generate intermittent noise levels of approximately 65 dBA L_{max} at 50 feet. However, vehicle traffic in any one location would be of short duration, would occur intermittently. The highest onsite noise levels associated with onsite vehicle use would be anticipated to occur along the main site access road. Based on the traffic analysis prepared for this project, operational vehicle traffic would total approximately 20 vehicles per day. Based on this estimate, the onsite vehicle traffic would generate noise levels of approximately 32 dBA CNEL/L_{dn} at 50 feet. Predicted onsite vehicle traffic noise levels at the nearest residence would be less than 5 dBA CNEL/L_{dn} and would not result in a detectable increase in ambient noise levels.

Other Potential Noise Sources

Other potential noise sources at the proposed project site, including wind noise, would be minor. Wind noise generally occurs due to vibrations generated as air moves around and/or over objects, low pressure areas, and small opening between materials. The vibrations generated, particularly during high wind conditions, may result in noise levels that are detectable to the human ear.

A literature search was conducted by AMBIENT Air Quality & Noise Consulting. Documents reviewed as part of the literature search are identified in **Appendix B**. No reported instances or potential noise-related impacts attributable to wind-generated noise from photovoltaic systems or solar farms were identified. In addition to the literature search, noise surveys were also conducted by AMBIENT Air Quality & Noise Consulting at the California Valley Solar Ranch located in San Luis Obispo County, which employs similar solar technology involving the use of single-axis tracking technology. The surveys were conducted under varying meteorological and wind conditions taking into account varying wind directions and solar panel orientations. Based on the surveys conducted, no detectable wind noise was identified associated with the solar facility. The results of the noise surveys are included in **Appendix C**.

Impact Summary

Noise generated by project operations would be predominantly associated with the operation of the proposed onsite substation and power conversion stations. The design of these project components has not yet been finalized. Depending on the location, number and type of

equipment installed, operational noise levels could potentially exceed the County's property line noise standard of 75 dBA L_{eq}. In the event that maintenance activities were to occur during the nighttime hours, detectable increases in ambient noise levels at the nearest residential land uses could potentially occur. Noise generated by other onsite sources, including the HSAT and DAT systems, electrical transmission lines, and onsite vehicle operations would not be projected to exceed applicable noise standards, nor result in a detectable increase in ambient noise levels at the nearest existing noise-sensitive receptors. Noise generated by onsite substations, power conversion stations and nighttime maintenance activities would be considered to have a **potentially significant** impact.

Mitigation Measure Noise-2

The following mitigation measures shall be implemented:

a. *Operational maintenance activities involving the use of noise-generating equipment (e.g., portable generators, compressors, pneumatic tools, etc.) shall be prohibited between the hours of 10:00 p.m. and 7:00 a.m., unless authorized by County of Imperial Planning and Development Services staff.*

b. *The proposed onsite substations and power conversion stations shall be designed to comply with the County of Imperial exterior noise standard for "General Industrial" land uses of 75 dBA L_{eq} measured at the project site property lines.*

c. *Within 30 days of start of project operations (or within a time frame agreed to by County of Imperial Planning and Development Services staff), noise monitoring surveys shall be completed for the purpose of documenting compliance with County of Imperial noise standard of 75 dBA L_{eq}. The noise monitoring surveys shall be conducted by an individual with expertise in conducting acoustical assessments. In the event that operational noise levels exceed the noise standard, noise-reduction measures shall be implemented sufficient to reduce operational noise levels to within acceptable levels. Written documentation of all noise monitoring surveys and any corrective measures implemented shall be provided to County of Imperial Planning and Development Services staff upon completion.*

Significance After Mitigation

With mitigation, operational noise levels associated with onsite substations and PCSs would be required to comply with the County of Imperial exterior noise standard. Nighttime noise-generating maintenance activities would be prohibited. With mitigation, operational noise levels would be reduced to a **less than significant** level.

IMPACT 4: ***Exposure to Groundborne Vibration****. Ground-borne vibration levels associated with short-term construction and long-term operational activities would not exceed applicable groundborne vibration criterion at nearby land uses. This impact would be* ***less than significant.***

Ground vibration spreads through the ground and diminishes in strength with distance. The effects of ground vibration can vary from no perceptible effects at the lowest levels, low rumbling sounds and detectable vibrations at moderate levels, and slight damage to nearby structures at the highest levels. At the highest levels of vibration, damage to structures is primarily architectural (e.g., loosening and cracking of plaster or stucco coatings) and rarely result in structural damage. For most structures, a peak particle velocity (ppv) threshold of 0.5 inches per second (in/sec) is sufficient to avoid structure damage, with the exception of fragile historic structures or ruins. For the protection of fragile, historic, and residential structures, the California

Department of Transportation recommends a more conservative threshold of 0.2 inches per second ppv. This same threshold would represent the level at which vibrations would be potentially annoying to people in buildings (FTA 2006, Caltrans 2002).

