APPENDIX F
NOISE STUDY

NOISE ASSESSMENT

Campo Verde Solar
County of Imperial

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GLOSSARY OF TERMS

Sound Pressure Level (SPL): a ratio of one sound pressure to a reference pressure (L_{ref}) of 20 µPa. Because of the dynamic range of the human ear, the ratio is calculated logarithmically by 20 log (L/L_{ref}).

A-weighted Sound Pressure Level (dBA): Some frequencies of noise are more noticeable than others. To compensate for this fact, different sound frequencies are weighted more.

Minimum Sound Level (L_{min}): Minimum SPL or the lowest SPL measured over the time interval using the A-weighted network and slow time weighting.

Maximum Sound Level (L_{max}): Maximum SPL or the highest SPL measured over the time interval the A-weighted network and slow time weighting.

Equivalent sound level (L_{eq}): the true equivalent sound level measured over the run time. Leq is the A-weighted steady sound level that contains the same total acoustical energy as the actual fluctuating sound level.

Day Night Sound Level (Ldn): Representing the Day/Night sound level, this measurement is a 24 –hour average sound level where 10 dB is added to all the readings that occur between 10 pm and 7 am. This is primarily used in community noise regulations where there is a 10 dB "Penalty" for night time noise. Typically Ldn is measured using A weighting.

Community Noise Exposure Level (CNEL): The accumulated exposure to sound measured in a 24-hour sampling interval and artificially boosted during certain hours. For CNEL, samples taken between 7 pm and 10 pm are boosted by 5 dB; samples taken between 10 pm and 7 am are boosted by 10 dB.

Octave Band: An octave band is defined as a frequency band whose upper band-edge frequency is twice the lower band frequency.

Third-Octave Band: A third-octave band is defined as a frequency band whose upper band-edge frequency is 1.26 times the lower band frequency.

Response Time (F,S,I): The response time is a standardized exponential time weighting of the input signal according to fast (F), slow (S) or impulse (I) time response relationships. Time response can be described with a time constant. The time constants for fast, slow and impulse responses are 1.0 seconds, 0.125 seconds and 0.35 milliseconds, respectively.

Corona Affect (Corona): Phenomenon associated with the electrical ionization of the air that occurs near the surface of the energized conductor and suspension hardware due to very high electric field strength. This is audible power line noise that is generated from electric Corona discharge, which is usually experienced as a random crackling or hissing sound.

EXECUTIVE SUMMARY

This noise study has been completed to determine the noise impacts associated with the development of the proposed Campo Verde Solar Energy Project. The Project site includes several parcels which total approximately 1,990 acres of private lands that have been used for agriculture. Construction of the project includes site preparation, foundation construction, erection of major equipment and structures, installation of electrical systems, control systems, and start-up/testing. These construction activities are expected to require approximately 12 to 24 months starting late 2012. The construction workforce is expected to reach a peak during month number seven (7) anticipated to occur during the 1st quarter of 2013 with a peak of up to 325 daily construction workers and 50 daily truck deliveries

During operations and maintenance, the project will primarily operate during daylight hours and will require (on average) less than 10 fulltime personnel for operations and maintenance. During a typical year, the project will require up to 10 daily water trucks for panel washing over approximately 15 business days; however, the washing frequency is estimated from one to four times a year.

Based on the empirical data, the manufactures specifications and the distances to the property lines the unshielded noise levels and cumulative noise levels from the proposed transformers/inverters, array tracker motors and the proposed Substation were found to be below the County's most restrictive nighttime property line standard of 45 dBA. No impacts are anticipated and no mitigation is required.

The measured Corona Affect noise levels were found to be below the County's most restrictive nighttime standard of 45 dBA. This was also consistent with previously measured and modeled noise levels on transmission line Projects throughout California operating at full capacity. No direct or cumulative impacts from the Corona are anticipated from the new transmission lines associated with the Project.

At a distance as close as 140 feet the point source noise attenuation from the grading activities and the nearest property line is -8.9 dBA. This would result in an anticipated worst case eight-hour average combined noise level of less than 75 dBA at the property line. During the installation of the PV panels at a distance of 130 feet would result in a noise level of less than 75 dBA. The mass grading and PV installation equipment is anticipated to average more than 500 feet from the nearest property line. Given this and the spatial separation of the equipment over the large site area, the noise levels of the grading and PV panel installation are anticipated to comply with the County of Imperial's 75 dBA standard at all Project property lines of each Phase and no impacts are anticipated.

Cumulatively, the project would not be expected to incrementally add to the noise levels during construction to any "reasonably foreseeable" projects as they are either not going to coincide with the project with respect to construction phasing or there prescribe worst-case construction noise levels would be separated by enough distance and not cumulatively add to one another.

The Project does create a short-term noise increase during the peak construction of more than 5 dBA CNEL in the "normally acceptable" category on one roadway segments. No sensitive receptors exist along this roadway segments and therefore sensitive receptors would be impacted by construction traffic noise due to the proposed Project's construction traffic and no mitigation would be required.

Traffic related short-term noise increases during the peak construction of the Project and Cumulative Projects has the potential to increase noise levels more than the acceptable limits on up to three roadway segments. Based on the list of cumulative projects, nearly all of the "reasonably foreseeable" projects in the area that affect the roadway noise levels are all photovoltaic projects. Thus, the traffic generation is due to short term construction traffic volumes. However, cumulatively, the project would not be expected to incrementally add to the roadway traffic noise levels to any "reasonably foreseeable" projects. This is because it is unlikely that the peak traffic from the construction of any other solar projects in the immediate area would coincide with the peak traffic period of the Project (a one-month period in the first quarter of 2013). Therefore, no impacts are anticipated during the proposed Project's construction traffic and no mitigation would be required.

During the operations of the Project it is estimated that the Project would generate less than 50 trips per day and no noise impacts would occur. Therefore, the Project's operational traffic will not result in a potentially significant direct or cumulative noise impact at existing or future noise sensitive land uses.

1.0 INTRODUCTION

The purpose of this Noise study is to determine potential noise impacts (if any) that may be created during the construction or operation of the proposed Campo Verde Solar Project. The Project site is spread out and encompasses various agricultural lots totaling 1,990 acres. The Project is within the County of Imperial west of the City of Calexico. Additionally, portions of the Gen-Tie line would traverse through federal lands under the control of the Bureau of Land Management (BLM.)

1.1 Project Location

The Campo Verde Solar Project is a proposed solar photovoltaic (PV) energy-generating facility located in Imperial County approximately 7 miles southwest of the community of El Centro, California. The Project Site is south of I-8 and west of Drew Road and northeast of Westside Main Canal. The general location of the Project is shown below in Figure 1-A on Page 3 of this report. The Project site includes several parcels which total approximately 1,990 acres of private lands that have been used for agriculture. A Project overview and layout is provided in Figure 1-B below.

1.2 Project Description

The Campo Verde Solar Project is being developed to sell its electricity and all renewable and environmental attributes to an electric utility purchaser under a long-term contract to help meet California RPS goals. The applicant has a long-term Power Purchase Agreement (PPA) with San Diego Gas and Electric (SDG&E) to purchase output from the Project.

The Campo Verde Solar Project would use First Solar PV modules that are generally non-reflective and convert sunlight into direct current (DC) electricity. The DC output of multiple rows of PV modules is collected through one or more combiner boxes and directed to an inverter that converts the DC electricity to alternating current (AC) electricity. From the inverter, the generated energy flows to a transformer where it is stepped up to distribution level voltage (approximately 34.5 kV). Multiple transformers are connected in parallel via 34.5 kV lines to the Project substation, where the power will be stepped up to 230 kV.

The use of solar PV technology is consistent with the definition of an "eligible renewable energy resource" in Section 399.12 of the California Public Utilities Code and the definition of "in-state renewable electricity generation facility" in Section 25741 of the California Public Resources Code.

The PV modules will produce the electricity generated by the Project by converting sunlight directly into electricity. The major equipment in the solar field includes the following:

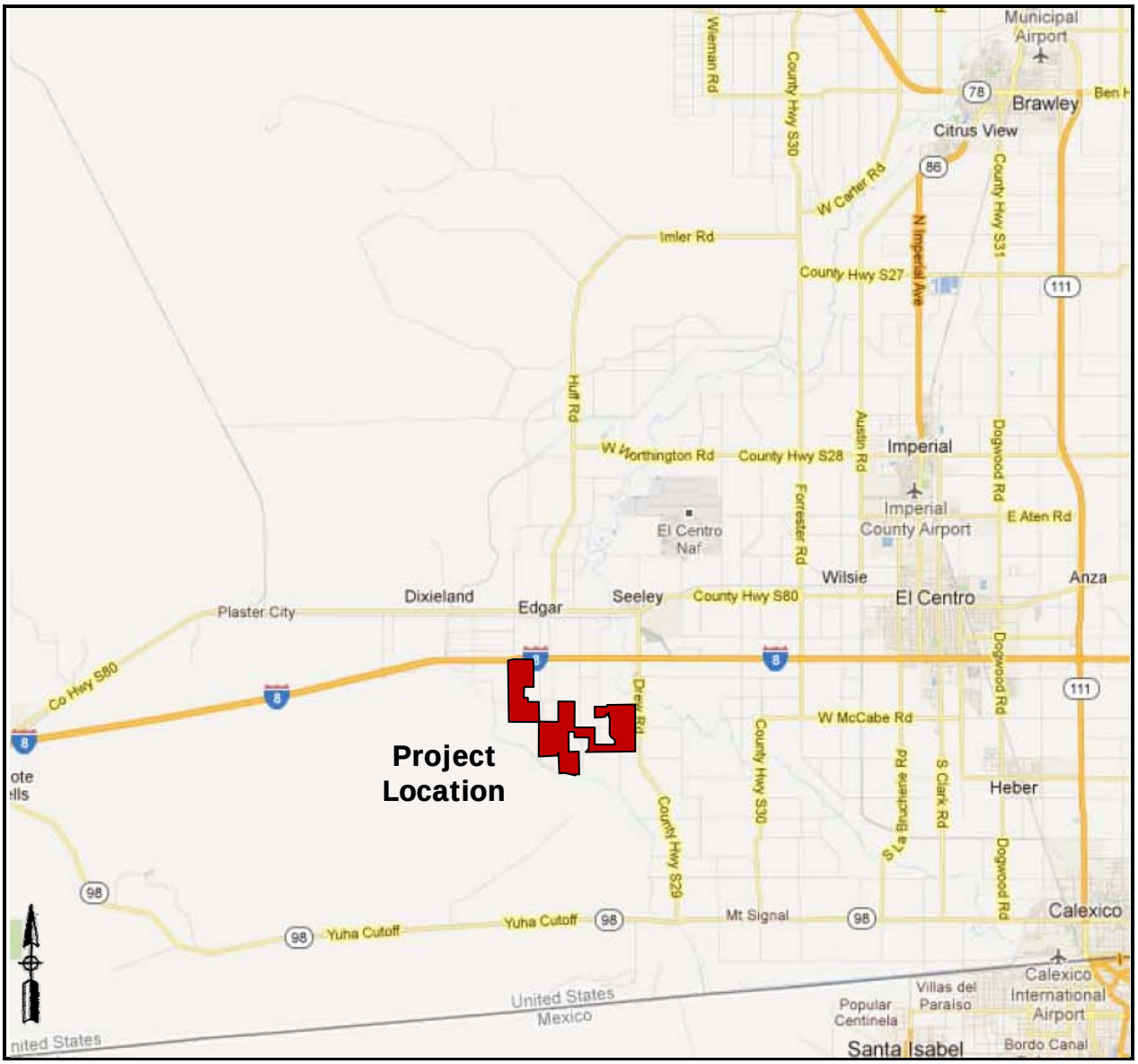
- Power Conversion Stations (PCS)
- 1000V DC collection system comprised of underground cabling and combiner boxes
- Medium voltage (12 kV and/or 34.5 kV) collection system
- Photovoltaic Combining Switchgear (PVCS)
- A Project Substation with 34.5 kV to 230kV/220kV step-up transformer(s) and switchyard
- Meteorological stations
- O&M buildings with parking and other associated facilities
- Telecommunications equipment

