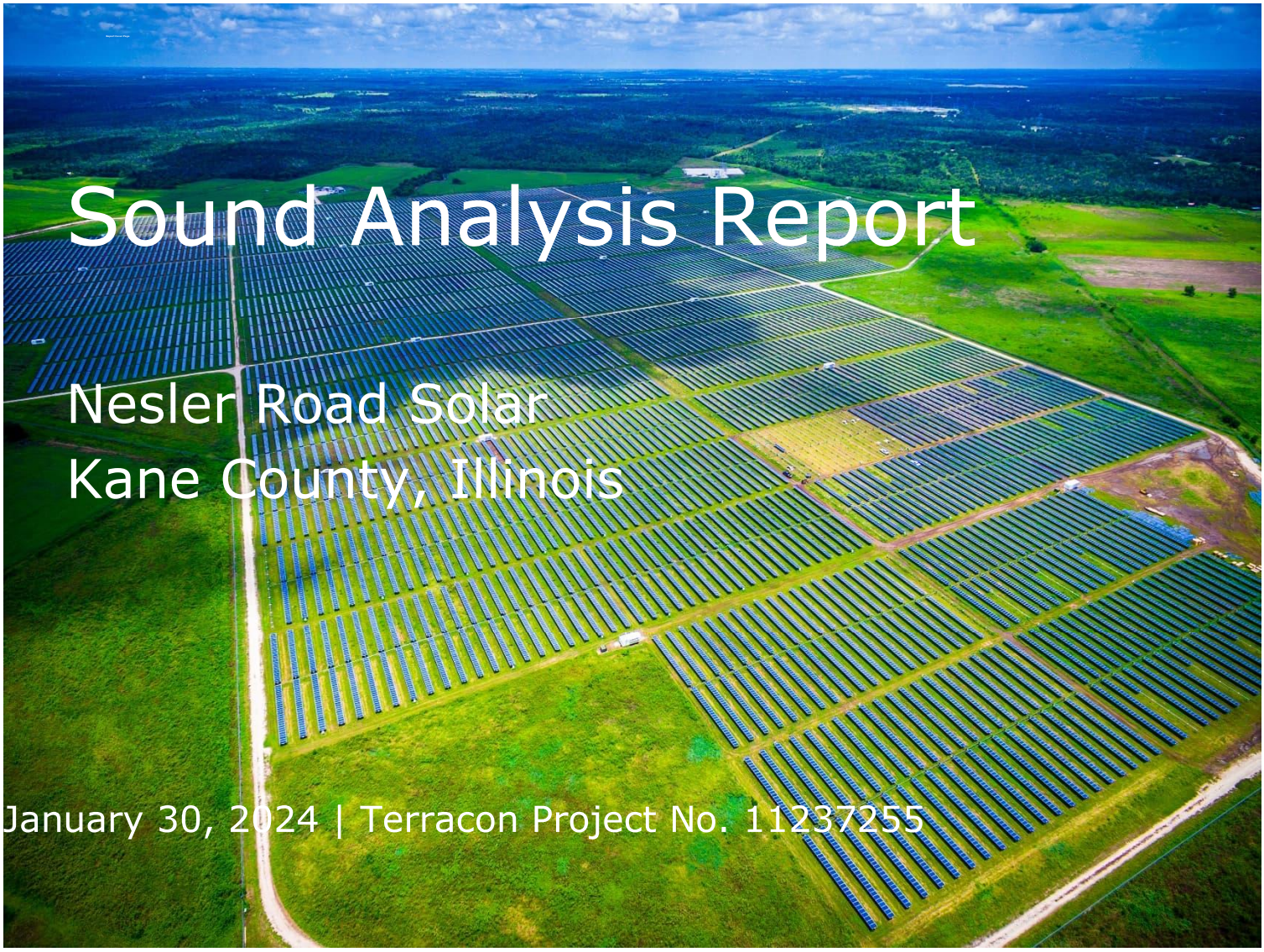


Sound Analysis Report

Nesler Road Solar
Kane County, Illinois

January 30, 2024 | Terracon Project No. 11237255

Prepared for:

Manhard Consulting
1 E Wacker Drive, Suite 2700
Chicago, IL 60601

Terracon
Explore with us
Nationwide
Terracon.com
Facilities
Environmental
Geotechnical
Materials

192 Exchange Boulevard
Glendale Heights, IL 60139
P 603-445-0180
F 603-357-9489
Terracon.com

January 30, 2024

Manhard Consulting
1 E Wacker Drive
Suite 2700
Chicago, IL 60601

Attn: Kevin Coughlin, PE, Associate Vice President
E: kcoughlin@manhard.com

Re: Nesler Solar, Kane County IL – Sound Analysis
Project Number: 11237255

Dear Mr. Coughlin:

Terracon is pleased to submit the revised Sound Analysis Report for the above referenced project in general accordance with Terracon Proposal No. P11237255R dated November 26, 2023. This report presents the findings of the noise analysis prepared using the client provided conceptual site plans for the proposed Nesler Road Solar project in Kane County, Illinois.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact Bill Kaufell or David Moon (630) 445-0180 or via email at jdmoon@terracon.com.

Sincerely,
Terracon

Bill Kaufell
Acoustics Group Leader

J. David Moon
Department Manager

Explore with us

Table of Contents

Figures

Attachments

1.0 Report Summary

Topic	Overview Statement
Project Description	The development of the Nesler Road Solar project in Kane County, Illinois, involves the construction of solar photovoltaic panels and associated equipment on a 37-acre tract of vacant, agricultural land.
Ambient Site Conditions	Existing sound levels in the project area are primarily influenced by transportation noise associated with local roadway traffic and the Union Pacific rail line to the south of the property. In addition to transportation sources, background sound is also influenced by agricultural activities and environmental related sources (birds, insects, residential activities) and would vary depending on the time of day and activity. Daytime ambient sound levels are assumed to vary between 45-55 A-weighted decibels, dB(A), based on the suburban nature of the area. Ambient sound measurements were not conducted on the site.
Construction	Construction of the solar farm will occur during typical work hours, Monday through Friday between 7:00 AM and 7:00 PM. However, some construction activities could also occur on weekends if necessary. Construction noise is expected to cause temporary and short-term adverse impacts to the ambient sound environment within the development site and for noise sensitive receptors near the site. Most of the construction equipment would not be operating for the entire construction period but would be phased in and out and moved to different areas within the development site as construction activities progress. The equipment most likely to make the most noise would be the pile driving activities that will occur during the installation of the solar panel arrays. The construction noise levels would be temporary and intermittent. Based on the location of the closest panel arrays to the equestrian facility to the east, it is suggested that property owner coordination is conducted to discuss construction sequencing and foundation installation schedules. While impacts are not anticipated, property owner coordination related to construction activities may alleviate concerns.
Operational Sound	The only quantifiable operational sound emissions are associated with the inverters and transformers. The facility will have 18 string inverters distributed throughout the center of the property, each the acoustic equivalent of a residential air-conditioning unit. The 2 transformers proposed within the facility would produce low levels of sound during facility operation (significantly less sound than the inverters). Proposed operation sound level contributions associated with the project at the closest residential receptor locations ranged from 34 to 41 dB(A). In addition, the 55 dBA and 61 dBA impact threshold contours specified in the state regulations were modeled within the property lines of the project. Based on the results of the SoundPLAN analysis, the solar project is not anticipated to have a significant impact on surrounding community sound levels or sensitive receptors and will comply with established threshold (55/61 dB(A) equivalent) outlined in Section 4.0.

2.0 Introduction

This report presents the results of our Noise Analysis services performed for the proposed Nesler Road Solar facility located in Kane County, Illinois. The proposed project is located at the northwest corner of a bend in Nesler Road in Elgin, Illinois, see Exhibit 1 in Appendix A. Proposed site activities include site grading and installation of solar panels. The 37-acre project site is located in Kane County, Illinois at latitude 42.014072 and longitude -88.393100.

The purpose of these services was to provide an estimate of the background, construction, and operational noise conditions related to the solar facility development, including:

- Ambient background sound assumptions
- Construction Noise Estimate
- Operational Noise Estimate

Project plans used to develop the sound modeling:

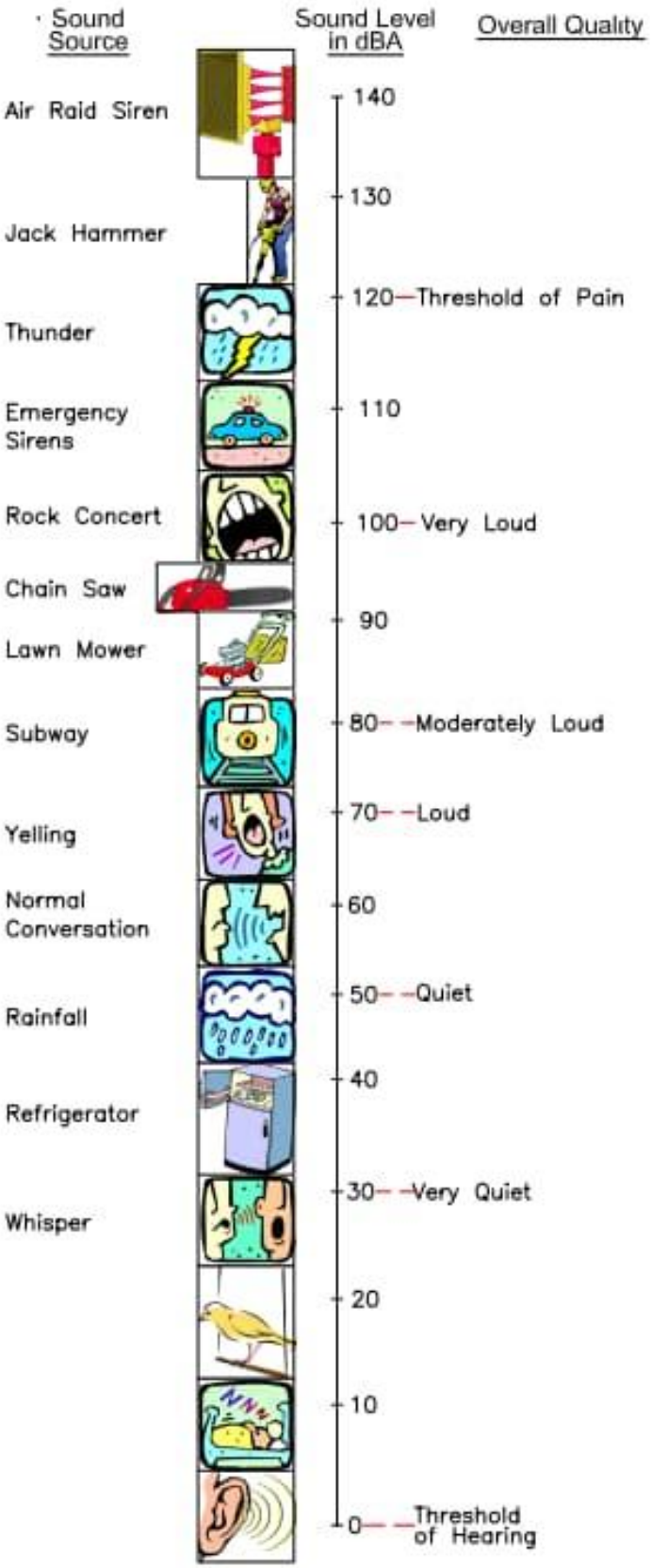
- 2024-01-18 Nesler Road Solar LLC. Site Plan SP-1 (Figure 1) prepared by Manhard Consulting, Ltd.

