Appendix K

Noise Technical Memorandum

Michael Baker INTERNATIONAL

We Make a Difference

MEMORANDUM

To: Lockhart Solar PV II, LLC

From: Eddie Torres, Michael Baker International
Danielle Regimbal, Michael Baker International

Date: October 13, 2021

Subject: Lockhart Solar PV II Project – Noise Technical Memorandum

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PURPOSE

The purpose of this technical memorandum is to evaluate potential short- and long-term noise and groundborne vibration impacts as a result of the Lockhart Solar PV II Project (Project), located in the unincorporated community of Hinkley, County of San Bernardino, California.

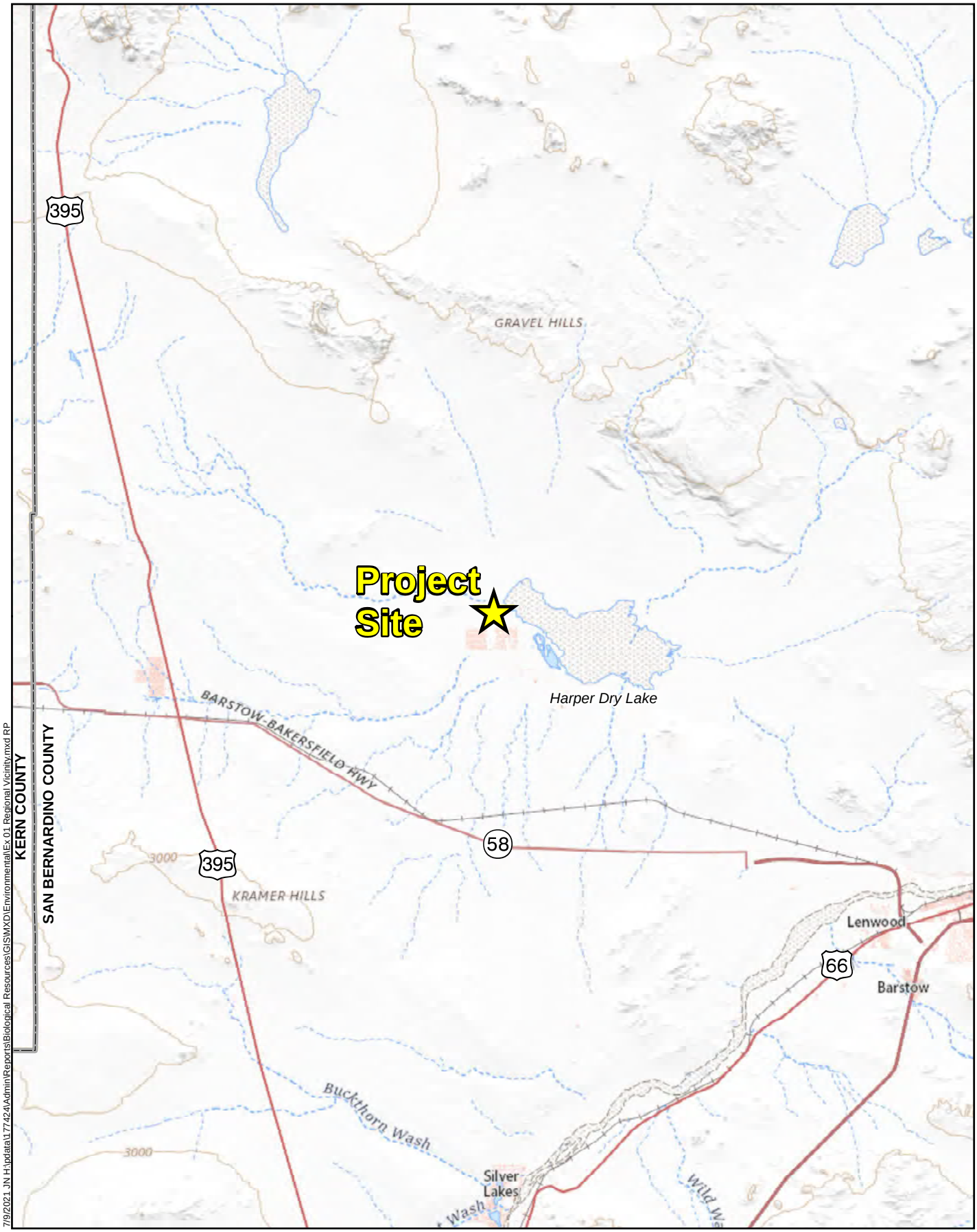
PROJECT LOCATION

The Project Site is located in unincorporated Hinkley, California, approximately 7 miles north of the intersection of Harper Lake Road and Mojave-Barstow Highway 58; refer to Exhibit 1, *Regional Vicinity*. The Project Site consists of three parcels, each of which contains vacant, previously disturbed land, miscellaneous concrete foundations, various electrical lines and poles, as well as existing facilities within the Shared Facilities Area. The Project Site is bordered on the south by the existing Solar Energy Generating System (SEGS) VIII and IX Solar Thermal Power Plants, which the County of San Bernardino (County) approved for repowering to photovoltaic (PV) solar and battery storage in 2019 as part of the Lockhart Solar I Facility (CUP Project #201900125 approved in 2019); Harper Lake Road to the east; Hoffman Road to the west; and vacant land to the north; refer to Exhibit 2, *Site Vicinity*. Vehicular access is currently provided via existing access gates off of Hoffman Road at the southern end of the Shared Facilities Area, as well as an existing access gate off of Harper Lake Road at the eastern end of the Project Site.