Long-term operational activities associated with the proposed project would not involve the use of any equipment or processes that would result in potentially significant levels of ground vibration. Increases in groundborne vibration levels attributable to the proposed project would be primarily associated with short-term construction-related activities. Construction activities associated with the proposed project would not be anticipated to require the use of equipment or processes that would generate substantial ground vibration. Given the distance to the nearest land uses (i.e., approximately 4,500 feet or greater), onsite construction activities would not result in excessive groundborne vibration levels that would adversely affect nearby land uses. As a result, this impact would be considered **less than significant**.

CUMULATIVE SETTING

The geographic extent of the cumulative setting for noise consists of the project area and the surrounding areas within the County within approximately 1 mile of the project site. No major stationary sources of noise have been identified in the project area or within approximately one mile of the project site. The primary factor for cumulative noise impact analysis is, therefore, the consideration of future traffic noise levels along SR-78.

CUMULATIVE IMPACTS & MITIGATION MEASURES

IMPACT 6: ***Contribution to Cumulative Noise Levels****. Long-term operation of the proposed project would not result in a substantial contribution to cumulative noise levels. This impact would be considered* ***less than significant.***

The project's contribution to the cumulative traffic noise levels along SR-78 was determined by comparing projected traffic noise conditions for future cumulative year 2025, with and without the contribution of project-generated vehicle traffic. Predicted increases in future cumulative traffic noise levels along primarily affected roadways are summarized in **Table 13**. As depicted, the contribution of project-generated vehicle traffic not would result in cumulatively considerable increase in traffic noise levels along SR-78. This impact would be considered **less than significant**.

Table 13
Predicted Increases in Traffic Noise Levels
Cumulative Year 2025 Conditions

Roadway	CNEL/L_{dn} at 50 Feet from Near-Travel-Lane Centerline[1]		Predicted Increase	Substantial Increase?[2]
	Without Proposed Project	With Proposed Project		
SR-78	73.34	73.36	0.02	*No*

1. *Traffic noise levels were calculated using the FHWA roadway noise prediction model for year 2025 conditions, based on data obtained from the traffic analysis prepared for this project (CRA 2013).*
2. *For purposes of this analysis, a substantial increase in noise levels is defined as an increase of 5.0, or greater, where the noise levels, without project implementation, are less than the County's "normally acceptable" noise standard. Where the noise level, without project implementation, equals or exceeds applicable noise standards, an increase of 3.0 dBA, or greater, would be considered a substantial increase.*

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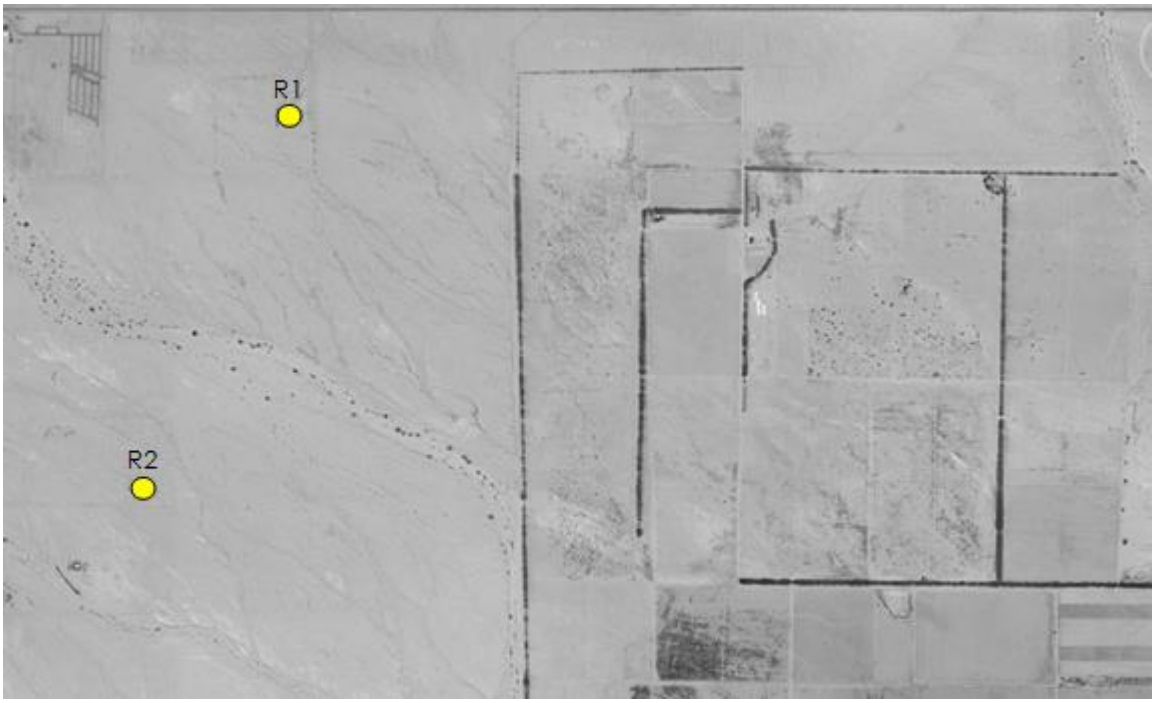
APPENDIX A