Construction of the project includes site preparation, foundation construction, erection of major equipment and structures, installation of electrical systems, control systems, and start-up/testing. These construction activities are expected to require approximately 12 to 24 months. The applicant anticipates construction to start in the second quarter of 2012 following a Conditional Use Permit (CUP) approval. According to the applicant, the construction workforce is expected to reach a peak during month number seven (7) anticipated to occur during the 1st quarter of 2013 with a peak of up to 325 daily vehicles for construction workers and 50 daily truck deliveries

During operations and maintenance, the project will primarily operate during daylight hours and will require (on average) less than 10 fulltime personnel for operations and maintenance. Operations personnel include employees running the facility, security, and any other work associated with the operations. Maintenance personnel include employees addressing maintenance on a daily basis. On average, the operations and maintenance trip generation is estimated at about 20 ADT with approximately 10 AM and 10 PM peak hour trips. During a typical year, the project will require up to 10 daily water trucks for panel washing over approximately 15 business days; however, the washing frequency is estimated from one to four times a year. During the washing period, the total project daily traffic may increase to 40 or 50 ADT over a 15 business day period.

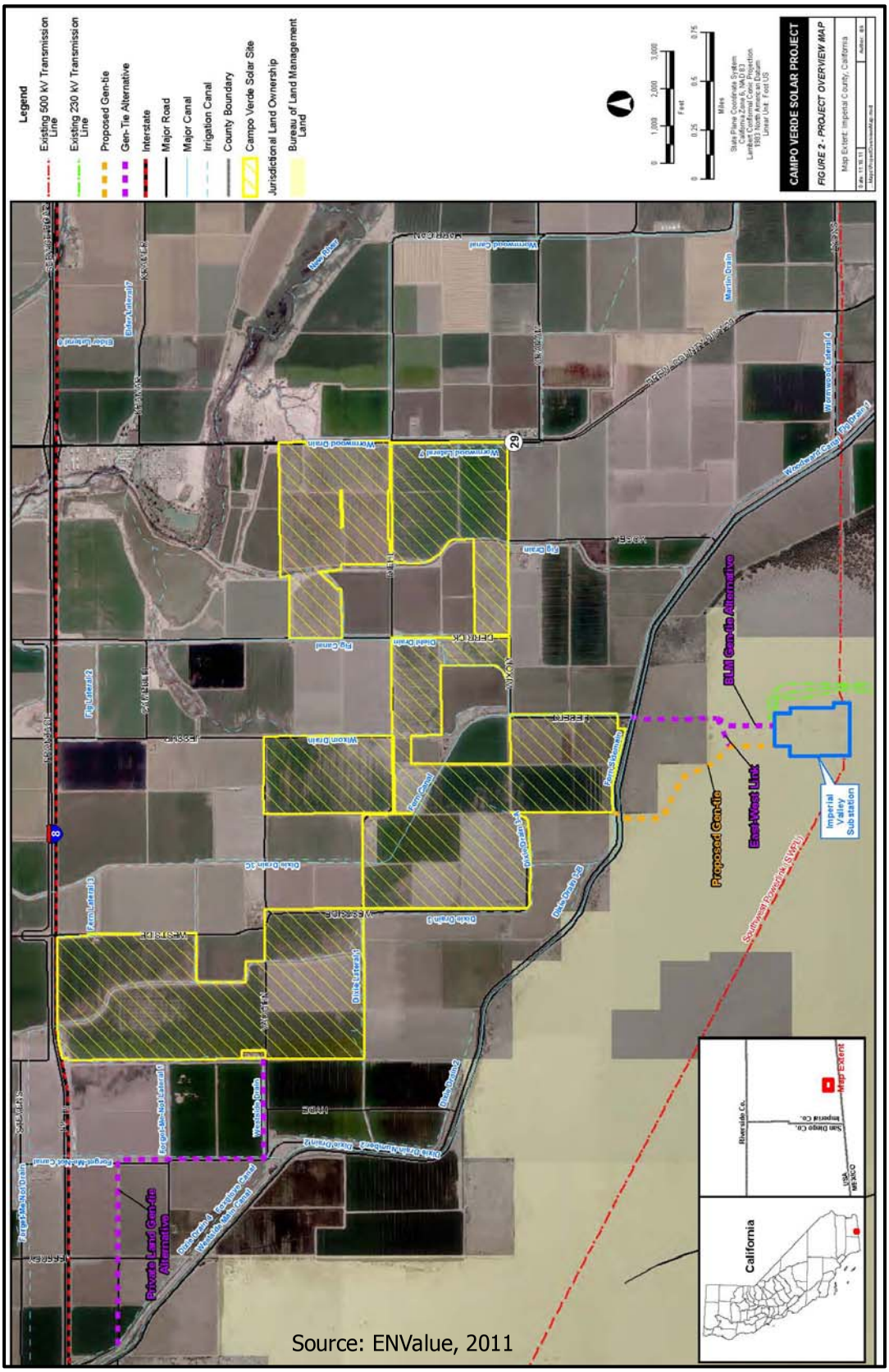
Since the operations and maintenance traffic generation is significantly less than the construction, the higher and more conservative construction trip generation was used to determine potential project impacts. In other words, the construction phase was used for the traffic analysis because it is calculated to generate significantly higher traffic than the project operations and maintenance phase when the Project is operational.

Figure 1-A: Project Vicinity Map and Project Footprint



Source: Google Maps, 12/11

Figure 1-B: Project Area Overview Map



1.3 Methodology and Equipment

Noise is defined as unwanted or annoying sound which interferes with or disrupts normal activities. Exposure to high noise levels has been demonstrated to cause hearing loss. The individual human response to environmental noise is based on the sensitivity of that individual, the type of noise that occurs and when the noise occurs.

Sound is measured on a logarithmic scale consisting of sound pressure levels known as a decibel (dB). The sounds heard by humans typically do not consist of a single frequency but of a broadband of frequencies having different sound pressure levels. The method for evaluating all the frequencies of the sound is to apply an A-weighting to reflect how the human ear responds to the different sound levels at different frequencies. The A-weighted sound level adequately describes the instantaneous noise whereas the equivalent sound level depicted as Leq represents a steady sound level containing the same total acoustical energy as the actual fluctuating sound level over a given time interval.

The Community Noise Equivalent Level (CNEL) is the 24 hour A-weighted average for sound, with corrections for evening and nighttime hours. The corrections require an addition of 5 decibels to sound levels in the evening hours between 7 p.m. and 10 p.m. and an addition of 10 decibels to sound levels at nighttime hours between 10 p.m. and 7 a.m. These additions are made to account for the increased sensitivity during the evening and nighttime hours when sound appears louder.

Because mobile/traffic noise levels are calculated on a logarithmic scale, a doubling of the traffic noise or acoustical energy results in a noise level increase of 3 dBA. Therefore the doubling of the traffic volume, without changing the vehicle speeds or mix ratio, results in a noise increase of 3 dBA. Mobile noise levels radiate in an almost oblique fashion from the source and drop off at a rate of 3 dBA for each doubling of distance under hard site conditions and at a rate of 4.5 dBA for soft site conditions. Hard site conditions consist of concrete, asphalt and hard pack dirt while soft site conditions exist in areas having slight grade changes, landscaped areas and vegetation. On the other hand, fixed or point sources radiate outward uniformly as it travels away from the source. Point Source sound levels attenuate or drop off at a rate of 6 dBA for each doubling of distance.

The most effective noise reduction methods consist of controlling the noise at the source, blocking the noise transmission with barriers or relocating the receiver. Any or all of these methods could be required to reduce noise levels to an acceptable level.

1.3.1 Corona Affect Noise

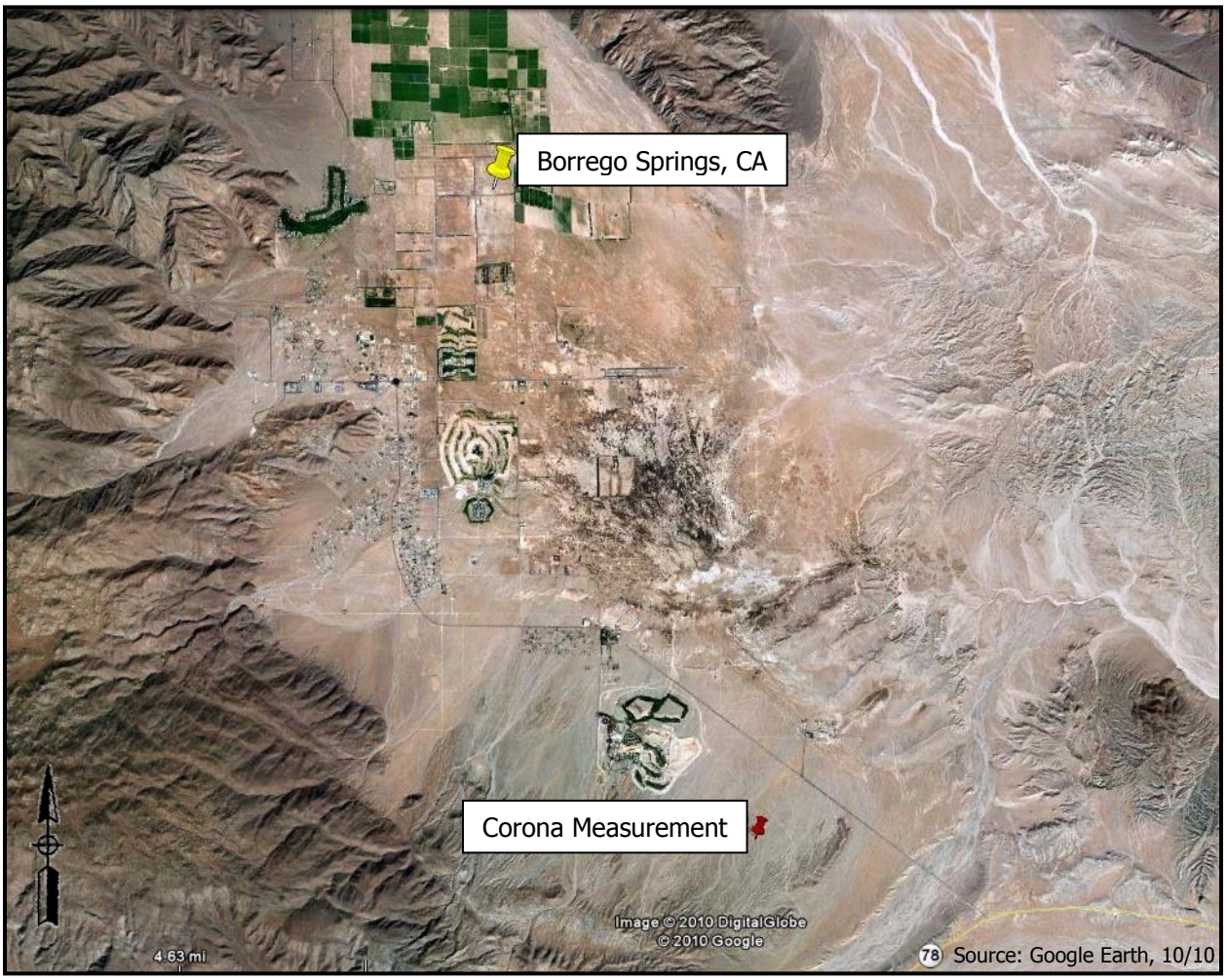
To assess potential noise impacts from the Corona Affect, measurements were taken along an existing San Diego Gas & Electric (SDG&E) transmission line located in the Borrego Springs area. The Corona Affect is a phenomenon associated with the electrical ionization of the air that occurs near the surface of the energized conductor and suspension hardware due to very high electric field strength. This is audible power line noise that is generated from electric Corona discharge, which is usually experienced as a random crackling or hissing sound. This was done to determine the local conditions and to establish a baseline for the Corona Affect of the proposed Gen-Tie transmission line. The noise measurements were conducted for a previous project by Ldn Consulting back in December 2009, between approximately 9:30 a.m. and 10:00 a.m. in dry, calm and clear conditions. The sound levels for the proposed on-site equipment were taken from the manufacture's specifications. The noise measurement location is provided graphically in Figure 1-C, denoted as Corona Measurement.