3.0 Fundamentals of Noise

Noise is defined as "unwanted sound." Therefore, it can be considered a psychological phenomenon and not physical. The roar of racecars adds to the excitement of spectators and hence would be considered sound. This same roar may annoy nearby neighbors, thereby becoming noise. Similarly, the roar of a waterfall at 70 dB(A) may be pleasing to the ear and perceived as sound, while sound produced by traffic or industrial activities at that same intensity could justifiably be considered noise. Factors playing a role in the perception of sound include magnitude, amplitude, duration, frequency, source, and receiver. Nevertheless, researchers have established a fair correlation between the measurement of sound, the A-weighted decibel (dB(A)), and its associated perceived human response. The graphic below outlines common noise sources with associated sound levels in dB(A).

Environmental sound levels are generally presented in terms of A-weighted decibels (dB(A)). The decibel (dB) scale is used to measure sound level. However, because the human ear does not respond equally to all frequencies, the A-weighted scale has been developed to place an emphasis on those frequencies which are more detectable to the human ear. This is an adjusted measurement of noise that takes into account the sensitivity of the human ear to the various sound frequencies which we can hear. The A-weighted scale, which has been in existence for over 40 years, is generally used in community and city noise ordinances and is expressed in units of dB(A) (decibels in the A-weighting).

Because sound is actually an energy level, it must be recorded on a logarithmic scale and expressed in logarithmic units called decibels (dB). Given this scale, a doubling of amplitude will result in a three-decibel increase in total level. Typically, a change in sound level between 2 and 3 dB(A) is barely perceptible, while a change of 5 dB(A) is readily noticeable by most people. A 10 dB(A) increase is usually perceived as a doubling of loudness; conversely, noise is perceived to be reduced by one-half when a sound level is reduced by 10 dB(A).


Sound Source
Sound Level in dBA
Overall Quality
Air Raid Siren
Jack Hammer
Thunder
Emergency Sirens
Rock Concert
Chain Saw
Lawn Mower
Subway
Yelling
Normal Conversation
Rainfall
Refrigerator
Whisper
140
130
120—Threshold of Pain
110
100—Very Loud
90
80—Moderately Loud
70—Loud
60
50—Quiet
40
30—Very Quiet
20
10
0—Threshold of Hearing

The metric frequently used when evaluating environmental sound levels is the equivalent continuous sound pressure level, or Leq. The Leq represents the average sound level for a given time period that would have the same total sound energy as the fluctuating sound levels over the measured time period. Along with the Leq, another frequently used metric when considering environmental sound levels and their effect on people is the day-night average sound level, the Ldn. The Ldn does not represent the sound level heard at any particular time but represents the average noise level over a 24-hour period, with sound levels between 10 PM and 7 AM artificially increased by 10 dB before averaging. The Ldn considers that household sound levels are typically lower during the evening and night than in the daytime and any exterior sound levels occurring between 10 PM and 7 AM are perceived to be louder and are more noticeable than the same exterior sound levels would be perceived during the daytime. Other acoustical statistics such as L(90) are generally considered to be representative of the background or ambient level of a noise environment. L(90) is the level exceeded for 90% of the time. For 90% of the time, the noise level is above this level. The maximum sound level (Lmax) was used for this assessment.

As sound waves propagate from a source to a receiver, the sound level changes in magnitude and frequency content. Sound propagates outward spherically from a point source and decreases by 6 dB for each doubling of distance. When the propagation path is close to the ground, ground absorption affects the attenuation. Acoustically hard sites (pavement) would have minimal ground absorption while a soft site (grass) would further reduce the sound at a rate 1.5 dB per doubling of distance. Additional sound reductions occur as a result of atmospheric effects and shielding (barrier in path of source/receiver).

4.0 Regulatory Setting

The project is located within Kane County, Illinois which does not have a quantitative noise nuisance threshold ordinance. Kane County regulations related to commercial solar facilities outlined in 25-5-4-9: Commercial Solar Energy Facilities include the following:

> *11. Noise Levels: Noise levels from Commercial Solar Energy Facilities shall be in compliance with applicable Illinois Pollution Control Board (IPCB) regulations. The Applicant shall submit manufacturer's sound power level characteristics and other relevant data regarding noise characteristics necessary for a competent noise analysis. The Applicant, through the use of a qualified professional, shall appropriately demonstrate compliance with the applicable noise requirements in its Special Use application.*

IPCB regulations outlined in Title 35: Environmental Protection Subtitle H: Noise Part 901.102 specifies sound emission standards according to land use classifications. Land use is categorized from A to C based on sensitivity to sound emissions. Class A is the most sensitive while Class C is the least and is not protected in the regulation. The project is being developed on agricultural land and is bordered by Fitchie Creek Forest Preserve to the north, Union Pacific Railroad to the south, agricultural land to the west and Our Day Farm equestrian facility and Nesler Road to the east. The land use in the study area consists primarily of agricultural with sparse residential development and transportation (rail and roadway). Residential receptors include the Saddlebrook II located adjacent to the Union Pacific railroad on Heatherington Place 1,000 feet (ft) to the southwest of the solar facility. In addition, Oakridge Farm on Prairie Crossing is 2,000 ft to the northwest of the facility.

The IPCB land use classifications adjacent to the project include residential areas (Land Use Code 1100) classified as Land Class A, Fitchie Creek Forest Preserve (Land Use Code 5500) classified as Land Class A, agricultural (Land Use Code 9100) and an equestrian facility (Land Use Code 9372) classified as Land Class C. The solar facility would also be classified as Land Class C. The IPCB provisions include sound emission thresholds for sound emitted to Class A and Class B lands. Class C land (agricultural/equestrian)

is not included in the IPCB sound regulations. The sound thresholds are presented below for Sound Emitted to Class A Land and the A-weighted summary has been provided as a single value that represents the impact threshold.

> *Section 901.102 Sound Emitted to Class A Land*
> *a) Except as elsewhere provided in this Part, a person must not cause or allow the emission of sound during daytime hours from any property-line noise source located on any Class A, B or C land to any receiving Class A land that exceeds any allowable octave band sound pressure level specified in the following table, when measured at any point within the receiving Class A land. Sound pressure levels must be measured at least 25 feet from the property-line noise source.*
>
> *Allowable Octave Band Sound Pressure Levels (dB) of Sound Emitted to any Receiving Class A Land from:*

Octave Band Center Frequency (Hertz)	***Land Class C***	***Land Class B***	***Land Class A***
31.5	*75*	*72*	*72*
63	*74*	*71*	*71*
125	*69*	*65*	*65*
250	*64*	*57*	*57*
500	*58*	*51*	*51*
1000	*52*	*45*	*45*
2000	*47*	*39*	*39*
4000	*43*	*34*	*34*
8000	*40*	*32*	*32*
A-Weighted Summary	**61**	**55**	**55**

5.0 Existing Site Conditions

The proposed solar farm development site consists of a 37-acre parcel in Kane County, Illinois. The project is being developed on agricultural land and is bordered by Fitchie Creek Forest Preserve to the north, Union Pacific Railroad to the south, agricultural land to the west and Our Day Farm equestrian facility and Nesler Road to the east. The land use in the study area consists primarily of agricultural with sparse residential development. Residential receptors include the Saddlebrook II located adjacent to the Union Pacific railroad on Heatherington Place 1,000 feet (ft) to the southwest of the solar facility. In addition, Oakridge Farm on Prairie Crossing is 2,000 ft to the northwest of the facility.

Existing sound levels in the project area are primarily influenced by transportation noise associated with local roadway traffic and the Union Pacific rail line to the south of the property. In addition to transportation sources, background sound is also influenced by agricultural activities and environmental background related sources (birds, insects, residential activities) and would vary depending on the time of day and activity. In the absence of noise from agricultural operations, other audible components in the ambient environment would be noise from insects, birds, dogs, and other wildlife and livestock, along with infrequent traffic noise from vehicles on rural roadways.

The Acoustical Society of America (ASA) through the American National Standards Institute (ANSI) has published a standard with estimates of general ambient sound levels (L_{eq} and L_{dn}) for six different land use categories, ranging from very noisy urban residential to very quiet suburban and rural residential. The six land use categories and their corresponding daytime, nighttime, and day-night average estimated sound levels are presented in Table 1.

Table 1: Representative Existing Conditions Based on Land Use[1]

Land Use Category	Typical L_{dn} (dB(A))	Day Level L_d (dB(A))	Night Level L_n (dB(A))
1, Very noisy urban residential	67	66	58
2, Noisy urban residential	62	61	54
3, Urban and noisy suburban residential	57	55	49
4, Quiet urban and normal suburban residential	52	50	44
5, Quiet suburban residential	47	45	39
6, Very quiet suburban and rural residential	42	40	34

The existing acoustic environment for the proposed development site and the closest noise sensitive receptors can be estimated using the sound level data presented in Table 1. For the development site, existing sound levels can range from Land Use Category 1 for the region adjacent to local transportation sources (roadways and rail lines) to Land Use Category 6 for areas removed from local noise sources. As proximity to the transportation sources decreases, the dominance of roadway/rail noise lessens and a combination of traffic noise and typical rural farming and agricultural noise make up the ambient background conditions. As the distance away from transportation sources continues to increase, farming and agricultural noise sources, such as tractors, backhoes, balers, plows, harrows, and seed drills (when in operation) become the more dominant noise sources. When farm equipment is not operating, ambient background noise levels would drop to 40-45 dB(A), consistent with the daytime sound levels presented for Land Use Category 5 and 6 in Table 1. Ambient sound measurements were not conducted in the project area. Daytime ambient sound levels are assumed to vary between 45-55 dB(A) based on the suburban nature of the area and would vary based on distance to local transportation sources.