NOISE MODELING

MODELED RECEPTOR LOCATIONS –CONSTRUCTION ACTIVITIES AND OPERATIONAL STATIONARY SOURCES



SHORT-TERM CONSTRUCTION
Attenuation Rate: 6 dB/Doubling of Distance
Excess Attenuation: 1.5 dB/1,000 feet

Construction Activity	Predicted Noise Level at 50 feet		Distance to Northwest Receptor (R1)		Noise Level (dBA Leq) at Northwest Receptor (R1)	
	Lmax	Leq	1hr	8hr	1hr	8hr
Water Well Drilling	79	77	7500	-	9	9
New Access Road Construction	85	85	4125	-	41	41
Internal Road Construction	85	83	5500	6300	34	34
Demolition	82	80	4500	-	34	34
Site Preparation	82	81	6400	8000	30	25
Grading	85	86	6400	8000	34	30
Above Combined:					**43**	**42**
Switch Station Construction	85	83	5625	6000	34	33
Transmission Line Construction	82	78	4125	-	34	34
Solar Panel Installation without Post Driving	85	84	6400	6900	31	30
Solar Panel Post Driving	89	87	6400	6900	35	34
Building Construction	81	78	6400	-	26	26
Substation Construction	81	78	6200	6200	27	27
Gen Tie Line	82	79	5625	-	30	30
Above Combined:					**41**	**40**

Construction Activity	Predicted Noise Level at 50 feet		Distance to Southwest Receptor (R2)		Noise Level (dBA Leq) at Southwest Receptor (R2)	
	Lmax	Leq	1hr	8hr	1hr	8hr
Water Well Drilling	79	77	8600	-	12	12
New Access Road Construction	85	85	7500	-	30	30
Internal Road Construction	85	83	5200	5200	35	35
Demolition	82	80	7000	-	27	27
Site Preparation	82	81	5400	7200	32	27
Grading	85	86	5400	7200	36	32
Above Combined:					**41**	**38**
Switch Station Construction	85	83	8880	9200	25	24
Transmission Line Construction	82	78	7500	-	23	23
Solar Panel Installation without Post Driving	85	84	5400	5900	35	34
Solar Panel Post Driving	89	87	5400	5900	38	37
Building Construction	81	78	5400	-	29	29
Substation Construction	81	78	8700	8700	20	20
Gen Tie Line	82	79	5500	-	30	30
Above Combined:					**41**	**40**

LONG-TERM OPERATIONS

Attenuation Rate: 6 dB/Doubling of Distance

Excess Attenuation: 1.5 dB/1,000 feet

Source	Distance (feet)	Noise Level (dBA Leq)
Substation Transformer Noise Levels [1]	3	70
Power Conversion Stations [2]	10	55-70
Transmission Line Corona Discharge [3]	25	25
Horizontal Single-Axis Tracker System [4]	400	37
Maintenance Equipment	50	70

1. *Substation transformersnoise based on data obtained from the Panoche Valley Solar Farm Project Draft Environmental Impact Report (San Benito County 2010)*
2. *PCS noise levels are based on non-load (nighttime) and load (daytime) conditions. Daytime (load) conditions are based on combined operational noise levels assuming operation of two inverters within an enclosed structure, one transformer mounted at the exterior of the structure, exterior mounted HVAC system and an exhaust fan (San Luis Obispo County 2011). Nighttime transformer noise levels assume minimum reduction of 2 dB for non-load conditions. Actual non-load noise levels may be lower.*