Noise measurements of the Corona Affect were taken using a Larson-Davis Model LxT Type 1 precision sound level meter, programmed, in "slow" mode, to record noise levels in "A" weighted form. The LxT was set to record in the low range of -10 to 110 dBA. The sound level meter and microphone were mounted on a tripod, five feet above the ground and equipped with a windscreen during all measurements. The sound level meter was calibrated before and after the monitoring using a Larson-Davis calibrator, Model CAL 200. The noise measurement location was determined based on access and low ambient conditions to capture only the potential transmission line noise levels. The existing SDG&E transmission line measurements were taken mid-span between two power poles along an existing SDG&E easement located outside Borrego Springs, CA.

1.3.2 On-site Ambient Noise

To determine the existing noise environment and to assess potential noise impacts, measurements were taken at two locations on the project having a direct line of site to the adjacent roadways. This was done to determine the worst case conditions at the nearest proposed NSLU. The noise measurements were recorded on August 18, 2011 by Ldn Consulting between approximately 10:45 a.m. and 11:45 a.m. The noise monitoring locations are provided graphically in Figure 1-D. Noise measurements gathered at the Project site were taken using a Larson-Davis Model LxT Type 1 precision sound level meter, programmed, in "slow" mode, to record noise levels in "A" weighted form. The sound level meter and microphone were mounted on a tripod, five feet above the ground and equipped with a windscreen during all measurements. The sound level meter was calibrated before and after the monitoring using a Larson-Davis calibrator, Model CAL 200.

Figure 1-C: Corona Affect Noise Measurement Location



The noise measurement locations were determined based on site access and noise impact potential. Monitoring location 1 (M1) was located roughly 30-feet from Westside Road near the intersection of Vaughn Road. Monitoring location 2 (M2) was taken in the eastern portion of the site approximately 30-feet from Drew Road at the intersection of Diehl Road.

The results of the noise measurements are presented in Table 1-1 on the following Page. The noise measurements were monitored for a time period of 15 minutes each. The ambient Leq noise levels measured in the area of the project during the late morning and mid day were found to be between 50-55 dBA Leq on the western portion of the site and 90% (L90) the noise levels were 36-38 dBA. The existing noise levels in the project area consisted primarily of low traffic volumes along Drew Road and Westside Road and background noise from existing agricultural operations in the distances both on and adjacent to the site. The existing noise levels were found to be below County thresholds for all sensitive land uses.

Figure 1-D: Project Site Noise Measurement Locations

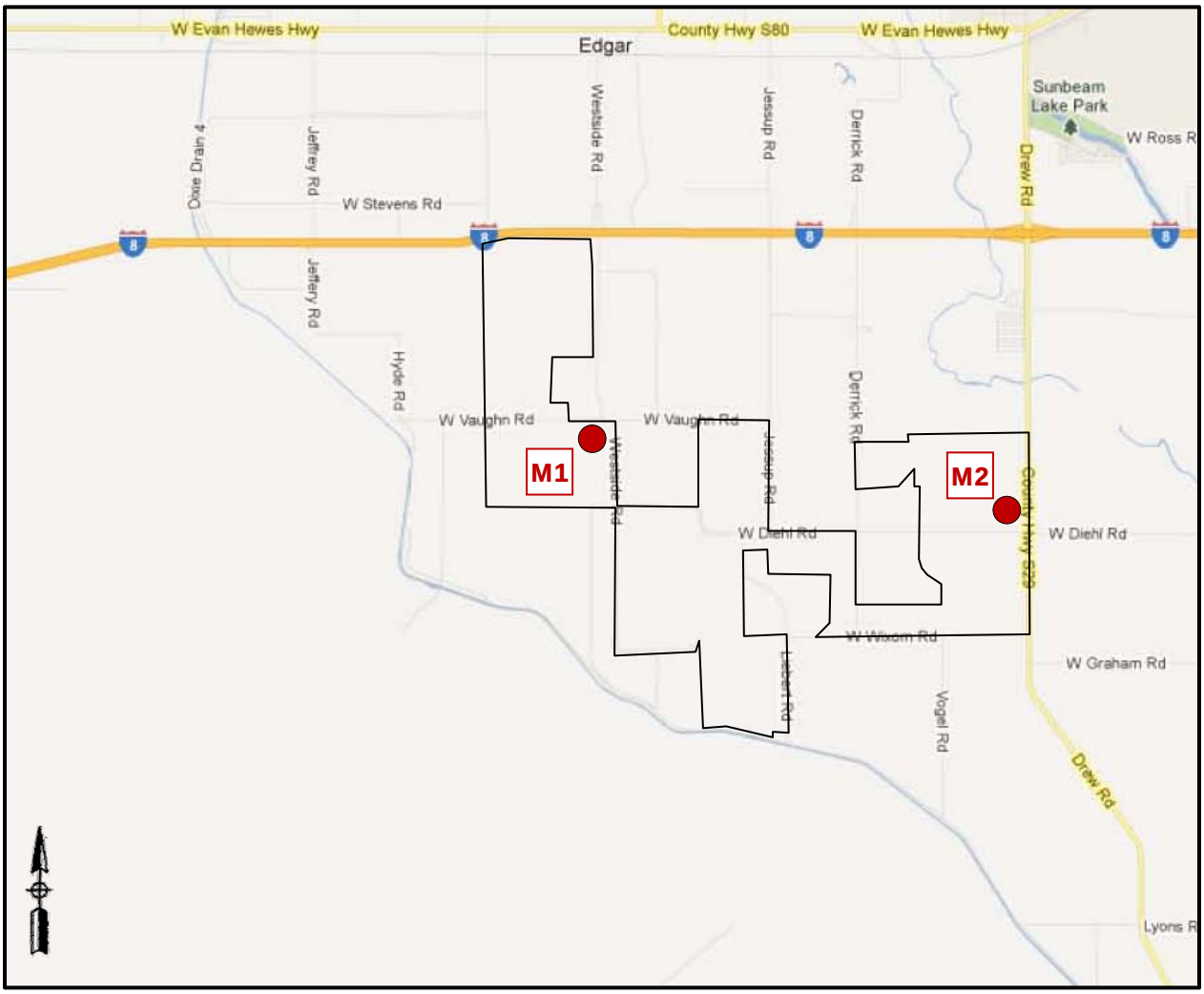


Table 1-1: Project Site Ambient Noise Levels

Location	Description	Time	Noise Levels (dBA)					
			Leq	Lmin	Lmax	L10	L50	L90
M1	Along Westside Road	10:45 a.m. – 11:00 a.m.	50.4	34.3	70.5	51.1	38.7	36.3
M2	Along Drew Road	11:30 a.m. – 11:45 a.m.	54.8	35.8	74.1	52.8	41.6	38.2
Source: Ldn Consulting, Inc. August 18, 2011								

2.0 SIGNIFICANCE CRITERIA

2.1 Operational Standards

The Property Line Noise Limits listed in Table 9 of the County's General Plan Noise Element and the County's Ordinance, Title 9, Division 7 (Noise Abatement and Control) Section 90702.00 Subsection A provides acceptable Sound level limits based on the property zoning. The applicable property line sound level limits are provided in Table 2-1 below and shall apply to noise generation from one property to an adjacent property. The 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 2-1: Property Line Noise Level Limits

Zone	Time	Applicable Limit One-hour Average Sound Level (Decibels)
Residential Zones	7 a.m. to 10 p.m.	50
	10 p.m. to 7 a.m.	45
Multi-residential Zones	7 a.m. to 10 p.m.	55
	10 p.m. to 7 a.m.	50
Commercial Zones	7 a.m. to 10 p.m.	60
	10 p.m. to 7 a.m.	55
Light Industrial/Industrial Park Zones	Anytime	70
General Industrial Zones	Anytime	75
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 dB L_{eq}. The sound level limit between two zoning districts (different land uses) shall be measured at the property line between the properties. Fixed-location public utility distribution or transmission facilities located on or adjacent to a property line shall be subject to the noise level limits of subsection A of this section, measured at or beyond six feet from the boundary of the easement upon which the equipment is located. This section does not apply to noise generated by helicopters at heliports or helistops authorized by a conditional use permit. This section does not apply to noise generated by standard agricultural field operating practices such as planting and harvesting of crops. The County of Imperial has a Right to Farm Ordinance (1031) which serves as recognition to agricultural practices to new development. Agricultural/industrial operations shall comply with the noise levels prescribed under the general industrial zones.		

Source: County of Imperial Ordinance, Title 9, Division 7 (Noise Abatement and Control)

These standards are intended to be enforced through the County's code enforcement program on the basis of complaints received from persons impacted by excessive noise. It must be acknowledged that a noise nuisance may occur even though an objective measurement with a sound level meter is not available. In such cases, the County may act to restrict disturbing, excessive, or offensive noise which causes discomfort or annoyance to reasonable persons of normal sensitivity residing in an area.

2.2 Construction Noise Standards

Based on the County of Imperial's Noise Element of the General Plan, 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 operation shall be limited to the hours of 7 a.m. to 7 p.m., Monday through Friday, and 9 a.m. to 5 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 a.m. and 5 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.

2.3 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.

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.

3.0 OPERATIONAL ACTIVITIES

3.1 Guidelines for the Determination of Significance

The County Ordinance, Title 9, Division 7 (Noise Abatement and Control) states it is unlawful for any person to make or cause any noise to the extent that the one-hour average sound level, at any point on or beyond the boundaries of their property exceeds the applicable limits provided above in Table 2-1. The Project and surrounding properties are zoned as A-2 - General Agriculture, A-2-R - General Agriculture, Rural Zone, and A-3 - Heavy Agriculture. Solar energy electrical generators, electrical power generating plants, substations, and facilities for the transmission of electrical energy are allowed as conditional uses in Agricultural zones. In keeping with the provisions of the zoning designation, the Applicant is seeking a Conditional Use Permit (CUP).