6.0 Construction Noise

Construction of the solar farm will occur during typical work hours, Monday through Friday between 7:00 AM and 7:00 PM. However, some construction activities could also occur on weekends if necessary. Construction noise is expected to cause temporary and short-term adverse impacts to the ambient sound environment within the development site and for noise sensitive receptors near the site. To predict the magnitude of construction noise that will temporarily affect noise sensitive receptors, modeling of construction noise levels was performed.

The U.S. Department of Transportation Federal Highway Administration (FHWA) developed a model for the prediction of construction noise that is based on actual sound level measurements of various equipment types. The FHWA Roadway Construction Noise Model (RCNM) has noise levels for various types of equipment pre-programmed into the software. Therefore, the noise level associated with the equipment is typical for the equipment type and not based on any specific make or model. Some examples of common construction equipment and their measured maximum noise levels at a distance of 50 feet that are used in the RCNM construction noise level predictions are presented in Table 2.

[1] Source: ANSI S12.902013/Part 3.

Table 2: Common Construction Equipment Noise Levels

Equipment Description	Actual Measured L_{max} @ 50 feet (dB(A), slow) (Samples Averaged)
Backhoe	78
Compressor (air)	78
Crane	81
Dozer	82
Drill Rig Truck	79
Dump Truck	76
Excavator	81
Front End Loader	79
Grader	85
Jackhammer	89
Pickup Truck	75
Rock Drill	81
Scraper	84
Tractor	84
Vibratory Pile Driver	101

Most of the construction equipment would not be operating for the entire construction period but would be phased in and out and moved to different areas within the development site as construction activities progress. Based on the RCNM measured noise levels of the equipment to be used during construction, the equipment most likely to make the most noise would be the pile driving activities that will occur during the installation of the solar panel arrays. To predict the worst-case construction noise scenario, equipment associated with solar panel array installation was modeled for varying distances. The equipment used for the RCNM construction noise calculations include a backhoe, crane, dozer, pickup truck, tractor, and vibratory pile driver. Results of the RCNM construction noise calculations for varying distances of the development site are presented in Table 3 as both L_{eq} and L_{max} values. Data from RCNM calculations is located in Attachment 1.

The piledriving activities used to construct the solar panel array are anticipated to be the loudest construction activity that would be experienced. These worst-case construction noise levels would be temporary and intermittent, as it would not be expected to take more than a day or two to construct the nearest solar panel array. As construction noise generating activities will progressively move across the development site during the duration of the construction phase, the highest noise levels would not be expected to be experienced at a single receptor for more than a day or two, as construction equipment and activities would only be in a single area for a short period of time.

Table 3: Estimated Construction Noise Levels in dB(A)

Equipment	1,000'		2,000'	
	Lmax	Leq	Lmax	Leq
Backhoe	52	48	46	42
Dozer	56	52	50	46
Dump Truck	50	47	44	41
Crane	55	47	49	41
Pickup Truck	49	45	43	39
Tractor	58	54	52	48
Vibratory Pile Driver	75	68	69	62

Based on the location of the closest panel arrays to the equestrian facility to the east, it is suggested that property owner coordination is conducted to discuss construction sequencing and foundation installation schedules. While

impacts are not anticipated, property owner coordination related to construction activities may alleviate concerns.

7.0 Operational Noise

Solar facilities primarily generate sound from three main sources: tracking motors, inverters, and transformers. The solar array for this project will use motorized tracking panels distributed across the site in order to keep the panels facing the sun and optimize output during different times of the day and year. Tracker motors are not in operation continuously and would reposition the arrays several times during daylight hours as well as reposition the arrays once at sunset (resetting array position for the following day). Each individual repositioning would be brief and the frequency at which arrays are repositioned would be anticipated to be limited to a few times each hour or less. The motors used to move the panels are small, brushless DC motors and produce relatively insignificant contributions to the sound emitted onsite and are often inaudible at close range, equating to less than 50 dB(A) at 10 meters.

The only quantifiable operational sound emissions are associated with the inverters and transformers. As the solar generation facility would only generate electricity between sunrise and sunset, noise from solar field inverters and transformers would be limited to daylight hours. The facility will have 18 string inverters distributed throughout the center of the property. These units have multi-stage fans that cool internal components which operate automatically when cooling is required. The maximum fan power is used when the inverter is at maximum capacity in high ambient temperatures. The sound produced by an inverter can be described as a low hum and has roughly the same acoustical output of a household air conditioning unit. According to the manufacturer's specifications, the noise emission produced by the inverter is rated at 80 dB(A) at 1 meter when operating at maximum capacity. Sound emission data for the inverters are included from the manufacturer in Attachment 2.

The transformers proposed within the facility would produce low levels of sound during facility operations, but, as with the inverters, this sound would primarily occur during daytime hours. There are two (2) – 2.5 MVA pad-mounted liquid cooled transformers are proposed for the project. While a manufacturer has not been selected for this equipment, the National Electrical Manufacturers Association (NEMA) specifies audible sound level limits for transformers. Based on the NEMA standards and manufacturer data, project transformers may generate noise levels up to 62 dB(A) at 1 meter (refer to manufacturer data in Attachment 2). Liquid cooled transformers have higher energy efficiency and produce low sound emissions during operations compared to dry transformers and can be used in close proximity to sound sensitive land uses.

Project transformers are likely the largest source of tonal sound since the inverter noise is broadband based. While liquid cooled transformers have tonal components at 120 Hertz, the tonal character of the transformers is not anticipated to be audible outside the property buffer based on the low sound emissions associated with the transformers, distances to sensitive receptors as well as masking associated with ambient sound sources in the vicinity.

Site Operations and Maintenance
Anticipated operational maintenance operations will include vegetation management and general solar panel maintenance. The upkeep and small fixes are not anticipated to generate any loud or distinguishable noise from off the site. The other potential component for increasing the ambient noise level around the site would be an increase in traffic into and around the site. The estimated number of vehicles needed to service the solar facility amounts to 1-2 vehicles on days when the panels are serviced.

Noise Modeling Methodology
The future operating acoustical environment for the proposed sources was simulated using the SoundPLAN v.5.1 software. SoundPLAN implements International Organization for Standardization (ISO) ISO-9613-2 1996 (Attenuation of sound during propagation outdoors – Part 2: General method of calculation), which is an international standard method for calculating sound during propagation outdoors in order to predict the levels of environmental

noise at a distance from a variety of sources. A three-dimensional topographical model was created to assess the sound propagation of the proposed facility. A digital terrain model was created using existing ground elevations and contours obtained from topographic mapping derived from USGS mapping at 1-meter intervals.

SoundPLAN is capable of either predicting A-weighted sound levels at discrete receptors (single locations) or calculating sound contours given the three-dimensional terrain. Sound level projections were calculated for sensitive receptor locations (11 receptors) within approximately 1/2 mile radius around the project boundaries. In addition, sound contour modeling was used for the proposed site to graphically display the future acoustical environment and illustrate the influence of the facility on adjoining properties.

Noise Modeling Results

The sensitive receptor modeling locations are located on Figure 2. The operational sound level projections for each of the sensitive receptors outlined on Figure 2 are found in Table 4 – Sound Modeling Results. Sound level contributions associated with the project at the sensitive receptor locations ranged from 34-41 dB(A). The majority of the receptors analyzed are below 40 dB(A) and the facility will not be audible at these discrete locations based on reductions associated with sound propagation and ambient background conditions. The visual results (isopleth) of the sound dispersion model results for the maximum worst-case operating condition scenario is depicted on Figure 3a through Figure 3c. Nesler Road traffic volumes and speeds were included on the modeling areas outlined in Figure 3c. Based on the results of the SoundPLAN analysis, the solar project is not anticipated to have a significant impact on surrounding community sound levels or sensitive receptors and will comply with established threshold (55-61 dB(A) equivalent) outlined in Section 4.0.

Property owner concerns related to sound level intrusion from the project to the equestrian operation to the east was noted in past correspondence for the project. The sound level emissions associated with the project are minimal and not expected to affect the equestrian operations. Furthermore, solar fields have traditionally offered grazing (and vegetation management) opportunities for smaller farm animals such as sheep and goats. Equine and bovine are not suggested due to potential panel damage, though if the panels are elevated these animals could be suitable to graze in a solar facility. Research related to noise impacts and equestrian operations are generally focused on the startle effect on the horses due to loud, instantaneous sounds such as gunfire, sonic booms, heliport activity, etc. The operational sound emissions are not to the magnitude that would affect farm animal behavior; the inverter equipment has the same acoustical energy as a residential air conditioning unit.