Equipment	*Noise Rating (dBA) at Source*	
	Load	*Non-Load*
Two 500-630 KW Inverters (Enclosed)	*73*	*N/A*
Transformer	*57*	*55*
Exhaust Fan	*71*	*N/A*
HVAC System	*79*	*N/A*
Combined Noise Level at 10 feet:	*70*	*55*

3. *Transmission Line Corona Discharge is conservatively based on a 230 kV line. Corona discharge noise generated by lower-rated lines would be less.*
4. *HSAT noise levels based on T20 Tracker System. Includes the simultaneous operation of 6 HSAT motors.(ICF 2010)*

Source	Distance to Nearest Receptor (feet)	Noise Level (dBA Leq) at Nearest Receptor
Substation Transformer Noise Levels [1]	5,600	Negligible (<5 dB)
Power Conversion Stations [2]	5,200	8
Transmission Line Corona Discharge [3]	4,250	Negligible (<5 dB)
Horizontal Single-Axis Tracker System [4]	5,200	7
Maintenance Equipment	5,200	22

TRAFFIC NOISE MODELING

TRAFFIC DISTRIBUTION

LDA/T	66.0
MDT	8.0
HDT	26.0
TOTAL	100.0

MEASURED:	63
MODELED:	64
KFACTOR:	0

EXISTING

ADT: 1000 SPEED: 55 ACTIVE HALF WIDTH (FT): 6
CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE = 64.26
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL 65 CNEL 60 CNEL 55 CNEL
0.0 0.0 106.8 229.8

EXISTING PLUS SHORT-TERM CONSTRUCTION

ADT: 1328 SPEED: 55 ACTIVE HALF WIDTH (FT): 6
SITE CHARACTERISTICS: SOFT GRADE (PERCENT): .5
CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE = 65.50
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL 65 CNEL 60 CNEL 55 CNEL
0.0 60.1 128.9 277.5
**Assumes 300 worker trips, 14 vendor trips, and 14 haul trucks.*

EXISTING PLUS PROJECT OPERATIONS

ADT: 1020 SPEED: 55 ACTIVE HALF WIDTH (FT): 6
CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE = 64.35
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL 65 CNEL 60 CNEL 55 CNEL
0.0 50.7 108.6 233.7

2015 NO PROJECT OPERATIONS

ADT: 1050 SPEED: 55 ACTIVE HALF WIDTH (FT): 6
CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE = 64.47
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL 65 CNEL 60 CNEL 55 CNEL
0.0 51.7 110.7 238.2

2015 PLUS PROJECT OPERATIONS

ADT: 1070 SPEED: 55 ACTIVE HALF WIDTH (FT): 6
CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE = 64.55
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL 65 CNEL 60 CNEL 55 CNEL
0.0 52.3 112.1 241.2

2025 NO PROJECT OPERATIONS

ADT: 8100 SPEED: 55 ACTIVE HALF WIDTH (FT): 6
CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE = 73.34
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL 65 CNEL 60 CNEL 55 CNEL
93.2 200.4 431.6 929.5

2025 PLUS PROJECT OPERATIONS

ADT: 8120 SPEED: 55 ACTIVE HALF WIDTH (FT): 6
CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE = 73.36
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL 65 CNEL 60 CNEL 55 CNEL
93.4 200.8 432.3 931.1

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APPENDIX B

LITERATURE SEARCH

The following documents were evaluated for the purpose of identifying potential wind-generated noise impacts associated with photovoltaic solar farms. No reports of potenital wind noise or potential for wind-generated noise asosciate with photovoltaic solar farms were identified.

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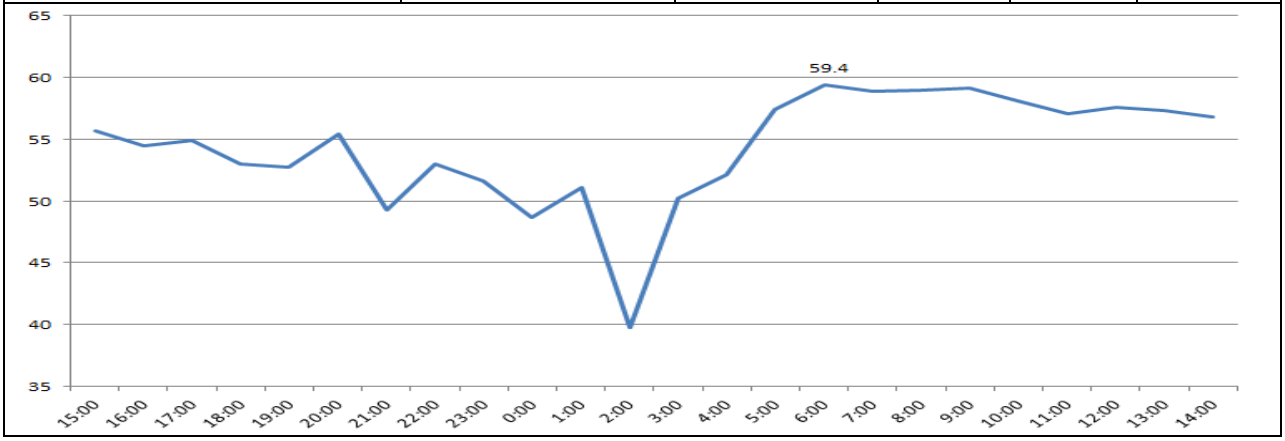
APPENDIX C