To be conservative, for the purposes of this analysis the most restrictive applicable sound limits identified in Section 90702.00 of the Noise Ordinance will be applied to accommodate the planning of not just existing but potential future residential uses that could be adjacent to the proposed Project. Section 90702.00 of the Noise Ordinance sets a sound level limit of 50 dBA Leq for daytime hours of 7 a.m. to 10 p.m. and 45 dBA Leq during the noise sensitive nighttime hours of 10 p.m. to 7 a.m. for residential noise sensitive land uses. Most of the proposed Project components will only operate during the daytime hours but a few may operate during nighttime or early morning hours and therefore the most restrictive and conservative approach is to apply the 45 dBA Leq nighttime standard at the property lines.

3.2 Potential Operational Noise Impacts

This section examines the potential stationary noise source impacts associated with the operation of the proposed Project. Specifically, noise levels from the proposed transformers, inverters, the substation and the transmission lines. Panels would be electrically connected into panel strings using wiring attached to the racking. Gathering lines would connect individual panel strings to one or more inverters/transformers and combiner boxes distributed throughout the facility. The electrical current is then transferred to the inverters, which convert the Direct Current (DC) produced by the PV panels into Alternating Current (AC). A pad-mounted transformer next to the inverter would increase the voltage. The AC would then travel through underground gathering lines to the Project Substation.

The Project proposes the installation of up to 170 small-scale, above ground structures that would be located within the solar panel fields to shade inverter/distributor transformers and switching gear. These structures would be approximately 9 foot by 30 foot in size and 10 feet high at the roof apex. The structures would be open on the sides and constructed of wood and

steel and would be neutral in color. Each of these locations may house a Satcon PowerGate Plus 1 MW Commercial Solar PV Inverters, or equivalent, and one of the smaller transformers necessary to increase the voltage. The transformer and inverter locations will be spread out over the site with one transformer and one inverter grouped next to each other. The Project also proposes a Project Substation, switchyard and O&M Building located in the southern portion of the site west of Liebert Road north of the Westside Main Canal. The proposed Substation location and a typical inverter / transformer and PV array locations can be seen in Figure 3-A below. Please refer to the Conditional Use Permit Site Plans for more details.

The electric power produced by the Project will be feed into the existing system with the incorporation of a new 230 kV Gen-Tie transmission line running from the site to the existing Imperial Valley Substation as shown previously in Figure 1-B. The new transmission lines may increase a phenomenon referred to as the "Corona Affect" along the new transmission route. The operational noise levels from the proposed on site small-scale inverter/transformer buildings along with the Substation equipment and the offsite Corona Affect are analyzed separately below.

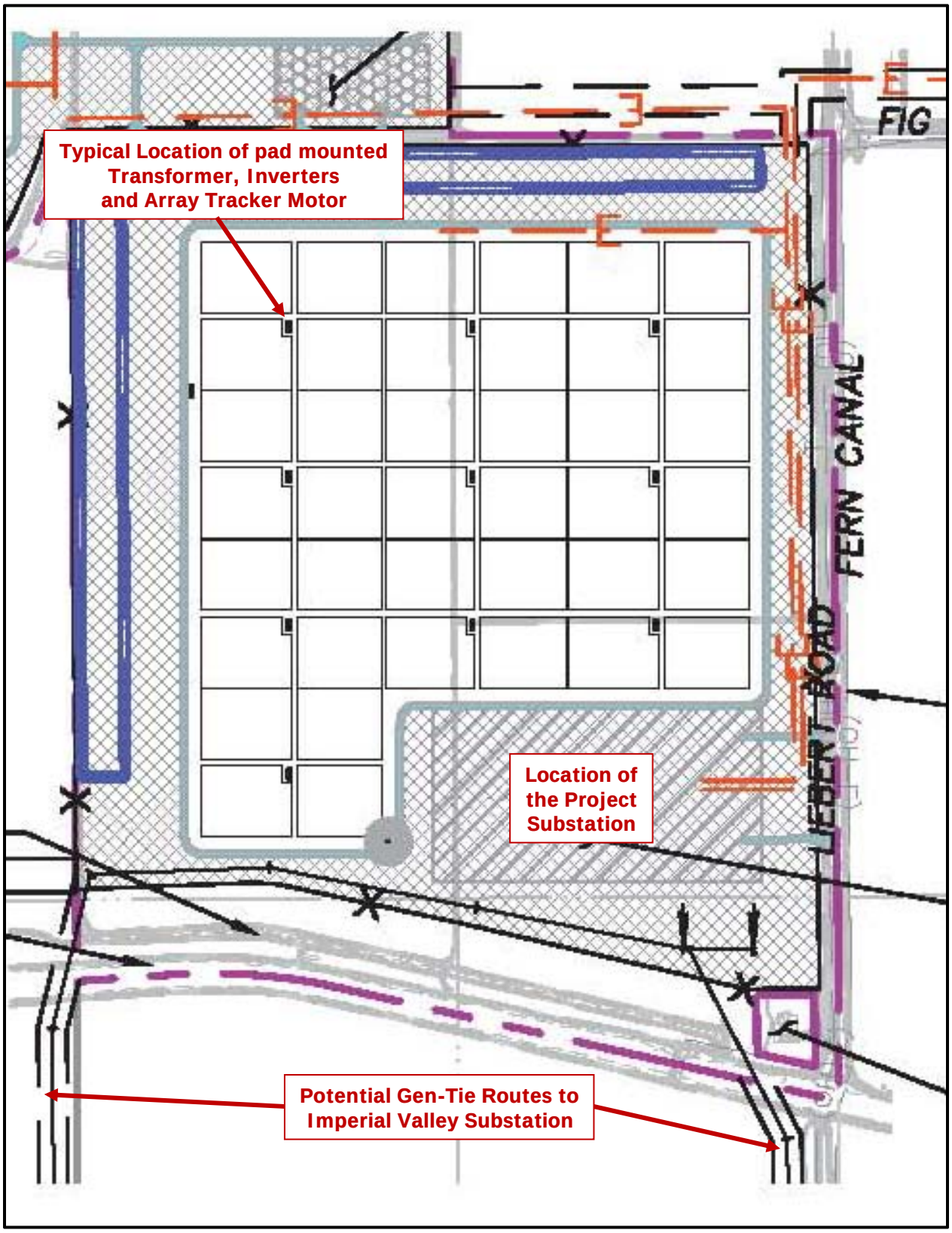
Sound from a small localized source (a "point" source) radiates uniformly outward as it travels away from the source. The sound level attenuates or drops-off at a rate of 6 dBA for each doubling of distance. A drop-off rate of 6 dBA per doubling of distance was used for all operational pieces of equipment. Using a point-source noise prediction model, calculations of the expected operational noise levels and potential impacts were completed. The essential model input data for these performance equations include the source levels of each type of equipment, relative source to receiver horizontal and any vertical separations, the amount of time the equipment is operating in a given day, also referred to as the duty-cycle and any transmission loss from topography or barriers. To determine the worst-case noise levels for the operations no topographic attenuation, duty-cycle reductions or barrier reductions were utilized.

3.2.1 Operational Noise Levels On-site

The Project may possibly utilize two different small-scaled transformers as part of the proposed inverter/transformer sites along with array tracker motors. The smaller transformers consist of a 1 megavolt-amp (MVA) from 200V to 12 kV and 1 MVA from 12V to 34.5 kV. A larger transformer is proposed as part of the Project's onsite substation. The unshielded noise levels for these small-scaled transformers and the larger transformer are provided below, respectively *(Source: National Electric Manufactures Association (NEMA) Publication No. TR 1-1993)*:

1. 1 MVA from 200V to 12 kV - 58 dBA @ 5 feet
2. 1 MVA from 12V to 34.5 kV - 58 dBA @ 5 feet
3. 20 MVA from 34.5 to 69 kV - 71 dBA @ 5 feet

Figure 3-A: Proposed Equipment Locations



The proposed Satcon PowerGate Plus 1 MW Commercial Solar PV Inverter, or equivalent, has an unshielded noise rating of less than 65 dBA at 5 feet and the array tracker motor has a noise rating of 61 dBA at 5 feet *(Source: Satcon PowerGate Specifications, 2009)*. The NEMA test results for transformers and the proposed Satcon inverters manufacturer's specifications are provided as ***Attachment A*** of this report.

Transformer/Inverter and Array Tracker Noise Levels

The worst case property line noise levels will occur where a transformer/inverter and array tracker motor are located approximately 269-feet from the property as can be seen in Figure 3-A above along Liebert Road. Currently the adjacent properties are zoned for agricultural uses but to be conservative the most restrictive residential nighttime property line standard of 45 dBA was assessed. This was done so that if a future residence or residential development are constructed the proposed Project will still be in compliance with the County standards. The noise levels of 58 dBA for the transformer, 65 dBA for the inverter and 61 dBA for the array tracker motor were combined and propagated out to the property line without any shielding. The results of the propagated noise levels are shown in Table 3-2.

The combined noise level at the nearest property line was projected to be 43.5 dBA Leq and no impacts are anticipated. In fact, at a distance of 65 feet or more the transformers/inverters and array tracker motors, unshielded, will comply with the County's most restrictive property line standard of 45 dBA Leq and no additional analysis is needed for the transform/inverters. Additionally, the transformers/inverters and array tracker motors are located 375 feet or more from other transformers/inverters and will not cumulatively raise the noise levels at the nearest property line due to their distance separation.

Table 3-2: Transformer/Inverter and Tracker Noise – Nearest Property Line

Source	Noise Level @ 5-Feet (dBA)[1]	Distance to Nearest Property Line (Feet)	Noise Reduction due to distance (dBA)	Resultant Noise Level @ Property Line (dBA Leq)	Property Line Standard (dBA Leq)	Impact?
Transformer	58.0	75	-34.6	23.4	45	**No**
Inverter	65.0	75	-34.6	30.4	45	**No**
Array Tracker	61.0	75	-34.6	26.4	45	**No**
Cumulative Noise Level @ Property Line (dBA)				32.4	45	**No**

[1] Noise data provided as an attachment to this report

Proposed Project Substation Noise Levels

The proposed Project's onsite Substation will be located in the southern portion of the site west of Liebert Road north of the Westside Main Canal (please refer to Figure 3-A above). The Substation is located 300 feet or more from the nearest property line, located to the south. As stated above, the larger transformer at the Substation has a noise level of 71 dBA at a distance of 5 feet. The reduction in the noise level at a distance of 300 feet is -35.6 dBA resulting in a noise level below 36 dBA at the nearest property line from the Substation. Therefore, the proposed Substation will comply with the County's most restrictive property line standard of 45 dBA Leq and no additional analysis is needed for the Substation.

3.2.2 Cumulative Operational Noise Levels

The location and relationships of the Substation, transformer/inverter and the nearest property line for the Project configuration is shown above in Figure 3-A above. To determine the cumulative noise levels at the property line, the noise levels of 58 dBA from the transformer, 65 dBA for the inverter, 61 dBA from the array tracker motor and 71 dBA for the larger transformer at the Substation were all combined and propagated out to the nearest property line without any shielding from the proposed buildings.