Table 4: Sound Modeling Results in dB(A)

Receiver Number	Coordinates (meters)		Elevation abv. Ground (meters)	Floor	Limit Day dB(A)[1]	Sound Level Day dB(A)
	X	Y				
1	294008	594421	278	GF	61	34
	294008	594421	281	1.Fl	61	34
	294008	594421	283	2.Fl	61	34
2	293914	594344	278	GF	61	34
	293914	594344	281	1.Fl	61	34
	293914	594344	284	2.Fl	61	35
3	293930	594091	275	GF	61	35
	293930	594091	277	1.Fl	61	36
	293930	594091	280	2.Fl	61	36
4	293921	594002	275	GF	61	36
	293921	594002	277	1.Fl	61	36
	293921	594002	280	2.Fl	61	39
5	294277	593479	266	GF	61	39
	294277	593479	269	1.Fl	61	40
	294277	593479	272	2.Fl	61	39
6	294214	593524	267	GF	61	40
	294214	593524	269	1.Fl	61	40
	294214	593524	272	2.Fl	61	40
7	294579	593332	271	GF	61	40
	294579	593332	274	1.Fl	61	40
	294579	593332	277	2.Fl	61	37
8	295173	593284	264	GF	61	37
	295173	593284	267	1.Fl	61	37
	295173	593284	270	2.Fl	61	35
9	295255	593750	270	GF	61	37
	295255	593750	273	1.Fl	61	39
	295255	593750	276	2.Fl	61	35
10	294991	594098	266	GF	61	35
	294991	594098	269	1.Fl	61	35
	294991	594098	271	2.Fl	61	40
11	295195	593675	270	GF	61	41
	295195	593675	273	1.Fl	61	41
	295195	593675	276	2.Fl	61	34

[1]Equivalent A-Weighted value outlined in Section 4.0

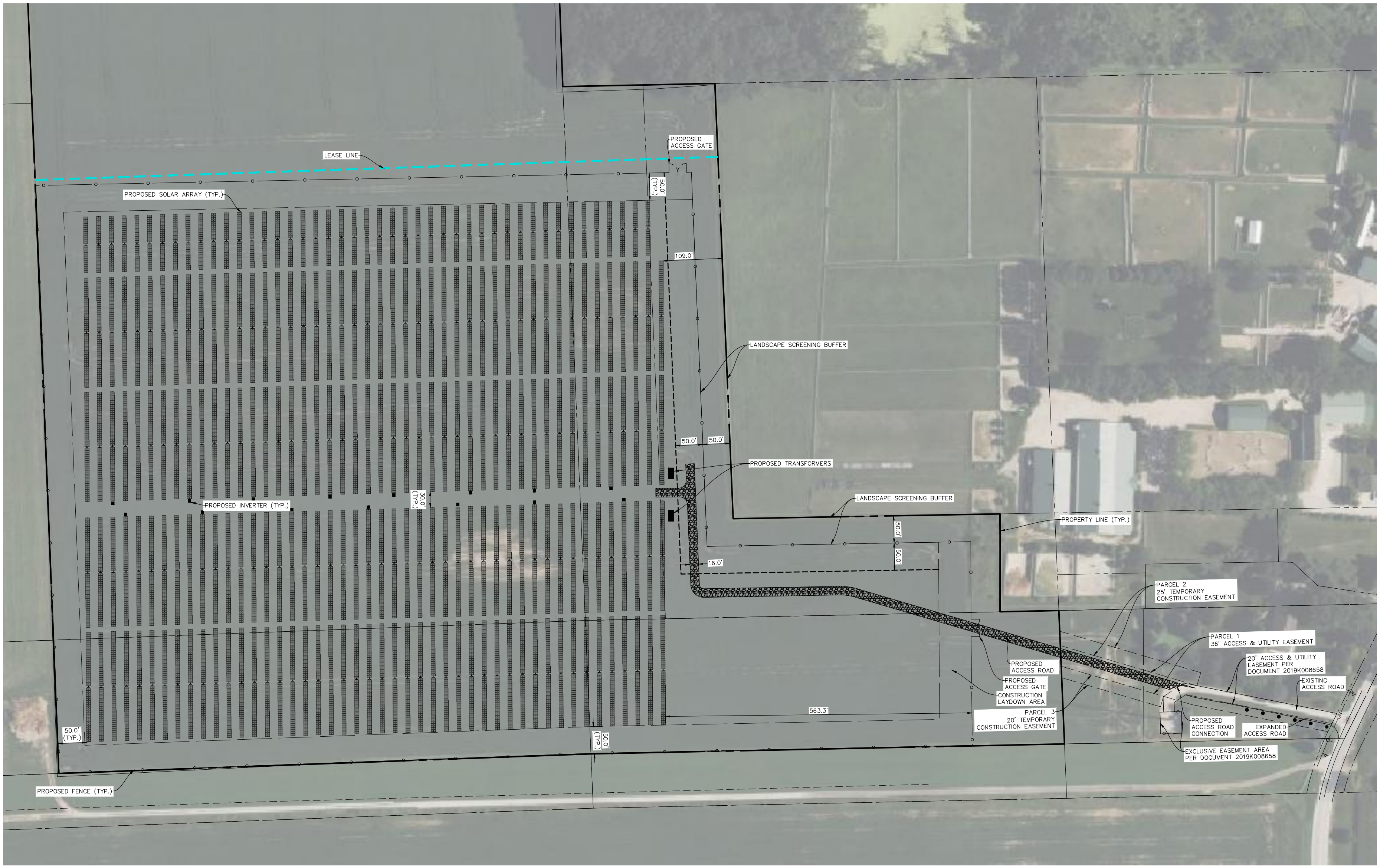
Figures

SITE DATA	
SITE AREA	37 ACRES
DRIVEWAY AREA	0.44 ACRES
SOLAR PANELS	10,738
EXISTING ZONE	F

LANDOWNER DATA
FENCING USED – 5,670–FT/1.07–MILES
NUMBER OF FENCE POSTS – 567
1–STRING TRACKERS – 45
2–STRING TRACKERS – 184

0 40 80 160
SCALE: 1"=80'

N



Manhard CONSULTING

1 East Wacker Drive, Suite 2700, Chicago, IL 60601 ph:312.824.3801 fx:847.634.0095 manhard.com

Civil Engineers • Surveyors • Water Resource Engineers • Water & Wastewater Engineers
Construction Managers • Environmental Scientists • Landscape Architects • Planners

DATE	REVISIONS	DRAWN BY

NESLER ROAD SOLAR LLC
KANE COUNTY, ILLINOIS
SITE PLAN

PROJ. MGR.:	MJC
PROJ. ASSOC.:	MJC
DRAWN BY:	MJC
DATE:	01/18/24
SCALE:	1"=80'

SHEET
SP-1
LRL.ELIL01

© 2024 MANHARD CONSULTING, ALL RIGHTS RESERVED

January 18, 2024 - 08:35 Dwg Name: P:\LrleIil01\dwg\Eng\Preliminary\Exhibits Eng\Site Plan Exhibit.dwg Updated By: MCallaghan