SUMMARY OF NOISE MONITORING SURVEYS

Summary of Measured Ambient Noise Levels in the Project Area

Date:	9/18/2013 – 9/19/2013
Equipment:	Larson Davis Laboratories, Type I, Model 820 integrating sound-level meter
Calibration:	Prior to and upon completion of noise measurement surveys.
Met. Conditions:	Max:100F; 25%H; Wind Speed: 1-4 mph

Location	Monitoring Period		Noise Levels (dBA)		
	Start Date & Time	Duration	L_{eq}	L_{max}	CNEL
M1: Blu In Café, Approximately 50 feet from SR 78 Centerline	09/18/13, 13:30 p.m.	15 minutes	62.3	80.9	--
	09/19/13, 10:07 a.m.	18 minutes	62.7	81.6	--
M2: SR 78, Approximately 95 feet from Road Centerline	09/18/13, 15:30 p.m.	30 minutes	55.3	74.0	--
	09/19/13, 8:00 a.m.	60 minutes	59.1	78.1	--
	09/19/13, 9:00 a.m.	60 minutes	58.2	77.4	--
M3: SR 78, Approximately 85 feet from Road Centerline	09/19/13, 6:30 a.m.	15 minutes	59.2	77.8	--
	09/19/13, 10:40 a.m.	15 minutes	58.4	78.5	--
	09/18/13-09/19/13	24 hours	--	--	61



Summary of Wind Noise Surveys at California Valley Solar Ranch, San Luis Obispo County, CA

The following noise surveys were conducted for the sole purpose of documenting any detectable increases in ambient noise levels resulting from wind-generated noise at a representative solar facility.

Location: California Valley Solar Ranch, San Luis Obispo County, CA							
Solar PV Technology: Single Axis Tracking							
Observation Locations: Site Boundaries							
Date/Time	Observation Location in Relation to PV Panel Location	Wind Speed (mph)	Humidity/ Cloud Cover	Wind Direction	Solar Panel Orientation/Angle	Ambient Noise Level (dBA L_{eq}/L_{max})	Detectable Wind Noise from Solar Facility?
12/03/13; 1235-1245	S	Variable ~8-15 mph	60-65%, Overcast	NNW	West Facing, 0° (Flat)	34/40	None
12/03/13; 1255-1308	S	Variable ~8-15 mph	60-65%, Overcast	NNW	West Facing, ~20-25°	35/41	None
12/03/13; 1315-1325	W	Variable ~8-15 mph	60-65%, Overcast	WNW	West Facing, ~20-25°	35/41	None
12/03/13; 1330-1340	E	Variable ~8-15 mph	60-65%, Overcast	WNW	West Facing, 0° (Flat)	34/40	None
12/03/13; 1347-1356	SW	Variable ~8-15 mph	60-65%, Overcast	WNW	West Facing, ~25-30°	37/41	None
12/03/13; 1415-1423	S	Variable ~8-15 mph	60-65%, Overcast	WNW	West Facing, 0° (Flat)	33/38	None
12/10/13; 1330-1340	W	Variable ~5-10 mph	15%, Partly Cloudy	SW	West Facing, ~35-40°	34/39	None
12/10/13; 1345-1352	E	Variable ~5-10 mph	15%, Partly Cloudy	WSW	West Facing, ~40-45°	35/41	None
12/10/13; 1545-1555	S	Variable ~5-10 mph	15%, Partly Cloudy	SW	West Facing, ~45°	34/38	None
Surveys were conducted using a Larson Davis Laboratories, Type I, Model 820 integrating sound-level meter, placed at a height of approximately 4.5 feet above ground level.							