The results of the cumulative noise levels for are provided in Table 3-3. The combined noise levels at the nearest property line were projected to be 37.2 dBA Leq and no impacts are anticipated from the Substation located in the southern portion of the Project site. Therefore, the Substation in combination with the pad mounted transformer/inverters and array tracker motors will comply with the County's most restrictive property line standard of 45 dBA Leq as identified above Table 3-3 and no future analysis is needed and no impacts are anticipated.

Table 3-3: Cumulative Operational Property Line Noise Levels

Source	Measurement Distance from Source (Feet)	Measured Noise Level (dBA)	Distance to Nearest Property Line (Feet)	Noise Reduction due to distance (dBA)	Resultant Noise Level @ Property Line (dBA Leq)	Property Line Standard (dBA Leq)	Impact?
Transformer	5	58.0	269	-34.6	**23.4**	45	**No**
Inverter	5	65.0	269	-34.6	**30.4**	45	**No**
Array Tracker	5	61.0	269	-34.6	**26.4**	45	**No**
Substation	5	71.0	300+	-35.6	**35.4**	45	**No**
Cumulative Noise Level @ Property Line (dBA)					37.2	45	**No**

[1] Noise data provided as an attachment to this report

3.2.3 Corona Affect Noise Levels

The Corona Affect (Corona) is a phenomenon associated with the electrical ionization of the air that occurs near the surface of the energized conductor and suspension hardware due to very high electric field strength. This is audible power line noise that is generated from electric Corona discharge, which is usually experienced as a random crackling or hissing sound. The amount of Corona produced by a transmission line is a function of the voltage of the line, the diameter of the conductors, the locations of the conductors in relation to each other, the elevation of the line above sea level, the condition of the conductors and hardware, and the local weather conditions.

Corona increases at higher elevations where the density of the atmosphere is less than at sea level. Audible noise will vary with elevation with the relationship of X/300 where X is the elevation of the transmission line above sea level measured in meters (EPRI 2005). Audible noise at 600 meters (~2,000 feet) in elevation will be twice the audible noise at 300 meters, all other things being equal. Typically for transmission lines the maximum Corona noise during wet weather conditions is usually less than 40 dBA at the edge of the right of way (ROW) *(Source: Miguel-Mission 230 kV #2 Project, Aspen Environmental Group, 2004).* Corona typically becomes a design concern for transmission lines at 345 kV and above and is less noticeable from lines like those proposed for the Project that are operated at lower voltages.

The electric field gradient is greatest at the surface of the conductor. Large-diameter conductors have lower electric field gradients at the conductor surface and, hence, lower Corona than smaller conductors. Irregularities, such as nicks and scrapes on the conductor surface, concentrate the electric field at these locations and increase the electric field gradient and thus the resulting Corona. Similarly, dust or insects on the conductor surface can cause irregularities and are a source for Corona along with moister from fog or raindrops. Corona noise is primarily audible during wet weather conditions such as fog and rain. Heavy rain will typically generate a noise level from the falling rain drops hitting the ground that will be greater than the noise generated by Corona and thus mask the audible noise from the transmission lines. Corona produced by a transmission line can be reduced by changing the design of the transmission line and through the selection of the conductors and hardware used for the construction of the line. For instance the use of conductor hangers that have rounded rather than sharp edges and no protruding sharp edges will help reduce Corona.

To determine the Corona Affect of the proposed Gen-Tie transmission line, noise measurements were previously taken along an existing SDG&E transmission line in the Borrego Springs area for a different solar power Project. The short-term measurements were conducted by Ldn Consulting December 4, 2009. The noise measurements were conducted along an SDG&E easement south of Borrego Springs as depicted previously in Figure 1-C. Due to ambient noise

sources consisting of airplanes, automobiles and birds only one-minute measurements could be taken without the results being affected by factors other than the existing transmission lines. During the noise measurements, the crackling or hissing of the transmission lines was slightly audible and the weather conditions were dry and calm. The results of those short-term measurements are provided in Table 3-4 below.

As can be seen in Table 3-4, during the dry conditions the noise levels from the Corona were very low, below 20 dBA. Typically during moist or wet conditions the Corona noise can double. This would result in a noise level of 35-37 dBA which is consistent with previous studies and modeling efforts conducted by the Electric Power Research Institute (EPRI) and CH2M Hill for the Cross Valley Transmission Line Project conducted for Southern California Edison 2008. The Corona is based on the transmission lines at full capacity not just the Project related power but the cumulative transmission of power.

Table 3-4: Measured Corona Noise Levels

Location	Time	One Hour Noise Levels (dBA)						Property Line Standard (dBA Leq)	Impact?
		Leq	Lmin	Lmax	L10	L50	L90		
Transmission Lines Borrego Springs	9:35–9:36 a.m.	17.6	16.7	22.7	18.7	17.0	16.8	45	**No**
Transmission Lines Borrego Springs	9:37–9:38 a.m.	18.3	17.4	27.2	19.3	18.1	17.7	45	**No**
Source: Ldn Consulting, Inc. December 4, 2009									

3.3 Conclusions

Based on the empirical data, the manufactures specifications and the distances to the property lines the unshielded noise levels and cumulative noise levels from the proposed transformers/inverters, array tracker motors and the proposed Substation were found to be below the County's most restrictive nighttime property line standard of 45 dBA. No impacts are anticipated and no mitigation is required. The measured Corona Affect noise levels were found to be below the County's most restrictive nighttime standard of 45 dBA. This was also consistent with previously measured and modeled noise levels on transmission line Projects throughout California operating at full capacity. No direct or cumulative impacts from the Corona are anticipated from the new transmission lines associated with the Project.

4.0 CONSTRUCTION ACTIVITIES

4.1 County of Imperial Construction 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 operation shall be limited to the hours of 7 a.m. to 7 p.m., Monday through Friday, and 9 a.m. to 5 p.m. Saturday. No commercial construction operations are permitted on Sunday or holidays.

4.2 Potential Project Construction Noise Impacts

Construction noise represents a short-term impact on the ambient noise levels. Noise generated by construction equipment includes haul trucks, water trucks, graders, dozers, loaders and scrapers can reach relatively high levels. Grading activities typically represent one of the highest potential sources for noise impacts and little or no grading will be necessary for this Project. The most effective method of controlling construction noise is through local control of construction hours and by limiting the hours of construction to normal weekday working hours.

The U.S. Environmental Protection Agency (U.S. EPA) has compiled data regarding the noise generating characteristics of specific types of construction equipment. Noise levels generated by heavy construction equipment at a distance of 50 feet can range from 60 dBA for a small tractor up to 100 dBA for rock breakers. However, these noise levels diminish rapidly with distance from the construction site at a rate of approximately 6 dBA per doubling of distance. For example, a noise level of 87 dBA measured at 50 feet from the noise source would be reduced to 81 dBA at 100 feet from the source and be further reduced to 75 dBA at 200 feet from the source.

Using a point-source noise prediction model, calculations of the expected construction noise impacts were completed. The essential model input data for these performance equations include the source levels of each type of equipment, relative source to receiver horizontal and vertical separations, the amount of time the equipment is operating in a given day, also referred to as the duty-cycle and any transmission loss from topography or barriers. To determine the worst-case noise levels for the grading operations no topographic attenuation or barrier reductions were utilized.

The Project construction period is expected to be 12-24 months and includes all site preparation, installation of the PV panels and all utilities including the Gen-Tie line. The mass

grading and subsequent installation of the utilities and the installation of the PV panels are discussed separately below. The noise levels utilized in this analysis for the mass grading and trenching operations are based upon the anticipated list of equipment proved by the Project Applicant and is shown in Table 4-1 below. Most of the construction activities will consist of clearing and grubbing the site and the trenching of utilities for the preparation of the PV panels. The equipment is anticipated to be spread out over the entire site with some equipment potentially operating near the property line while the rest of the equipment may be located over 1,000-2,000 feet from the same property line. This would result in an acoustical center for the grading operation of more than 500 feet from the nearest property line.

Table 4-1: Construction Grading Noise Levels

Construction Equipment	Quantity	Duty Cycle (Hours/Day)	Source Level @ 50-Feet (dBA)	Cumulative Noise Level @ 50-Feet (dBA Leq-8h)
Graders	2	6.8	74	76.3
Rubber Tired Dozers	2	6.8	72	74.3
Water Trucks	4	6.8	70	75.3
Other Equipment	3	8	72	76.8
Rollers	2	6.8	75	77.3
Tractors/Loaders/Backhoes	2	6.8	73	75.3
Rough Terrain Forklifts	2	1.7	72	68.3
			Cumulative Levels @ 50 Feet (dBA)	83.9
			Distance To Property Line	140
			Noise Reduction Due To Distance	-8.9
			NEAREST PROPERTY LINE NOISE LEVEL	75.0
			County of Imperial Threshold	75
			IMPACT?	**NO**

As can be seen in Table 4-1, if all the equipment was operating in the same location, which is not physically possible, at a distance as close as 140 feet from the nearest property line the point source noise attenuation from construction activities is -8.9 dBA. This would result in an anticipated worst case eight-hour average combined noise level of less than 75 dBA at the property line. Given this and the spatial separation of the equipment, the noise levels will comply with the County of Imperial's 75 dBA standard at all Project property lines and no impacts are anticipated.

The installation of the PV panels will utilize a total of two small pile drivers to install the panel stands, two mobile cranes to move the PV panel in position and two pneumatic tools to secure the panels to the stands. The noise levels utilized for the installation of the PV panels in this analysis are based upon the anticipated list of equipment provided by the Project Applicant and are shown in Table 4-2 below. Based upon normal installation procedures the equipment is anticipated to be spread out over the entire site similar to the mass grading operation. Some equipment will be operating near the property line while the rest of the equipment may be located over 1,000-2,000 feet from the same property line. This would result in an acoustical center for the PV installation operation of more than 500 feet from the nearest property line. The distance to the property lines would increase as the interior panels are installed and the noise levels would decrease due to distance.

Table 4-2: PV Panel Installation Noise Levels

Construction Equipment	Quantity	Duty Cycle (Hours/Day)	Source Level @ 50-Feet (dBA)	Cumulative Noise Level @ 50-Feet (dBA Leq-8h)
Rough Terrain Forklifts	8	1.7	72	74.3
Cranes	4	1.8	75	74.5
Generator Sets	1	8	74	74.0
Tractors/Loaders/Backhoes	1	8	73	73.0
Air Compressors	2	4	76	76.0
Forklifts	2	7	72	74.4
Water Trucks	3	2	70	68.8
Aerial Lifts	1	8	70	70.0
Crawler Tractors	1	8	72	72.0
			Cumulative Levels @ 50 Feet (dBA)	83.0
			Distance To Property Line	130
			Noise Reduction Due To Distance	-8.3
			NEAREST PROPERTY LINE NOISE LEVEL	74.7
			County of Imperial Threshold	75
			IMPACT?	**NO**

As can be seen above in Table 4-2, if all the equipment was operating in the same location, which is not physically possible, at a distance as close as 130 feet from the nearest property line the point source noise attenuation from construction activities is -8.3 dBA. This would result in an

anticipated worst case eight-hour average combined noise level of less than 75 dBA at the property line. Given this and the spatial separation of the equipment, the noise levels will comply with the County of Imperial's 75 dBA standard at all Project property lines and no impacts are anticipated.