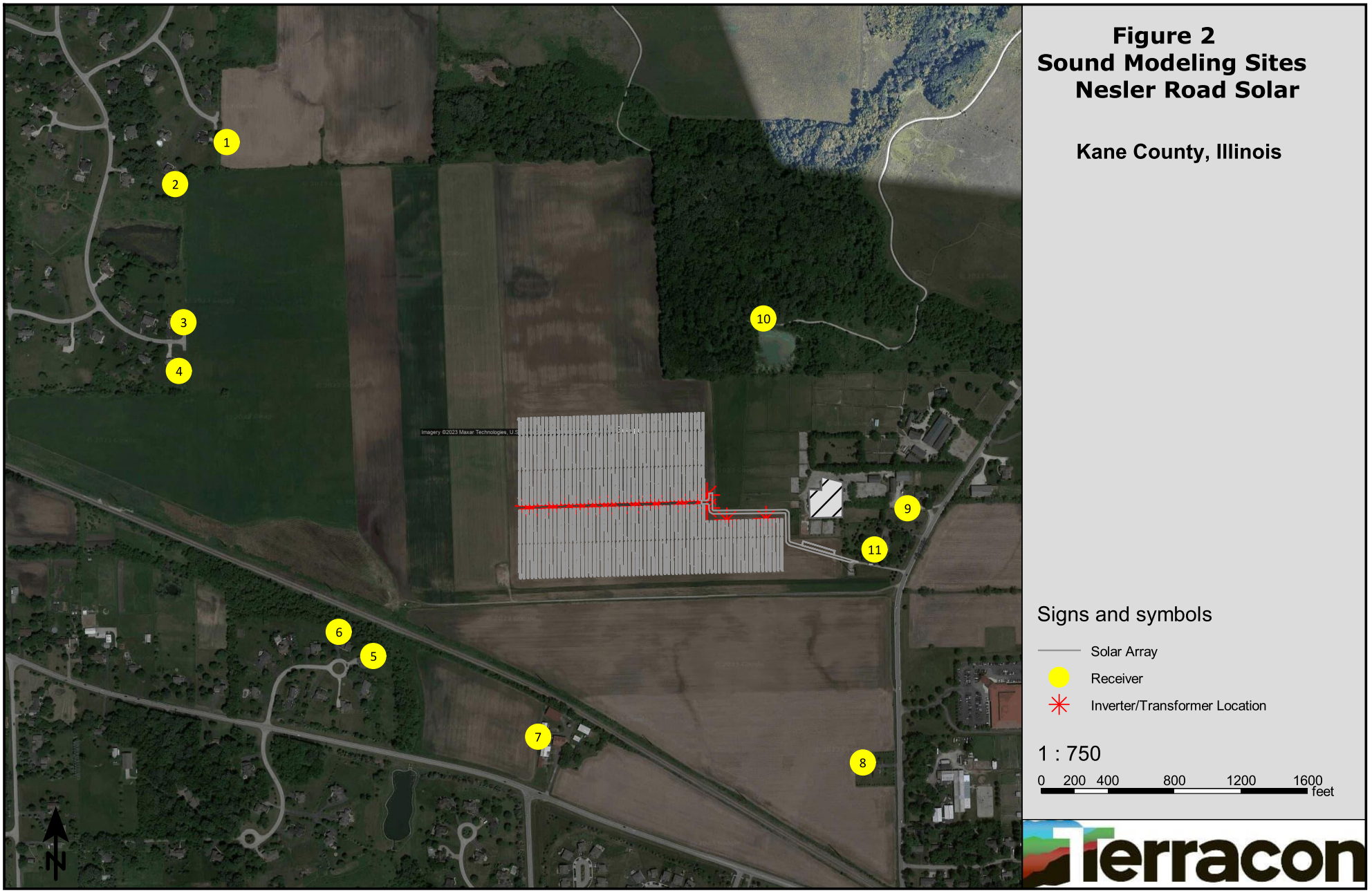


Figure 2
Sound Modeling Sites
Nesler Road Solar

Kane County, Illinois

Terracon

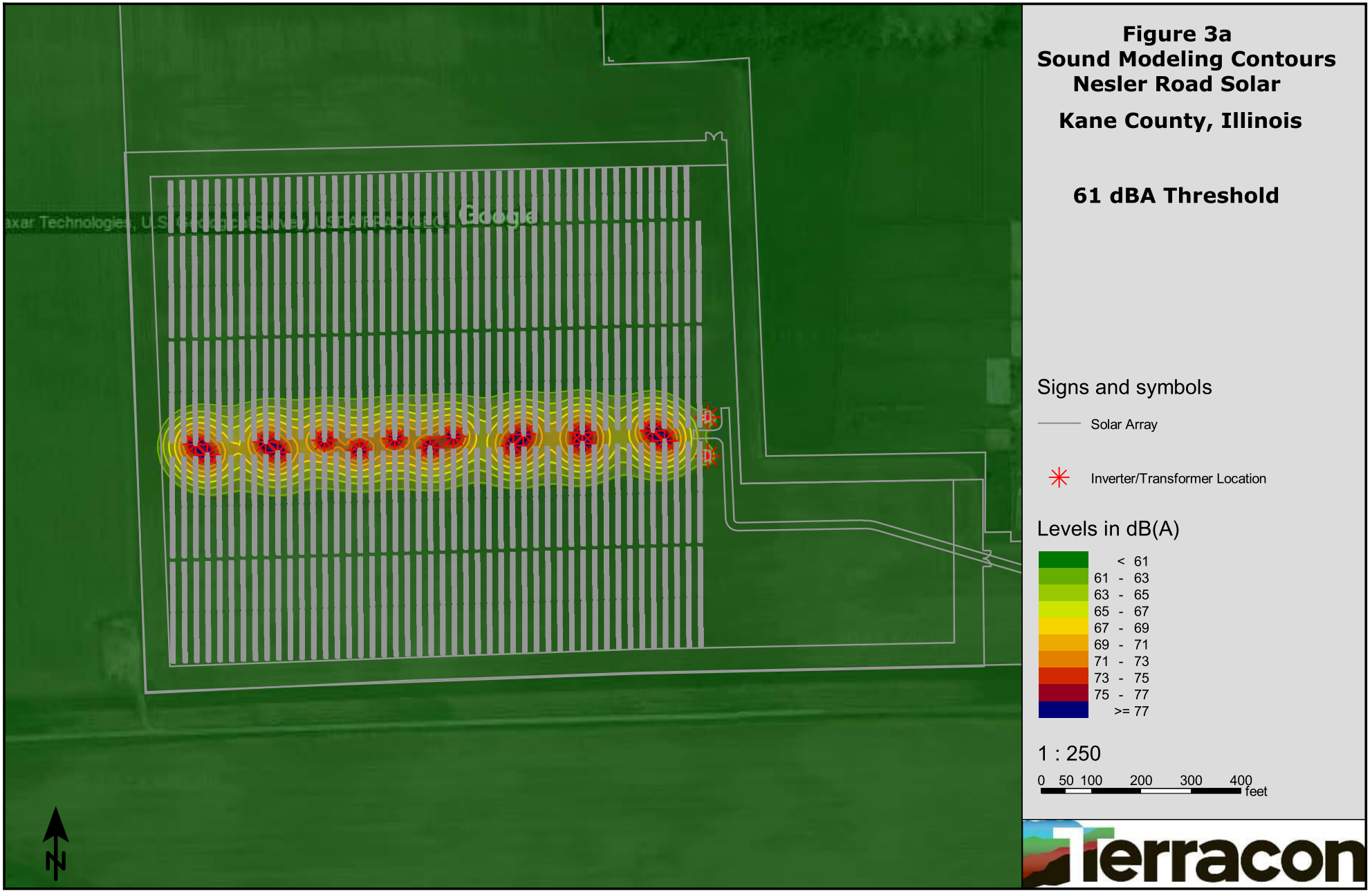


Figure 3a
Sound Modeling Contours
Nesler Road Solar
Kane County, Illinois
61 dBA Threshold
Signs and symbols
Solar Array
Inverter/Transformer Location
Levels in dB(A)
< 61
61 - 63
63 - 65
65 - 67
67 - 69
69 - 71
71 - 73
73 - 75
75 - 77
>= 77
1 : 250
0 50 100 200 300 400
feet
N
Terracon

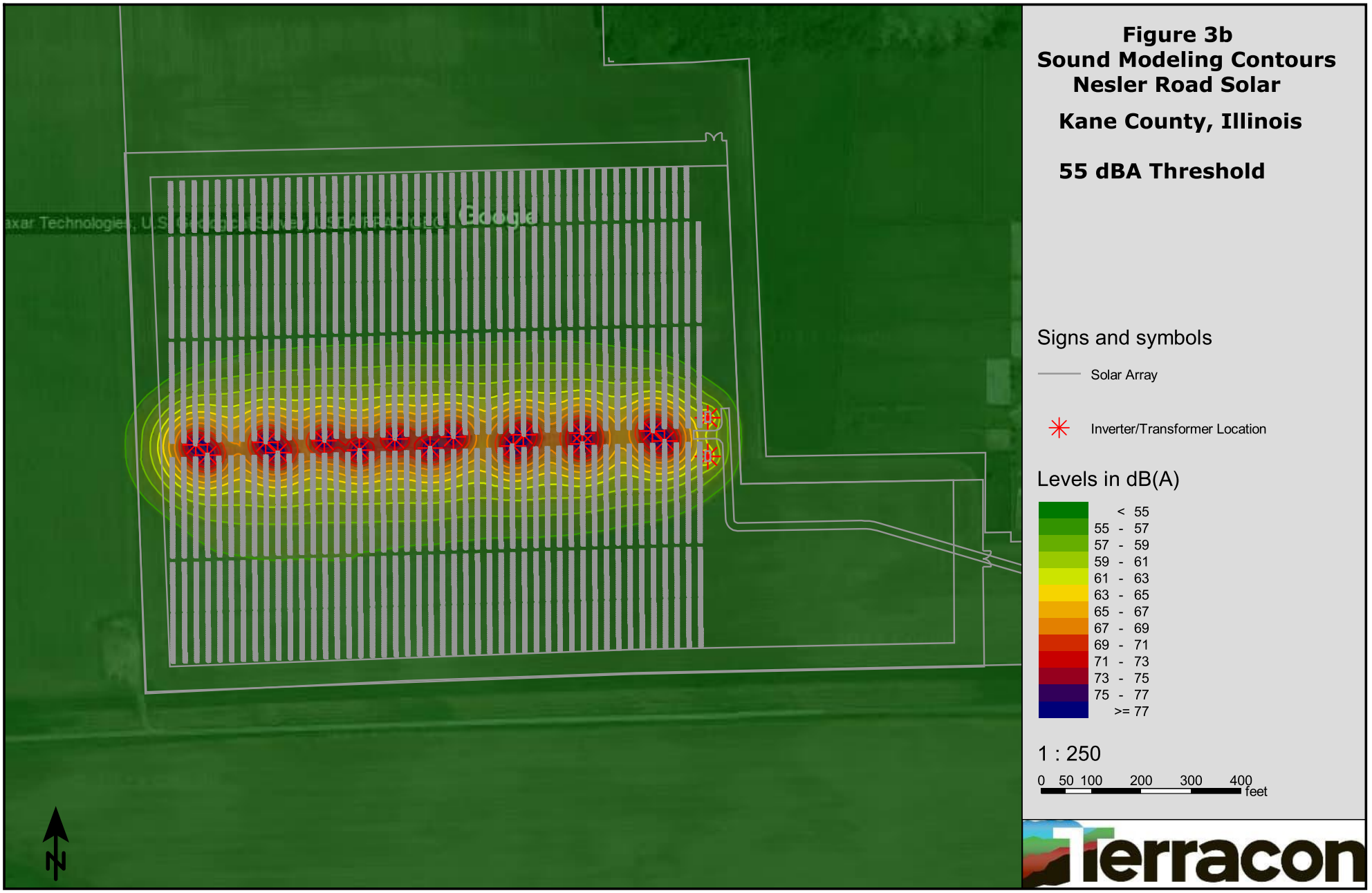


Figure 3b
Sound Modeling Contours
Nesler Road Solar
Kane County, Illinois
55 dBA Threshold
Signs and symbols
Solar Array
Inverter/Transformer Location
Levels in dB(A)
< 55
55 - 57
57 - 59
59 - 61
61 - 63
63 - 65
65 - 67
67 - 69
69 - 71
71 - 73
73 - 75
75 - 77
>= 77
1 : 250
0 50 100 200 300 400
feet
N
Terracon


Figure 3c
Sound Modeling Contours
Nesler Road Solar
Kane County, Illinois
55 dBA Threshold
Signs and symbols
Solar Array
Nesler Road
Inverter/Transformer Location
Levels in dB(A)
< 55
55 - 57
57 - 59
59 - 61
61 - 63
63 - 65
>= 65
1 : 500
0 125 250 500 750 1000
feet
N
Terracon

Attachments

Attachment 1 – RCNM Results

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/10/2023
Case Description: Nesler Road Solar

**** Receptor #1 ****

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
1000' Residential		45.0	45.0	45.0

Equipment

Description	Spec Impact Device	Actual Usage (%)	Receptor Lmax (dBA)	Estimated Lmax (dBA)	Distance (feet)	Shielding (dBA)
Backhoe	No	40	77.6	1000.0	0.0	
Dozer	No	40	81.7	1000.0	0.0	
Dump Truck	No	40	76.5	1000.0	0.0	
Crane	No	16	80.6	1000.0	0.0	
Pickup Truck	No	40	75.0	1000.0	0.0	
Tractor	No	40	84.0	1000.0	0.0	
Vibratory Pile Driver	No	20	100.8	1000.0	0.0	

Results

Noise Limits (dBA)			Noise Limit Exceedance (dBA)			Calculated (dBA)								
Day	Evening	Night	Day	Evening	Night	Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
						Backhoe	51.5	47.6	N/A	N/A	N/A	N/A	N/A	N/A
						Dozer	55.6	51.7	N/A	N/A	N/A	N/A	N/A	N/A
						Dump Truck	50.4	46.5	N/A	N/A	N/A	N/A	N/A	N/A
						Crane	54.5	46.6	N/A	N/A	N/A	N/A	N/A	N/A
						Pickup Truck	49.0	45.0	N/A	N/A	N/A	N/A	N/A	N/A
						Tractor	58.0	54.0	N/A	N/A	N/A	N/A	N/A	N/A
						Vibratory Pile Driver	74.8	67.8	N/A	N/A	N/A	N/A	N/A	N/A
						Total	74.8	68.2	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
2000' Commercial		45.0	45.0	45.0

Equipment

Description	Spec Impact Device	Actual Usage (%)	Receptor Lmax (dBA)	Estimated Lmax (dBA)	Distance (feet)	Shielding (dBA)

---------- ------ ----- ----- ----- -------- ---------
Backhoe No 40 77.6 2000.0 0.0
Dozer No 40 81.7 2000.0 0.0
Dump Truck No 40 76.5 2000.0 0.0
Crane No 16 80.6 2000.0 0.0
Pickup Truck No 40 75.0 2000.0 0.0 Tractor No 40 84.0 2000.0 0.0
Vibratory Pile Driver No 20 100.8 2000.0 0.0

Results

Noise Limits (dBA) Noise Limit Exceedance (dBA)

--- Calculated (dBA) Day Evening Night Day Evening Night ---
--- --- --- --- Equipment Lmax Leq Lmax Leq Lmax Leq Lmax Leq Lmax Leq Lmax Leq
--- --- --- --- --- --- --- --- --- --- --- --- Backhoe 45.5 41.5 N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A Dozer 49.6 45.6 N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A Dump Truck 44.4 40.4 N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A Crane 48.5 40.6 N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A Pickup Truck 43.0 39.0 N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A Tractor 52.0 48.0 N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A Vibratory Pile Driver 68.8 61.8 N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A Total 68.8 62.2 N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A

Attachment 2 – Sound Emission Data

250/275 kW, 1500 Vdc String Inverters for North America

CPS SCH275KTL-DO/US-800

The 250/275 kW high power CPS three-phase string inverters are designed for ground-mount applications. The units are high performance, advanced and reliable inverters designed specifically for the North American environment and grid. High efficiencies, wide operating voltages, broad temperature ranges and NEMA Type 4X enclosure enable this inverter platform to operate at high performance across many applications. The SCH275KTL inverters include a selectable active power of either 250 kW or 275 kW (factory default) with 12 MPPTs and are available with either 36 fused PV string inputs or 24 unfused PV string inputs. The CPS FlexOM solution enables communication, controls and remote product upgrades.

Key Features

- NFPA 70, NEC 2017/2020 compliant
- Touch-safe DC fuse holders adds convenience and safety
- CPS FlexOM Gateway enables remote firmware upgrades
- Integrated DC disconnect switches
- Protection functions for enhanced reliability and safety
- Selectable max AC active power of 250 kW or 275 kW
- UL 1741-SA certified to CA Rule 21, including SA14-SA18
- 12 MPPTs with 36 fused inputs or 24 unfused inputs
- Copper and Aluminum compatible AC connections
- NEMA Type 4X outdoor rated, tough tested enclosure
- Full power capacity up to 42°C
- Standard 5-year warranty with extensions to 20 years
- Supported comm protocols (Modbus RTU, TCP/IP, PLC)
- UL 1741-SB and IEEE 1547-2018 certified

C SA US

FC This device complies with part 15 of the FCC Rules

© CHINT POWER SYSTEMS AMERICA 2023/1-MKT NA

Chint Power Systems America
1380 Presidential Drive, Suite 100, Richardson, TX 75081
Tel: 855-584-7168 Mail: AmericaSales@chintpower.com Web: www.chintpowersystems.com

Model Name	CPS SCH275KTL-DO/US-800-36	CPS SCH275KTL-DO/US-800-24
DC Input		
Max. DC input voltage	1500 V	
Operating DC input voltage range	500-1450 Vdc	
Start-up DC input voltage / power	550 Vdc / 500 W	
MPPT voltage range @ PF>0.99[1]	900-1300 Vdc	
Number of MPP trackers	12	12
Max. PV input current (clipping point)	26 A per MPPT	26 A per MPPT
Max. PV short-circuit current	600 A, 50 A per MPPT	600 A, 50 A per MPPT
Number of DC inputs	36 fused inputs, 3 per MPPT	24 non-fused inputs, 2 per MPPT
DC disconnection type	Load-rated DC switches	
DC surge protection	Type II	
AC Output		
Max AC output power (selectable) @ PF>0.99	250 kW / 275 kW	
Max. AC apparent power	275 kVA	
Rated output voltage	800 Vac	
Output voltage range[2]	704-880 Vac	
Grid connection type	3-phase / PE	
Max. AC output current @ 800 Vac	198.5 A	
Rated output frequency	60 Hz	
Output frequency range[2]	57 - 63 Hz	
Power factor	>0.99 (±0.8 adjustable)	
Current THD @ rated load	<3%	
Max. fault current contribution (1 cycle RMS)	215.2 A	
Max. OCPD rating	300 A	
AC surge protection	Type II	
System and Performance		
Max. efficiency	99.0%	
CEC efficiency	98.5%	
Stand-by / night consumption	5 W	
Environment		
Enclosure protection degree	NEMA Type 4X	
Cooling method	Variable speed cooling fans	
Operating temperature range[3]	-22°F to +140°F / -30°C to +60°C (derating from +107°F / +42°C)	
Non-operating temperature range[3]	-40°F to +140°F / -40°C to +60°C	
Operating humidity	0-100%	
Operating altitude	8202 ft / 2500 m (no derating)	
Audible noise	<80 dBA @ 1 m and 25°C	
Display and Communication		
User interface and display	LED indicators, WiFi + App	
Inverter monitoring	Modbus RS485 / Ethernet TCP/ IP[4] / PLC[5]	
Site-level monitoring	CPS FlexOM (1 per 32 inverters)	
Modbus data mapping	SunSpec / CPS	
Remote diagnostics / firmware upgrade functions	Standard / (with FlexOM Gateway)	
Mechanical		
Dimensions (H x W x D)	27.2 x 41.3 x 15.7 in (690 x 1050 x 400 mm)	
Weight	Approx. 262 lbs (119 kg)	
Mounting / installation angle	Vertical installation	
AC termination	Stud type terminal (wire range: 3/0 AWG – 750 kcmil AL/CU, lugs not supplied)	
DC termination	36 fused input: screw clamp fuse holder (wire range: #14 - #8 AWG CU) 24 non-fused input: screw clamp terminal (wire range: #14 - #8 and #6 - #4 AWG CU)[6]	
Fused string inputs (3 per MPPT)[7]	20 A fuses provided (fuse values up to 30 A acceptable)	
Safety		
Certifications and standards	UL 1741-SA/SB Ed. 3, CSA-22.2 NO.107.1-16, IEEE 1547a-2014, IEEE 1547-2018, FCC PART 15	
Selectable grid standard	IEEE 1547a-2014, IEEE 1547-2018, CA Rule 21, ISO-NE	
Smart-grid features	Volt-RideThru, Freq-RideThru, Ramp-Rate, Specified-PF, Volt-VAR, Freq-Watt, Volt-Watt	
Protection Functions		
IV curve tracing[8]	Yes	
Insulation resistance monitoring	Yes	
Onboard fault oscillography	Yes	
PV MPPT current monitoring	Yes	
Residual current monitoring	Yes	
Input reverse polarity protection	Yes	
Output overcurrent protection	Yes	
Output short-circuit protection	Yes	
Output overvoltage protection	Yes	
Warranty		
Standard	5 years	
Extended terms	10, 15 and 20 years	

1) See user manual for information regarding MPPT voltage range when operating at non-unity PF.
2) The output voltage and frequency ranges may differ according to the specific grid standard.
3) See user manual for further requirements regarding non-operating conditions.
4) CPS FlexOM Gateway required for Ethernet Modbus TCP/IP communication.
5) CPS AC-PLC Kit required for AC PLC communication.
6) One threaded hole per MPPT for connecting #6 - #4 AWG CU.
7) Fused string inputs only applicable to the SCH275KTL 36-input model.
8) CPS FlexOM Gateway and Portal access required for IV curve tracing.

Larson Electronics LLC
9419 E US HWY 175, Kemp, TX 75143
Phone: 800.369.6671

www.LarsonElectronics.com
Email: sales@LarsonElectronics.com
Fax: 903.498.3364

MT-PML-R2-3P-DMA-2.5MVA-YE-LT-DF-A6-BB-AZ-2B4-M1

2.5 MVA Pad Mount Transformer - 34500V delta Primary, 480Y/277 Wye Secondary - KNAN/Bell Green

Product ID: 268942

Please see last page for supporting documentation for this product(certificates, CAD files & drawings, IES files, wiring diagrams, etc).

Larson Electronics LLC manufactures a wide variety of products, including custom built to spec designs. The pictures displayed for this unit are a general representation of form factor for the product line and may not accurately represent this exact configuration in every detail due to custom builds and changes between similar products in our standard catalog. The specifics for this configuration are listed in the specification table and supporting documentation (CAD files, Dimensional Drawing, Name Plate Diagram, Wiring Diagram, etc.). This means that specific details (receptacles, plugs, wires, connections, mounting brackets, external finishes, etc.) may not be accurately represented in images vs specifications. Please review specifications and do not order based solely on images.

MT-PML-R2-3P-DMA-2.5MVA-YE-LT-DF-A6-BB-AZ-2B4-M1 3PH Pad Mount Transformer

Transformer Type: Pad Mounted, Compartmental-Type
Transformer Configuration: Liquid Filled Pad Mounted
Transformer Feed Type: Loop Feed
Operation: Step-Down Operation (Not Approved for Step-Up)
Phase: Three Phase
Capacity: 2.5 MVA (2500 KVA)
Vector Group: DYN1
Primary Voltage: 34500V
Primary Voltage Switch: N/A
Primary Voltage Class: 35 kV Class
Primary Phasor: Delta
Primary BIL: 150 KV
Secondary Voltage: 480Y/277
Secondary Voltage Class: 1.2 kV Class
Secondary Phasor: Wye-N
Secondary BIL: 30 KV
Frequency: 60 Hz
Temperature Rise: 65°C
Insulation Rating: Class E Insulation - 120°C, 248°F
Cooling Class: KNAN; Self-Cooled
Forced Air (Fans): None
Tap Changer: 5-position Tap Changer
Tap Qty: (2) FCAN Above Taps, (2) FCBN Below Taps
Tap %: 2.5%

Ratings

Meets/Exceeds DOE 2016 Efficiency Ratings
Meets/Exceeds CSA Efficiency Ratings
Complies with ANSI / IEEE C57.12.00
Complies with ANSI / IEEE C57 12.28
Complies with ANSI / IEEE C57 12.29
Complies with ANSI / IEEE C57 12.34
Complies with ANSI / IEEE C57 12.35
Complies with ANSI / IEEE C57.12.70
Complies with ANSI / IEEE C57.12.110
Complies with ANSI / IEEE C57.12.131
Complies with ANSI / IEEE C62.11
Complies with ANSI / IEEE C62.22
Complies with ANSI / IEEE 386
Complies with ANSI / IEEE C2
Complies with ANSI / IEEE C37.47
Complies with ANSI Z535.4
Complies with ASTM D3487
Complies with ASTM D6871
Complies with NEMA 260-1996
Complies with 10 CFR Part 431
Complies with CSA C2.1-06
Complies with CSA C50
Complies with CSA C88
Complies with CSA C88.1