4.3 Potential Cumulative Construction Noise Impacts

Results of the analysis indicate that the project will meet the County 75 dBA standard for grading activities at all project property lines without mitigation at a distance as 140 feet. If cumulative grading operations from other planned or approved Projects are simultaneously occurring at a shared property line noise levels may exceed the County threshold of 75 dBA. The two separate operations would be considered overlapping and would act as a single noise generator. To reduce the noise levels below the County's 75 dBA threshold the construction operations would need to be moved to a distance of 200 feet from the shared property line. This increase in distance would reduce the noise levels below the County's property line standard of 75 dBA. Cumulatively, the project would not be expected to incrementally add to the noise levels during construction to any "reasonably foreseeable" projects as they are either not going to coincide with the project with respect to construction phasing or there worst-case construction noise levels would be separated by enough distance and not cumulatively add to one another.

4.4 Construction Conclusions

At a distance as close as 140 feet the point source noise attenuation from the grading activities and the nearest property line is -8.9 dBA. This would result in an anticipated worst case eight-hour average combined noise level of less than 75 dBA at the property line. During the installation of the PV panels at a distance of 130 feet would result in a noise level of less than 75 dBA. The mass grading and PV installation equipment is anticipated to average more than 500 feet from the nearest property line. Given this and the spatial separation of the equipment over the large site area, the noise levels of the grading and PV panel installation are anticipated to comply with the County of Imperial's 75 dBA standard at all Project property lines of each Phase and no impacts are anticipated.

Cumulatively, the project would not be expected to incrementally add to the noise levels during construction to any "reasonably foreseeable" projects as they are either not going to coincide with the project with respect to construction phasing or there worst-case construction noise levels would be separated by enough distance and not cumulatively add to one another.

5.0 TRAFFIC RELATED NOISE

5.1 Off-site Traffic Related Noise Impacts

The off-site Project related roadway segment noise levels Projected in this report were calculated using the methods in the Highway Noise Model published by the Federal Highway Administration (FHWA Highway Traffic Noise Prediction Model, FHWA-RD-77-108, December, 1978). The FHWA Model uses the traffic volume, vehicle mix and speed to compute the equivalent noise level. A spreadsheet calculation was used which computes equivalent noise levels for each of the time periods used in the calculation of CNEL. Weighting these equivalent noise levels and summing them gives the CNEL for the traffic Projections. The noise contours are then established by iterating the equivalent noise level until the distance to the desired noise contour(s) are found.

Because mobile/traffic noise levels are calculated on a logarithmic scale, a doubling of the traffic noise or acoustical energy results in a noise level increase of 3 dBA. Therefore the doubling of the traffic volume, without changing the vehicle speeds or mix ratio, results in a noise increase of 3 dBA. Mobile noise levels radiates in an almost oblique fashion from the source and drop off at a rate of 3 dBA for each doubling of distance under hard site conditions and at a rate of 4.5 dBA for soft site conditions. Hard site conditions consist of concrete, asphalt and hard pack dirt while soft site conditions exist in areas having slight grade changes, landscaped areas and vegetation. Soft site conditions, based on the existing ground conditions and agricultural use, were used to develop the noise contours and analyze noise impacts along all roadway segments. The future traffic noise model utilizes a typical, conservative vehicle mix of 95% Autos, 3% Medium Trucks and 2% Heavy Trucks for all analyzed roadway segments. The vehicle mix provides the hourly distribution percentages of automobile, medium trucks and heavy trucks for input into the FHWA Model.

Project related roadway noise levels would be considered significant if the future noise level with the Project will be within the "normally acceptable" noise levels shown in the Noise/Land Use Compatibility Guidelines, but will result in an increase of 5 dBA CNEL or greater. If the future noise levels with the Project will be greater than the "normally acceptable" noise levels shown in the Noise/Land Use Compatibility Guidelines, a noise increase of 3 dBA CNEL or greater shall be considered a potentially significant noise impact and mitigation measures must be considered.

5.2 Project Related Traffic Noise Impacts

Direct Construction Traffic Noise Impacts

To determine if roadway noise level increases associated during the construction of the Project will create noise impacts, the noise levels for the existing conditions were compared with the noise

level increase from the Project' peak related construction traffic. The worst case construction related noise increases would occur when comparing the existing 2011 conditions prior to construction beginning in the year 2012. To be conservative, the construction phase's peak, one month, traffic volume was utilized. Utilizing the Project's traffic assessment (Source: LOS Engineering, Inc. 12/11) noise contours were developed for the following traffic scenarios:

Existing Year 2011: Current noise conditions without the construction of the Project.

Existing Year 2011 Plus Project: Current noise conditions plus the peak construction related traffic of the Project.

Existing Year 2011 vs. Existing Year 2011 Plus Project: Comparison of the Project construction traffic related noise level increases in the vicinity of the Project site.

The noise levels and the distances to the 60 dBA CNEL contours for the roadways in the vicinity of the Project site are given in Table 5-1 for the Existing Year 2011 Scenario without Project construction traffic and in Table 5-2 for the Existing Year 2011 Plus Project constriction traffic Scenario. Note that the values given do not take into account the effect of any noise barriers or topography that may affect ambient noise levels. Table 5-3 presents the comparison of the Existing Year 2011 with and without Project related noise levels. The overall roadway segment noise levels will increase from 0.3 dBA CNEL to 12.9 dBA CNEL during the construction of the Project based on the anticipated Project related construction traffic.

Table 5-1: Existing Traffic Noise Levels (Without Project)

Roadway Segment	ADT[1]	Vehicle Speeds (MPH)[1]	Noise Level @ 50-Feet (dBA CNEL)	60 dBA CNEL Contour Distance (Feet)
Diehl Road				
Derrick Road to Drew Road	199	40	51.3	13
Drew Road				
Evan Hewes Highway to I-8	2,443	55	65.3	112
I-8 to Diehl Road	1,033	55	61.5	63
Diehl Road to SR-98	512	55	58.5	40
Evan Hewes Highway				
Derrick Road to Drew Road	2,954	40	63.0	79
Drew Road to Forrester Road	2,843	40	62.8	77
Forrester Road				
Evan Hewes Highway to I-8	5,551	55	68.8	194

[1] Source: Project Traffic study prepared by LOS Engineering, Inc. 12/11

Table 5-2: Existing + Project Traffic Noise Levels

Roadway Segment	ADT[1]	Vehicle Speeds (MPH)[1]	Noise Level @ 50-Feet (dBA CNEL)	60 dBA CNEL Contour Distance (Feet)
Diehl Road				
Derrick Road to Drew Road	1,128	40	58.8	42
Drew Road				
Evan Hewes Highway to I-8	2,589	55	65.5	117
I-8 to Diehl Road	1,912	55	64.2	95
Diehl Road to SR-98	639	55	59.5	46
Evan Hewes Highway				
Derrick Road to Drew Road	3,142	40	63.3	83
Drew Road to Forrester Road	3,031	40	63.1	81
Forrester Road				
Evan Hewes Highway to I-8	6,145	55	69.3	208

[1] Source: Project Traffic study prepared by LOS Engineering, Inc. 12/11

Table 5-3: Existing vs. Existing + Project Traffic Noise Levels

Roadway Segment	Existing Noise Level @ 50-Feet (dBA CNEL)	Existing Plus Project Noise Level @ 50-Feet (dBA CNEL)	Project Related Noise Level Increase (dBA CNEL)	County Noise Increase Threshold	Potential Impact?
Diehl Road					
Derrick Road to Drew Road	51.3	58.8	**7.5**	5	**Yes**
Drew Road					
Evan Hewes Highway to I-8	65.3	65.5	0.3	3	No
I-8 to Diehl Road	61.5	64.2	2.7	3	No
Diehl Road to SR-98	58.5	59.5	1.0	5	No
Evan Hewes Highway					
Derrick Road to Drew Road	63.0	63.3	0.3	3	No
Drew Road to Forrester Road	62.8	63.1	0.3	3	No
Forrester Road					
Evan Hewes Highway to I-8	68.8	69.3	0.4	3	No

Sound Levels provided are worst-case and do not take into account topography or shielding from barriers.

The Project does create a short-term noise increases during the peak construction of more than 5 dBA CNEL on one roadway segment as can be seen in **bold** in the last column of Table 5-3 below.

The noise level is below the 60 dBA CNEL threshold and in the "normally acceptable" category. Additionally, no sensitive receptors exist along this roadway segment. No sensitive receptors would be directly impacted by construction traffic noise due to the proposed Project's construction traffic and no mitigation would be required.

Cumulative Construction Traffic Noise Impacts

To determine if cumulative off-site noise level increases associated with the peak construction of the proposed project and other planned or permitted projects in the vicinity will create noise impacts, the noise levels for the peak construction period of the Project and other planned and permitted projects were compared with the existing opening year conditions. To be conservative, the construction phase's peak, one month, traffic volume was utilized. Utilizing the project's traffic assessment (Source: LOS Engineering, Inc. 12/11) noise contours were developed for the following traffic scenarios:

Existing Year 2011 Plus Project Plus Cumulative Projects: Current day noise conditions plus the peak construction period of the project and other permitted or planned projects.

Existing Year 2011 vs. Existing Year 2011 Plus Project Plus Cumulative: Comparison of the existing noise levels and the related noise level increases from the combination of the proposed project peak construction traffic and all other planned or permitted projects in the vicinity of the site.

The existing noise levels and the distances to the 60 dBA CNEL contours for the roadways in the vicinity of the Project site are given in Table 5-1 above for the Existing Year 2011 Scenario. The cumulative noise conditions are provided in Table 5-4 below. No noise barriers or topography that may affect noise levels were incorporated in the calculations. Table 5-5 presents the comparison of the Existing Year 2011 and the Existing Year 2011 plus Project and Cumulative noise levels.

Traffic related short-term noise increases during the peak construction of the Project and Cumulative Projects has the potential to increase noise levels more than the acceptable limit on three roadway segments as can be seen in **bold** in the last column of Table 5-5 below. Based on the list of cumulative projects, nearly all of the "reasonably foreseeable" projects in the area that affect the roadway noise levels are all photovoltaic projects. Thus, the traffic generation is due to short term construction traffic volumes. However, cumulatively, the project would not be expected to incrementally add to the roadway traffic noise levels to any "reasonably foreseeable" projects. This is because it is unlikely that the peak traffic from the construction of any other solar projects in the immediate area would coincide with the peak traffic period of the Project (a one-month period in the first quarter of 2013). Therefore, no impacts are anticipated during the proposed Project's construction traffic and no mitigation would be required.

Table 5-4: Existing + Project + Cumulative Traffic Noise Levels

Roadway Segment	ADT[1]	Vehicle Speeds (MPH)[1]	Noise Level @ 50-Feet (dBA CNEL)	60 dBA CNEL Contour Distance (Feet)
Diehl Road				
Derrick Road to Drew Road	1,128	40	58.8	42
Drew Road				
Evan Hewes Highway to I-8	2,915	55	66.0	126
I-8 to Diehl Road	3,339	55	66.6	138
Diehl Road to SR-98	2,066	55	64.6	101
Evan Hewes Highway				
Derrick Road to Drew Road	3,529	40	63.8	89
Drew Road to Forrester Road	3,449	40	63.7	88
Forrester Road				
Evan Hewes Highway to I-8	6,996	55	69.8	227

[1] Source: Project Traffic study prepared by LOS Engineering, Inc. 12/11

Table 5-5: Existing vs. Existing + Project + Cumulative Traffic Noise Levels

Roadway Segment	Existing Noise Level @ 50-Feet (dBA CNEL)	Existing Plus Project Plus Cumulative Noise Level @ 50-Feet (dBA CNEL)	Cumulative Related Noise Level Increase (dBA CNEL)	County Noise Increase Threshold	Potential Impact?
Diehl Road					
Derrick Road to Drew Road	51.3	58.8	7.5	5	**Yes**
Drew Road					
Evan Hewes Highway to I-8	65.3	66.0	0.8	3	No
I-8 to Diehl Road	61.5	66.6	5.1	3	**Yes**
Diehl Road to SR-98	58.5	64.6	6.1	5	**Yes**
Evan Hewes Highway					
Derrick Road to Drew Road	63.0	63.8	0.8	3	No
Drew Road to Forrester Road	62.8	63.7	0.8	3	No
Forrester Road					
Evan Hewes Highway to I-8	68.8	69.8	1.0	3	No

Sound Levels provided are worst-case and do not take into account topography or shielding from barriers.

Operational Traffic Noise Impacts

During operations and maintenance, the project will primarily operate during daylight hours and will require (on average) less than 10 fulltime personnel for operations and maintenance. Operations personnel include employees running the facility, security, and any other work associated with the operations. Maintenance personnel include employees addressing maintenance on a daily basis. On average, the operations and maintenance trip generation is estimated at about 20 ADT with approximately 10 AM and 10 PM peak hour trips. During a typical year, the project will require up to 10 daily water trucks for panel washing over approximately 15 business days; however, the washing frequency is estimated from one to four times a year. During the washing period, the total project daily traffic may increase to 40 or 50 ADT over a 15 business day period according to the Project's Traffic study (LOS Engineering, 2011).

Typically it requires a project to double (or add 100%) to the traffic volumes to have a noise level increase of 3 dBA CNEL. Since the operations and maintenance traffic generation is minimal compared to the existing traffic volumes. The Project's operational traffic will not result in a potentially significant direct or cumulative noise impact at existing or future noise sensitive land.

5.3 Conclusions

The Project does create a short-term noise increase during the peak construction of more than 5 dBA CNEL in the "normally acceptable" category on one roadway segments. No sensitive receptors exist along this roadway segments and therefore sensitive receptors would be impacted by construction traffic noise due to the proposed Project's construction traffic and no mitigation would be required.

Traffic related short-term noise increases during the peak construction of the Project and Cumulative Projects has the potential to increase noise levels more than the acceptable limits on up to three roadway segments. Along the segment of Diehl Road, no sensitive uses exist and no impacts are anticipated. The two segments along Drew Road have the potential to affect the existing sensitive uses (i.e., residential). Based on the list of cumulative projects, nearly all of the "reasonably foreseeable" projects in the area that affect the roadway noise levels are all photovoltaic projects. Thus, the traffic generation is due to short term construction traffic volumes. It is unlikely that the proposed Project would be expected to incrementally add to the roadway traffic noise levels to any "reasonably foreseeable" projects as they are either not going to coincide with the Project with respect to peak traffic period (first quarter of 2013 and only for a one month period). Therefore, no impacts are anticipated during the proposed Project's construction traffic and no mitigation would be required.

During the operations of the Project it is estimated that the Project would generate less than 50 trips per day and no noise impacts would occur as stated above. Therefore, the Project's operational traffic will not result in a potentially significant direct or cumulative noise impact at existing or future noise sensitive land uses.

6.0 CERTIFICATIONS

The contents of this report represent an accurate depiction of the noise environment and impacts within and surrounding the Campo Verde Solar Energy Project. The information contained in this report was based on the best available data at the time of preparation.

DRAFT

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Date February 10, 2012

ATTACHMENT A

MANUFACTURES SPECIFICATIONS AND NOISE DATA
(Transformers and Inverters)

NEMA Standards Publication No. TR 1-1993 (R2000)

Transformers, Regulators and Reactors

Published by:

National Electrical Manufacturers Association
1300 North 17th Street, Suite 1847
Rosslyn, VA 22209

TABLE OF CONTENTS

FOREWORD

The standards appearing in this publication have been developed by the Transformer Section and have been approved for publication by the National Electrical Manufacturers Association. They are used by the electrical industry to promote production economies and to assist users in the proper selection of transformers.

The Transformer Section is working actively with the American National Standards Committee, C57, on Transformers, Regulators and Reactors, in the development, correlation and maintenance of national standards for transformers. This Committee operates under the procedures of the American National Standards Institute (ANSI).

It is the policy of the NEMA Transformer Section to remove material from the NEMA Standards Publication as it is adopted and published in the American National Standard C57 series. The NEMA Standards Publication for Transformers, Regulators and Reactors references these and other American National Standards applying to transformers, and is intended to supplement, without duplication, the American National Standards.

The NEMA Standards Publication for Transformers, Regulators and Reactors contains provision for the following:

a. American National Standards adopted by reference and applicable exceptions approved by NEMA, if any.
b. NEMA Official Standards Proposals. These are official drafts of proposed standards developed within NEMA or in cooperation with other interested organizations, for consideration by ANSI. They have a maximum life of five years, during which time they may be approved as American National Standards or adopted as NEMA Standards, or rescinded.
c. Manufacturing Standards. These are NEMA Standards which are primarily of interest to the manufacturers of transformers and which are not yet included in an American National Standard.
d. Standards Which Are Controversial. These are NEMA Standards, on which there is a difference of opinion within Committee C57. The NEMA version will be included in the NEMA Standards Publication until such time as the differences between ANSI and NEMA are resolved.

NEMA Standards Publications are subject to periodic review and take into consideration user input. They are being revised constantly to meet changing economic conditions and technical progress. Users should secure latest editions. Proposed or recommended revisions should be submitted to:

Vice President, Engineering Department
National Electrical Manufacturers Association
2101 L Street, N.W.
Washington, D.C. 20037-1526

SCOPE

This publication provides a list of all ANSI C57 Standards that have been approved by NEMA. In addition it includes certain NEMA Standard test methods, test codes, properties, etc., of liquid-immersed transformers, regulators, and reactors that are not American National Standards.

PART 0
GENERAL

The following American National Standards have been approved as NEMA Standards and should be inserted in this Part 0:

ANSI/IEEE C57.12.00-1988	*General Requirements for Liquid-Immersed Distribution, Power and Regulating Transformers*
ANSI/IEEE C57.12.01-1989	*General Requirements for Dry Type Power and Distribution Transformers*
ANSI C57.12.10-1988	*Requirements for Transformers 230,000 volts and below, 833/958-8333/10,417 kVA single-phase 750/862-60,000/80,000/100,000 kVA three phase, including supplements*
ANSI C57.12.70-1993	*Terminal Markings and Connections for Distribution and Power Transformers*
ANSI/IEEE C57.12.90-1993	*Test Code for Liquid-immersed Distribution, Power & Regulating Transformers and Guide for Short-Circuit Testing of Distribution & Power Transformers*
ANSI/IEEE C57.19.00-1992	*General Requirements and Test Procedure for Outdoor Apparatus Bushings*
ANSI/IEEE C57.19.01-1992	*Standard Performance Characteristics & Dimensions for Outdoor Apparatus Bushings*
ANSI/IEEE C57.92-1992	*Guide for Loading Mineral-oil-immersed Power Transformers up to and including 100 MVA with 55C or 65C Average Winding Rise*

The NEMA Standards TR 1-0.01 through TR 1-0.09 on the following pages (see Part 0 Pages 1–9) also apply generally to transformers.

0.01 PREFERRED VOLTAGE RATINGS

Preferred system voltages and corresponding transformer voltage ratings are given in the American National Standard for Electric Power Systems and Equipment--Voltage Ratings (60 Hz), C84.1-1989. It is recommended that these ratings be used as a guide in the purchase and operation of transformers.

0.02 FORCED-AIR (FA) AND FORCED-OIL (FOA) RATINGS

Under the conditions of par. 5.11 of American National Standard ANSI/IEEE C57.12.00-1988, the relationship between self-cooled ratings and forced-air-cooled or forced-oil-cooled ratings shall be in accordance with Table 0-1.

Table 0-1
FORCED-AIR AND FORCED-OIL RATINGS RELATIONSHIPS

	Self-cooled Ratings* (kVA)		Percent of Self-Cooled Ratings With Auxiliary Cooling	
Class	Single Phase	Three Phase	First Stage	Second Stage
OA/FA	501-2499	501-2499	115	--
OA/FA	2500-9999	2500-11999	125	--
OA/FA	10000 and above	12000 and above	133-1/3	--
OA/FA/FA	10000 and above	12000 and above	133-1/3	166-2/3
OA/FA/FOA	10000 and above	12000 and above	133-1/3	166-2/3
OA/FOA/FOA	10000 and above	12000 and above	133-1/3	166-2/3

*In the case of multi-winding transformers or autotransformers, the ratings given are the equivalent two-winding ratings.

PERFORMANCE

0.03 RADIO INFLUENCE VOLTAGE LEVELS

The following values apply to liquid-filled transformers. They do not apply to load tap changing during switching or to operation of auxiliary relays and control switches.

0.03.1 Distribution Transformers

Radio influence voltage levels for distribution transformers, for systems rated 69 kV and less, shall not exceed 100 microvolts when measured in accordance with Section 7.01. The test voltage shall be the line-to-neutral voltage corresponding to 110 percent excitation of the transformer. This will be the coil voltage for wye connections and 1/3 times the coil voltage for delta connections.

0.04 POWER FACTOR OF INSULATION OF OIL-IMMERSED TRANSFORMERS

While the real significance which can be attached to the power factor of oil-immersed transformers is still a matter of opinion, experience has shown that power factor is helpful in assessing the probable conditions of the insulation when good judgement is used.

The proper interpretation of power factor of oil-immersed transformers is being given careful attention by manufacturers in connection with the problems of (1) selecting insulating materials, (2) sealing, and (3) processing the transformers. However, it is the comparative values which are guides for the successful solution for these problems rather than an absolute value of power factor.

The generally accepted factory tests for proving the insulation level are the prescribed low-frequency tests and impulse tests given in the American National Standard C57.12.90-1993.

When required, a factory power-factor test can be made, and this measurement will be of value for comparison with field power-factor measurements to assess the probable condition of the insulation. It is not feasible to establish standard power-factor values for oil-immersed transformers because:

a. Experience has definitely proved that little or no relation exists between power factor and the ability of the transformer to withstand the prescribed dielectric tests.
b. Experience has definitely proved that the variation in power factor with temperature is substantial and erratic so that no single correction curve will fit all cases.

When a factory power-factor measurement of a transformer is required, the measurement should be made with the insulation at room temperature, preferably at or close to 20°C.

0.05 AUDIBLE SOUND LEVELS

Transformers shall be so designed that the average sound level will not exceed the values given in Tables 0-2 through 0-4 when measured at the factory in accordance with the conditions outlined in ANSI/IEEE C57.12.90-1993.

The guaranteed sound levels should continue to be per Tables 0-2 through 0-4 until such time as enough data on measured noise power levels becomes available.

Sound pressure levels are established and published in this document. Sound power may be calculated from sound pressure, using the method described in C57.12.90-1993.