Tap Changer Switch Rating: 600-Amp, 35 kV
Tap Changer Switch Location: High Voltage (HV) [Left Side] Front Compartment
Impedance: 5.0-7.5% Typical, Target 5.75%
Primary Connection Type: Dead Front
Primary Termination Arrangement: V Terminal Arrangement
Primary Termination: Externally Clamped Integral Bushings w/ Removable Studs, 600A Dead Break Elbows
Primary Connection Qty: (6) Primary Connections for use w/ Elbow Connectors
Primary Parking Stand Qty: (6) Welded Brackets for Installing Accessory Parking Stand Bushings
Primary Bushing Rating: 35 kV Class, 150 kV BIL, 600A, Dead Break, IEEE 386 Color Brown
Primary Neutral Connection: Primary HO Neutral Internally Bonded to Tank
Primary Surge Arrestors: (3) High Voltage Elbow Surge Arrestors, Included
Primary Surge Arrestor Voltage Rating: 45 kV Class Elbow Arrestor
Primary Surge Arrestor MCOV Rating: 36.5 kVrms
Primary Over Current Protection (OCP): Bayonet Expulsion Fuse in series w/ Partial-Range Current-Limiting Fuse
Primary Over Current Protection Method: Fused, Oil-Immersed
Primary Over Current Protection Holder: Bayonet Fuse Holder w/ Flapper Valve and External Drip Shield
Primary Grounding Provisions: (1) NEMA Ground Bar attached to tank via (2) Welded Ground Bungs in HV Cabinet
Secondary Connection Type: Live Front
Secondary Termination Arrangement: Staggered Terminal Arrangement
Secondary Connections: NEMA Spade Terminals, 10-Hole Spade, Externally Clamped, Accepts up to (10) Double Lug connections with (5) cables per side of Spade connector
Secondary Connection Qty: (4) Externally Clamped One-Piece Epoxy Bushings Copper Threaded Studs
Secondary Connection Supports: N/A
Secondary Over Current Protection (OCP): N/A
Secondary Neutral Connection: Secondary X2 Neutral Grounded to Tank via 1/2”-13 UNC Tapped Hole, 7/16” Deep Bung & Copper Ground Strap
Secondary Grounding Provisions: (1) NEMA Ground Bar attached to tank via (2) Welded Ground Bungs in LV Cabinet
Metering Current Transformer (CT): N/A
Metering Panel: N/A
Auxiliary Control Panel : N/A
Load Break Switch: 4-Position Load Break Switch
Load Break Switch Qty: (1)
Load Break Switch Rating: 600-Amp, 35 kV
Load Break Switch Location: High Voltage (HV) Front Compartment
Efficiency Standard(s): Meets DOE 2016 Standards, Meets CSA Standards Meets ANSI/IEEE Standards
K-Factor Rating (Harmonic Mitigation): K-1 (Standard)
Pulse Drive Rating: N/A
Insulation Fluid: Biodegradable Natural Vegetable Oil Ester Insulating Fluid - Non-PCB Fluid
Fluid (Oil) Capacity*: 310 Gallons
Fluid (Oil) Weight*: 2,410 lb
Liquid Level Indicator: Analog Dial Gauge
Temperature Indicator: Analog Dial Gauge
Pressure/Vacuum Indicator: Analog Dial Gauge
Pressure Relief Device: Included, Automatic Action
Fault Indicator: N/A
Gas Sampler Valve: Included, Schrader Valve
Fill Valve: 1" NPT Port w/ Removable Bolt Plug
Fill Valve Location: Front Compartment
Drain Valve: 1" NPT Port w/ 5/8" NPT Sampler Valve
Drain Valve Location: Front Compartment
Winding Material: Aluminum
Ambient Temperature Rating: 40°C
Ambient Operating Temperature Range: -40°C to +40°C (-50°F to +104°F)

Sound Level: 62 dBA

Elevation (Altitude): 3300ft (1000 meters) Above Sea Level
Core Material: Grain Oriented Steel
Tank Material: Coated Steel
Cabinet Material: Coated Steel
Base Platform Material: Coated Steel
Portability: Lifting lugs, provisions for jacking under base, w/ base construction

Complies with CSA C88-16
Complies with CSA C227.4
Complies with CSA C227.5
Complies with CSA C802-3
Complies with CSA C802.1

Features

Pentahead Bolt Entry Assembly

High-Fire Point Insulating Fluid

Non-PCB Insulating Fluid
Tamper Proof Housing
Hinged Front Compartment Doors, Pad Lockable
NEMA 3R Wiring Compartment

Hot Stick Included, HV Door Mount

Efficiency %: 99.40%

Based on transformer operating at 50% of nameplate base kVA.

Load Losses Based on 85°C Reference Temp.

No Load Loss (in watts): +/- 2,700W

Full Load Loss (in watts) at 100%: +/- 15,500W

Total Load Loss (in watts) at 100%: +/- 18,200W

Total Losses at 55°C LL Temp.& 20°C NL Temp.

Total Load Loss (in watts) at 50%: +/- 6,408W

Note: Losses offered are typical only, not guaranteed

Labeling:

Externally Stencilled (Painted) KVA Rating
Externally Stencilled (Painted) Voltage Rating
External Non-PCB Label
External Warning & Danger Label

External Barcode Label

Internal Busing & Accessory Labeling
Stainless Steel Riveted Nameplate

Factory Tests:

Winding Resistance Test
Insulation Resistance Test
Voltage Ratio Error Test
Short-circuit Impedance Test
No-load Loss (Wattage) Test
Load Loss (Wattage) Test
Induced Voltage Withstand Test
Separate Source Voltage Withstand Test
Pressure Integrity Test Test

Shipping:

Shipped on pallet on open flatbed
Palletized on Wooden Pallet w/ Skid Pockets
Pallet Skid Facing Outward Sides of Truck
Note: Crated shipping in lieu of palletizing can be done upon request for an additional fee

suitable for using rollers or skidding
Housing Type: Compartmental Air-Filled Cabinet w/ Locking Doors, HV Compartment Left, LV Compartment Right, Steel Barrier Separation, HV Door Spring-Loaded Release Pin in LV Compartment
Enclosure Rating: NEMA 3R Weatherproof Wiring Cabinet, Sealed Tank
Seismic Rating: Yes
Paint Type: Weatherproof and UV Resistant Epoxy Coating and Undercoating
Finish Color: Munsell™ 7.0 GY 3.29/1.5 Bell Green
Mounting: Pad Mounted
Conduit Opening: Bottom Feed Underground Entry/Exit
HV Compartment Base Wireway Dimensions*: -"-W x -"-D
LV Compartment Base Wireway Dimensions*: -"-W x -"-D
MV/LV Compartment Cabinet Depth*: -"-D
Tank Cover Access Handhole: N/A
Dimensions*: -"-W x -"-D x -"-H
Dry Weight (w/o Oil)*: - lb
Total Weight (Liquid Filled)*: - lb
*Please note that numbers are approximate and subject to change

Special Orders - Requirements
Contact us for special requirements
Toll Free: 1-800-369-6671
Intl: 1-214-616-6180
Fax: 1-903-498-3364
E-mail: sales@larsonelectronics.com

The MT-PML-R2-3P-DMA-2.5MVA-YE-LT-DF-A6-BB-AZ-2B4-M1 from Larson Electronics is an Industrial Pad Mount Transformer that offers powerful, reliable, and efficient power distribution in indoor, outdoor, and public locations. The low operating costs, low heat emissions, and low cost of ownership makes this transformer ideal for a wide range of applications and businesses. An enclosed design caters to installations on concrete pads without protective fencing.
PLEASE NOTE: ANY FREE SHIPPING OFFERS DO NOT APPLY TO POWER DISTRIBUTION PANELS, TRANSFORMERS, OR SUBSTATIONS*
Transformer Features: With a transformer rating of 2500 KVA (2.5 MVA), the industrial transformer features a primary voltage of three-phase 34500V Delta and a secondary voltage of three-phase 480Y/277 Wye. The unit has a primary loop feed for single installations and dead-front primary connections. This transformer features a 5-position tap changer with two, +/- 2.5% taps above and two, +/- 2.5% taps below to allow small changes for voltage. There are no load break switches, rapid rise relays and protection fuses present on the system.
Aluminum transformer winding material helps improve performance, reduce weight and lower cost. Compared to copper, aluminum windings have lower eddy losses due to higher resistivity. This transformer consists of rectangular coil and five-legged wound core design with three coils and four core loops (this is for three-phase transformers only; single-phase units have one coil and two core loops).
The MT-PML-R2-3P-DMA-2.5MVA-YE-LT-DF-A6-BB-AZ-2B4-M1 is air cooled and does not have fans or mounting provision for fans.
Enclosure Design: This pad mounted transformer is a compartmental design. The tank and housing are fabricated from steel. The front electrical enclosure carries a NEMA 3R rating. The high voltage and low voltage compartments are located in front of the transformer tank, with the high voltage compartment on the left side and low voltage compartment on the right side. The HV and LV compartments are air filled and separated by a full length steel barrier between the compartments. A removable steel plate at the base of the HV and LV compartments prevents rodents and other intrusions from entering the enclosure once installed. This steel plate allows for underground conduit entry into the enclosure compartments. Two hinged exterior doors allows for access into the compartments. A single pad lockable handle on the low voltage compartment door allows for securing the transformer. A spring loaded pin within the low voltage compartment prevents the high voltage door from being opened without pulling the safety pin. A hot stick is included in the high voltage compartment, mounted to the HV door.
Temperature Rise: This unit features 65°C temperature rise for reduced heat waste, increased reliability and longer life. At 65°C temperature rise, the transformer offers 2500 KVA (2.5 MVA). The transformer meets standard efficiency requirements. The combination of low temperature rise and high

efficiency makes this unit suitable for use in electrical rooms, air conditioned spaces in buildings, underground vaults and similar locations, in addition to outdoor areas.
Insulation Fluid: The MT-PML-R2-3P-DMA-2.5MVA-YE-LT-DF-A6-BB-AZ-2B4-M1 features biodegradable cooling fluid (KNAN) with a capacity of 310 gallons. We offer transformers with FR-3 oil fluid, if needed.
Biodegradable Fluid: Biodegradable cooling fluid (vegetable oil) has a higher heat capacity compared to mineral oil, making the liquid safer to use and more reliable during operations. Vegetable oil has a higher flash point and fire point than mineral oil, hydrocarbon oil, silicone oil and synthetic ester. This cooling fluid is also non-toxic and can tolerate higher breakdown voltages than mineral oil. When operating at high temperatures, biodegradable cooling liquid sustains up to 120% loan conditions, which helps preserve the transformer's lifespan and performance.
Gauges: The following gauges are included with the system: liquid level, temperature and pressure/vacuum gauges. Standard liquid level, temperature and pressure/vacuum gauges are analog, manual reading types. These gauges do not have auxiliary contacts.
Fault Pressure Devices: This transformer features an automatic action fault pressure device. Fault pressure devices are used to detect high rates of pressure rise within the tank.
Rapid Rise Relay: There are no rapid rise relays on the unit. This safety component is designed for protection when a rapid increase in tank pressure occurs. The relay is suitable for detecting sudden pressure fluctuations above predetermined safe limits.
Surge Arrestors: This system comes with high elbow surge arrestors on the primary side. Designed for over-voltage and transient voltage protection, the components prevent damage caused by lightning, internal switching or voltage surges. We can offer models without high elbow surge arrestors that have mounting provisions for customer-provided surge arrestors.
Valves: The MT-PML-R2-3P-DMA-2.5MVA-YE-LT-DF-A6-BB-AZ-2B4-M1 is equipped with a pressure relief valve, fill valve, and drain valve with sampler port.
Protection Fuses: This transformer does not contain protection fuses. For units without protection fuses, up stream protection is provided. We recommend provisions for protection fuses when possible, as blown fuses may require more frequent oil changes.
Mount: The heavy-duty enclosure makes the unit suitable for both indoor and outdoor applications. This power distribution system can be pad mounted on concrete pads.
Benefits: The MT-PML-R2-3P-DMA-2.5MVA-YE-LT-DF-A6-BB-AZ-2B4-M1 pad mount transformer offers many benefits to consumers. This transformer provides owners with significant energy savings, as well as offering environmental benefits. Higher efficiency not only extends the life of the transformer, but also turns into cost savings for owners in the form of lower energy bills and decreased cost of ownership.
Applications: General purposes, industrial sites, electrical rooms, underground vaults, manufacturing facilities, steel plants, offshore, commercial, military, processing plants, electric power distribution, utilities, public locations, and more. Larson Electronics is a manufacturer and as such can build stationary and portable transformer systems to your specifications. Although we carry several models of power distribution transformer systems, we can deliver custom ordered units almost as quickly as our prebuilt units. If this model does not meet your needs, please contact us at 1-800-369-6671 or sales@larsonelectronics.com to discuss your specific requirements.

Larson Electronics LLC
9419 E US HWY 175, Kemp, TX 75143
Phone: 800.369.6671

www.LarsonElectronics.com
Email: sales@LarsonElectronics.com
Fax: 903.498.3364

Frequently Asked Questions (FAQ)

Q. What type of transformers does Larson Electronics offer?

A. Larson Electronics offered dry type transformers and liquid filled transformers. For liquid filled transformers, Larson Electronics' offers overhead distribution transformers (utility pole mount), pad mounted distribution transformers (mounts to a concrete pad), pad mounted power transformers, underground submersible distribution transformers, and substation transformers.

Q. What are the main benefits of a liquid filled transformer?

A. Liquid filled transformers have higher energy efficiency, durability, short circuit strength, low sound level, lower maintenance costs, and longer useful life expectancy compared to dry type transformers.

Q. What types of transformer liquids does Larson Electronics use?

A. Larson Electronics offered mineral oil fluid (ONAN) and biodegradable fluid (KNAN). On request we can provide brand name FR3 fluid or other brand name fluids for additional cost and lead time. All fluids offered by Larson Electronics are non-PCB containing fluids.

Q. What is the difference between mineral oil (ONAN) and biodegradable fluid (KNAN)?

A. Mineral oil has a flash point of 147-165°C. Biodegradable insulation fluids have a higher flash point up to 350°C. Using biodegradable fluids reduce the risk of potential fire due to the transformer overheating. Utilizing biodegradable fluids extends the lifespan on the transformer due to better insulation, higher flash point, better moisture resistance, and higher maximum voltage breakdown points over mineral oils.

Q. What is the difference between FR3 fluid and biodegradable fluid?

A. Envirotemp FR3 is a brand name of biodegradable ester oils made by Cargill. Cargill is not the only manufacturer of biodegradable ester fluids used for cooling liquid filled transformers. Larson Electronics stocks RAPO biodegradable fluid that exceeds testing for ASTM D6871. Cargill Envirotemp FR3 can be used in substitution of the standard biodegradable fluid. This substitution will increase cost and lead times.

Q. Do Larson Electronics transformers contain PCB?

A. All dry-type and liquid filled transformers manufactured by Larson Electronics are PCB (polychlorinated biphenyl) free at the time of shipment. Mixtures of polychlorinated biphenyls (PCB's) were banned commercially for use as transformers cooling fluids in 1977 due to being toxic, bio-accumulative, not at all biodegradable, and difficult to dispose of safely. None of Larson Electronics transformers contain PCB and only use PCB-free fluids.

Q. What are the transformer ratings?

A. IEEE Std C57.12.20 (Overhead Type), IEEE Std C57.12.34 (Three-Phase Pad-Mounted Compartmental), IEEE Std C57.12.38 (Single-Phase Pad-Mounted), IEEE Std C57.12.36 (Distribution Substation Transformers). For more detailed list of standards, please see the ASTM Certificate 1 link.

Q. Is this transformer UL Listed? Is this transformer CSA Listed?

A. By default, no. The majority of medium voltage transformer installations do not require certification by a Nationally Recognized Testing Laboratory (NRTL) unless being installed inside a building. Medium voltage equipment is built to and complies to ANSI, ASTM, DOE, IEEE, and NETA standards. UL is one of multiple NRTLs per OSHA certification for testing

facilities for USA standards. CSA is one of multiple NRTLs per Canada certification standards. For an additional fee, we can submit your order for NRTL testing after completion of build. This testing service is per order, requires payment of testing fees, and will increase lead time.

Q. What is the lifespan of a transformer?

A. The average lifespan of a liquid filled transformer is 25 years. Many transformers will survive past the 25 year mark and are still in service for up to 35 years.

Q. What is the difference between Loop Feed and Radial Feed?

A. Radial feed Transformers will have three high voltage bushings (H1, H2, and H3). There is one bushing for each phase to allow for the incoming high voltage cables. On Wye and Grounded Wye connected Transformers, there will also be an H0 bushing. Loop feed Transformers will have six high voltage bushings (H1A, H2A, H3A, H1B, H2B, and H3B). There are two bushings for each phase. This allows the customer to connect all of their Transformers in a loop configuration. It will also allow the customer to bring two feeds to the Transformer. A four position switch can be used to switch between the A feed and the B feed.

Q. What is the difference between Dead Front and Live Front?

A. Live-front: The voltage-carrying parts are exposed. Live-front terminations have high voltage connectors, arresters, or fuses are exposed to the operator after cabinet has been opened. Dead-front: Often referred to as dead-front bushings. Safety is enhanced as there are no current-carrying parts exposed to the operator. For overhead distribution transformers and underground submersible transformers, live front is common. For pad mount transformers, the primary is typically dead front and the secondary is live front. Protection barriers can be added to live front pad mounted transformers.

Q. What is the difference between copper and aluminum windings inside the transformer?

A. Transformers wound with aluminum or copper wire have similar losses and performance. The choice of using copper or aluminum windings depends upon the application and the individual preferences. The type of winding material does not affect the transformer's reliability. A transformer's life is defined by the life of its insulation system.

Q. How many BTU's of heat does a transformer generate?

A. The heat a transformer generates is dependent upon the transformer losses. To determine air conditioning requirements multiply the sum of the full load losses (obtained from factory or test report) of all transformers in the room by 3.41 to obtain the BTUs/hour. For example: A transformer with losses of 2000 watts will generate 6820 BTUs/hour.

Q. Do you have to ground this transformer?

A. In most cases the enclosure of the transformer is grounded for safety reasons. However, a transformer will function properly without being grounded. Be sure to research all grounding requirements for your specific application against the NETA and NEC as well as any local electrical codes.

Q. What types of transformer protection are available?

A. For over-current protection, Larson Electronics offers Fuses, breakers and interrupters. For over-voltage protection, Larson Electronics offers arresters. Larson Electronics can provide both Primary and Secondary protection equipment.

Q. What is required for mounting this transformer?

A. For mounting requirements, please see the ASTM Certificate 2 link.

Q. Does my primary and secondary voltage matter for a transformer?

A. Yes, this matters greatly. For primary voltage, most transformers will be equipped with a tap changer for small primary voltage changes due to voltage drop for losses experienced in the transmission line. Some transformers will be equipped with dual voltage primaries with a voltage selector switch to choose which voltage to operate the transformer on. In both cases, these are designed to provide a steady output voltage. It is very important to confirm what voltage your primary voltage being delivered from the utility provider and what the required electrical voltage for the building or house is. You cannot only provide the KVA size, or the abbreviated primary voltage as there is not standardized voltage across the country and each region can be different. Once manufacturing has started, these cannot be changed.

Q. Where is the detailed dimensional drawing for this unit?

A. We can provide a feature drawing that shows accessories and estimated form factor. Due to the variety of options and varying voltages, an exact dimensional drawing for the specific unit you have ordered is not available until after purchase and engineering has completed the drawing for your sales order. We do not offer completed detailed engineered drawings before purchase. The feature drawings are detailed enough for concrete pad designs and preliminary engineering site designs.

Q. What is the warranty of this transformer?

A. 12 months from point of connecting electrical service to the transformer or 18 months from point of ordering, whichever comes first.

Q. Can this transformer be customized?

A. Yes, Larson Electronics allows for customization of all transformers. Please send customization requests to sales@larsonelectronics.com. If you have an engineered specification or engineered drawings, please provide those at the time of request.

Harmonized System (HS) Code: 85043300
Export Control Classification Number (ECCN): EAR99