Rectifier, railway, furnace, grounding, mobile and mobile unit substation transformers are not covered by the tables. The tables do not apply during the time that power switches are operating in load-tap-changing transformers and in transformers with integral power switches.

ble 0-2
AUDIBLE SOUND LEVELS F .-IMMERSED POWER TRANSFORMERS

nn 1 - Class*OA, Ow and FOW Ratings
nn 2 - Class* FA and FOA First stage Auxiliary Cooling*†
nn 3 - Straight FOA* Ratings, FA* FOA* Second-stage Auxiliary Cooling*†

erage Sound	Equivalent Two-winding Rating▲																	
vel ††,	350 kV BIL and Below			450, 550, 650 kV BIL			750 and 825 kV BIL			900 and 1050 kV BIL			1175 kV BIL			1300 kV BIL and Above		
ıcibels	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
	700	...	...	...	..	...	...	..	...	...	...	...	...	...	...	...	...	...
	1000	.	. .	...	..	..	...	...	...	...	...	...	...	...	...	...	...	...
	..	. .	...	700	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	1500	. .	..	1000	...	...	. .	..	...	...	...	...	...	...	...	...	...	...
	2000	.	. .	...	...	.	...	...	..	...	...	...	...	...	...	...	...	...
	2500	...	...	1500	...	.	.	..	..	..	...	...	...	..	..	...	...	...
	3000	...	...	2000	...	..	. .	...	...	...	...	. .	...	..	...	...	...	...
	4000	...	...	2500	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	5000	...	...	3000	...	...	...	...	...	...	...	...	...	..	...	...	...	...
	6000	...	...	4000	.	.	3000	...	...	...	...	...	...	...	...	...	...	...
	7500	6250▲▲	..	5000	3750▲▲	..	4000	3125▲▲	..	..	...	. .	...	..	...	...	...	...
	10000	7500		6000	5000	.	5000	3750	...	. .	...	. .	...	..	...	...	...	...
	12500	9375	.	7500	6250	..	6000	5000	...	...	...	...	...	...	...	...	...	...
	15000	12500	.	10000	7500	..	7500	6250	. .	...	...	...	..	. .	...	...	...	...
	20000	16667		12500	9375		10000	7500	...	...	...	...	...	...	...	...	...	...
	25000	20000	20800	15000	12500	..	12500	9375	...	...	...	...	...	..	...	...	...	...
	30000	26667	25000	20000	16667	...	15000	12500	...	12500	...	. .	...	...	..	...	...	...
	40000	33333	33333	25000	20000	20800	20000	16667	...	15000	...	...	12500	...	...	...	...	...
	50000	40000	41667	30000	26667	25000	25000	20000	20800	20000	16667	...	15000	...	...	12500	...	...
	60000	53333	50000	40000	33333	33333	30000	26667	25000	25000	20000	20800	20000	16667	. .	15000	...	...
	80000	66667	66667	50000	40000	41667	40000	33333	33333	30000	26667	25000	25000	20000	20800	20000	16667	...
	100000	80000	83333	60000	53333	50000	50000	40000	41667	40000	33333	33333	30000	26667	25000	25000	20000	20800
	...	106667	100000	80000	66667	66667	60000	53333	50000	50000	40000	41667	40000	33333	33333	30000	26667	25000
	..	133333	133333	100000	80000	83333	80000	66667	66667	60000	53333	50000	50000	40000	41667	40000	33333	33333
	...	...	166667	...	106667	100000	100000	80000	83333	80000	66667	66667	60000	53333	50000	50000	40000	41667
	...	...	200000	...	133333	133333	...	106667	100000	100000	80000	83333	80000	66667	66667	60000	53333	50000
	..	...	250000	...	...	166667	...	133333	133333	...	106667	100000	100000	80000	83333	80000	66667	66667
	..	...	300000	...	...	200000	...	...	166667	...	133333	133333	...	106667	100000	100000	80000	83333
	..	...	400000	...	...	250000	...	...	200000	...	...	166667	...	133333	133333	...	106667	100000
	...	...	...	...	...	300000	...	...	250000	...	...	200000	...	...	166667	...	133333	133333
	...	...	...	...	...	400000	...	...	300000	...	...	250000	...	...	200000	...	...	166667
	...	...	...	...	...	...	...	...	400000	...	...	300000	...	...	250000	...	...	200000
	...	...	...	...	...	...	...	...	...	...	...	400000	...	...	300000	...	...	250000
	...	...	...	...	...	..	...	...	...	...	...	...	...	...	400000	...	...	300000
	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	400000

Classes of cooling (see 2.6.1 of American National Standard C57.12.00-1988.
First- and second-stage auxiliary cooling (see TR 1.0.02).
For column 2 and 3 ratings, the sound levels are with the auxiliary cooling equipment in operation.
†For intermediate kVA ratings, use the average sound level of the next larger kVA rating.
The equivalent two-winding 55°C or 65°C rating is defined as one-half the sum of the kVA rating of all windings.
▲Sixty-seven decibels for all kVA ratings equal to this or smaller.

Table 0-3
AUDIBLE SOUND LEVELS FOR LIQUID-IMMERSED DISTRIBUTION TRANSFORMERS AND NETWORK TRANSFORMERS

Equivalent Two-winding kVA	Average Sound Level, Decibels
0–50	48
51–100	51
101–300	55
301–500	56
750	57
1000	58
1500	60
2000	61
2500	62

Small Transformer

Table 0-4
AUDIBLE SOUND LEVELS FOR DRY-TYPE TRANSFORMERS 15000-VOLT NOMINAL SYSTEM VOLTAGE AND BELOW

Equivalent Two-Winding kVA	Average Sound Level, Decibels		Equivalent Two-winding kVA	Average Sound Level, Decibels
	Self-cooled Ventilated*	Self-cooled Sealed*		Ventilated Forced Air Cooled **,†
0–50	50	50	...	...
51–150	55	55	...	...
151–300	58	57	3–300	67
301–500	60	59	301–500	67
501–700	62	61	501–833	67
701–1000	64	63	834–1167	67
1001–1500	65	64	1168–1667	68
1501–2000	66	65	1668–2000	69
2001–3000	68	66	2001–3333	71
3001–4000	70	68	3334–5000	73
4001–5000	71	69	5001–6667	74
5001–6000	72	70	6668–8333	75
6001–7500	73	71	8334–10000	76

Large Transformer

* Class AA rating

**Does not apply to sealed-type transformers

†Class FA and AFA ratings

Part 1
POWER TRANSFORMERS

The American National Standard C57.12.10-1988 has been approved as a NEMA Standard for power transformers and should be inserted in this Part 1.

The ANSI/IEEE Standard C57.92-1992, has been approved by NEMA and should be inserted in this Part 1.

The following other parts of this NEMA Publication No. TR 1 shall also apply:

a. Part 1 General
b. Part 6 Terminology
c. Part 7 Test Code
d. Part 12 Underground-Type Three-Phase Distribution Transformer

Satcon™

Clean power.

Unparalleled Performance

Satcon enables you to closely match array capacities to achieve maximum energy throughput.

+20%

Edge™ MPPT

Features a proprietary maximum power point tracking (MPPT) system

Provides rapid and accurate control

Improves performance by up to 20%, even in challenging climate conditions

Boosts overall PV plant kilowatt yield

Provides a wide range of operation across all photovoltaic cell technologies, including thin film, monocrystalline, and polycrystalline PV panels

Power Efficiency

Full array nameplate power rating maintained throughout the entire MPPT DC voltage range

Superior dynamic performance in cloudy conditions

Printed Circuit Board Durability

Wide thermal operating range: -40° C (-40° F) to 85° C (185° F)

Conformal coated to withstand extreme humidity and air-pollution levels

Proven Reliability

Rugged and reliable, PowerGate Plus PV inverters are engineered from the ground up to meet the demands of large-scale installations.

Low Maintenance

Modular components make service efficient

Dual cooling fans

Safety

Seismic Zone 4 compliant

Built-in DC and AC disconnect switches

Integrated DC two-pole disconnect switch isolates the inverter (with the exception of the GFDI circuit) from the photovoltaic power system to allow inspection and maintenance

Protective cover over exposed power connections

PowerGate® Plus 1 MW Commercial Solar PV Inverter

PowerGate Plus 1 MW Specifications		UL/CSA	CE
Input Parameters			
Maximum Array Input Voltage	900V DC (CE)	•	•
Input Voltage Range (MPPT; Full Power)	420–850V DC	•	•
Maximum Input Current	2,397A DC	•	•
Output Parameters			
Nominal Output Voltage to Transformer	265V AC	•	•
Output Frequency Range	59.5–60.5 Hz	•	
	49.5–50.5 Hz		•
AC Voltage Range Set Points	-12%/+10%	•	•
Nominal Output Frequency	60 Hz	•	
	50 Hz		•
Number of Phases	3	•	•
Maximum Output Current per Phase	2,178A	•	•
Maximum Overcurrent Protection per Phase	2,614A	•	•
CEC-Weighted Efficiency	97%	•	•
Maximum Continuous Output Power	1000 kW (1000 kVA)	•	•
Power Factor at Full Load	>0.99	•	•
Harmonic Distortion	<3% THD	•	•
Temperature			
Operating Ambient Temperature Range (Full Power)	-20° C to +50° C	•	•
Storage Temperature Range	-30° C to +70° C	•	•
Cooling	Forced Air	•	•
Noise			
Noise Level	<65 dB(A)	•	•

• Standard ○ Optional

Satcon™

PowerGate Plus 1 MW

PowerGate Plus 1 MW	
UL/CSA	265V AC Output
CE	265V AC Output

External transformer required.

Streamlined Design

With all components encased in a single, space-saving enclosure, PowerGate Plus PV inverters are easy to install, operate, and maintain.

Single Cabinet with Small Footprint

Convenient access to all components

Large in-floor cable glands make access to DC and AC cables easy

Rugged Construction

Engineered for outdoor environments

Output Transformer (Optional)

Provides galvanic isolation

Uses medium voltage output to accommodate long-distance power feeds to designated loads or substations

PowerGate Plus 1 MW Specifications		UL/CSA	CE
Combiner			
Number of Inputs and Fuse Rating	40 (160A DC) (Opt.)	o	o
	60 (100A DC) (Opt.)	o	o
Transformer			
External Transformer		o	o
Inverter and Integrated External Transformer Cabinets			
Enclosure Rating (Outdoor)	NEMA 3R, IP44	•	•
Enclosure Finish (16-Gauge, Powder-Coated Steel)	RAL-7032	•	•
Base and Door Finish (14-Gauge, Powder-Coated Steel)	RAL-7032	•	•
Cabinet Dimensions (Height x Width x Depth)	Inverter	107" x 148" x 84" (272 cm x 376 cm x 213 cm)	
Cabinet Weight	Inverter	12,000 lbs.	5,443 kg
Testing and Certification			
UL1741, CSA 107.1-01, IEEE 1547, IEEE C62.41.2		•	
CE Certification			•
Zone 4 Seismic Rating		•	•
Warranty			
Five Years		•	•
Extended Warranty (10, 15, or 20 years) (Optional)		o	o
Extended Service Agreement (Optional)		o	o
Intelligent Monitoring			
Satcon PV View® Plus (Optional)		o	o
Satcon PV Zone (Optional)		o	o
Third-Party Compatibility		o	o

• Standard
o Optional

Note: Specifications are subject to change.

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