EXISTING SITE CONDITIONS

The Project Site consists of area within three parcels, each of which contain vacant, previously disturbed land or miscellaneous concrete foundations, various electrical lines and poles, as well as existing facilities within the Shared Facilities Area. The Project is largely sited on land previously approved by the California Energy Commission (CEC) for development of SEGS X, a solar thermal power facility for which construction was initiated but was never completed. The Project Site has been subject to near complete surface disturbance associated with past agricultural use, grading during initial construction of the SEGS X facility, as well as construction of the shared facilities area for the existing SEGS VIII and IX Solar Thermal Power

5 Hutton Centre Drive, Suite 500, Santa Ana, CA 92707
Office: 949.472.3505 | Fax: 949.472.8373



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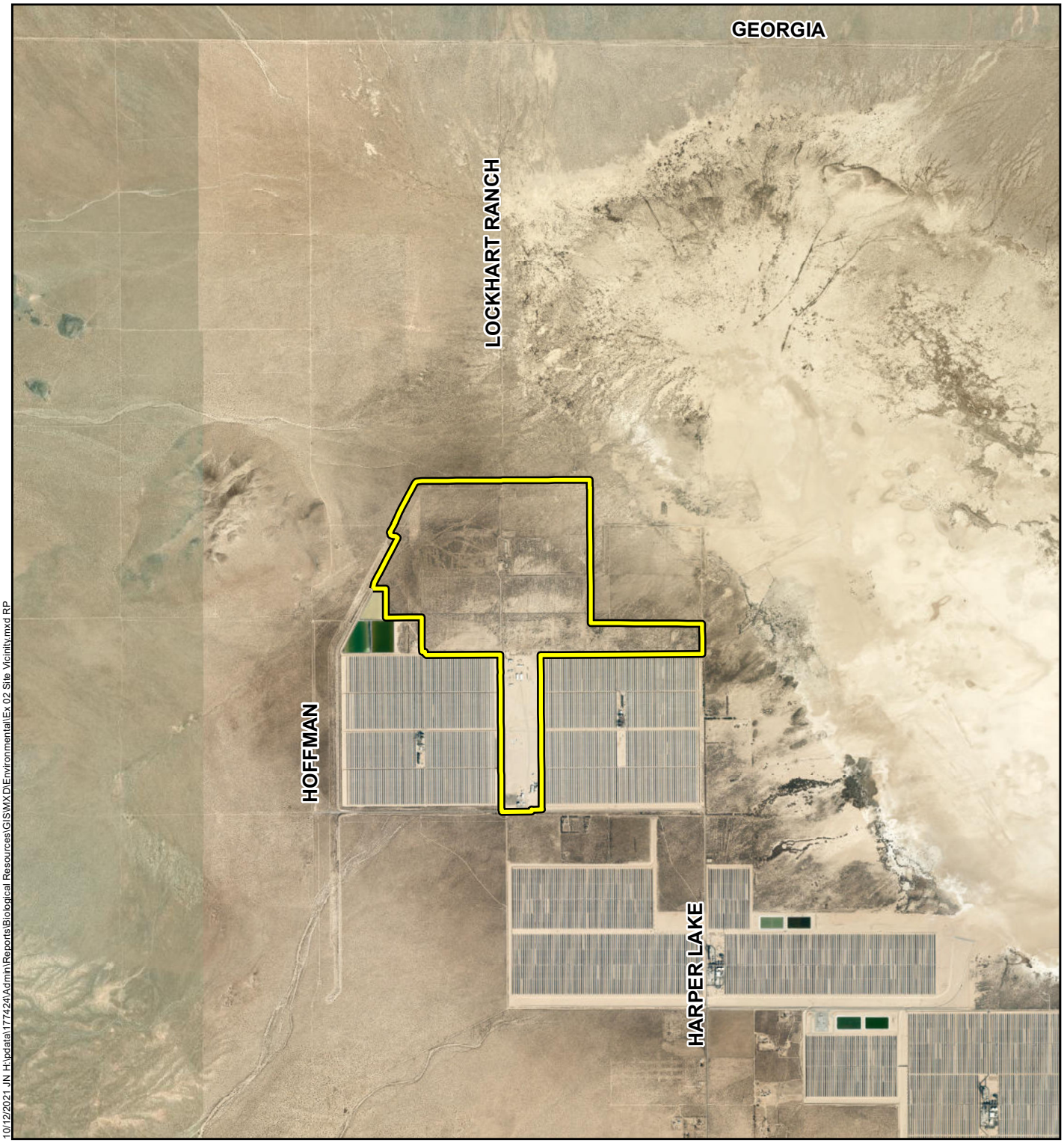
0 2.5 5 Miles

Source: ArcGIS Online, 2018

LOCKHART SOLAR PV II PROJECT
NOISE TECHNICAL MEMORANDUM

Regional Vicinity

Exhibit 1



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Legend

Project Site

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0 0.375 0.75 Miles

Source: Esri, 2020

LOCKHART SOLAR PV II PROJECT
NOISE TECHNICAL MEMORANDUM

Site Vicinity

Exhibit 2

Plants. Approximately 600-acres were identified for the SEGS X power plant including land for associated facilities to be shared with the two adjacent solar thermal power plants (SEGS VIII and IX). Prior to work stoppage, several concrete foundations for the power block as well as concrete foundations for solar racking had been installed in the central and southwest portions of the Project Site.

PROJECT DESCRIPTION

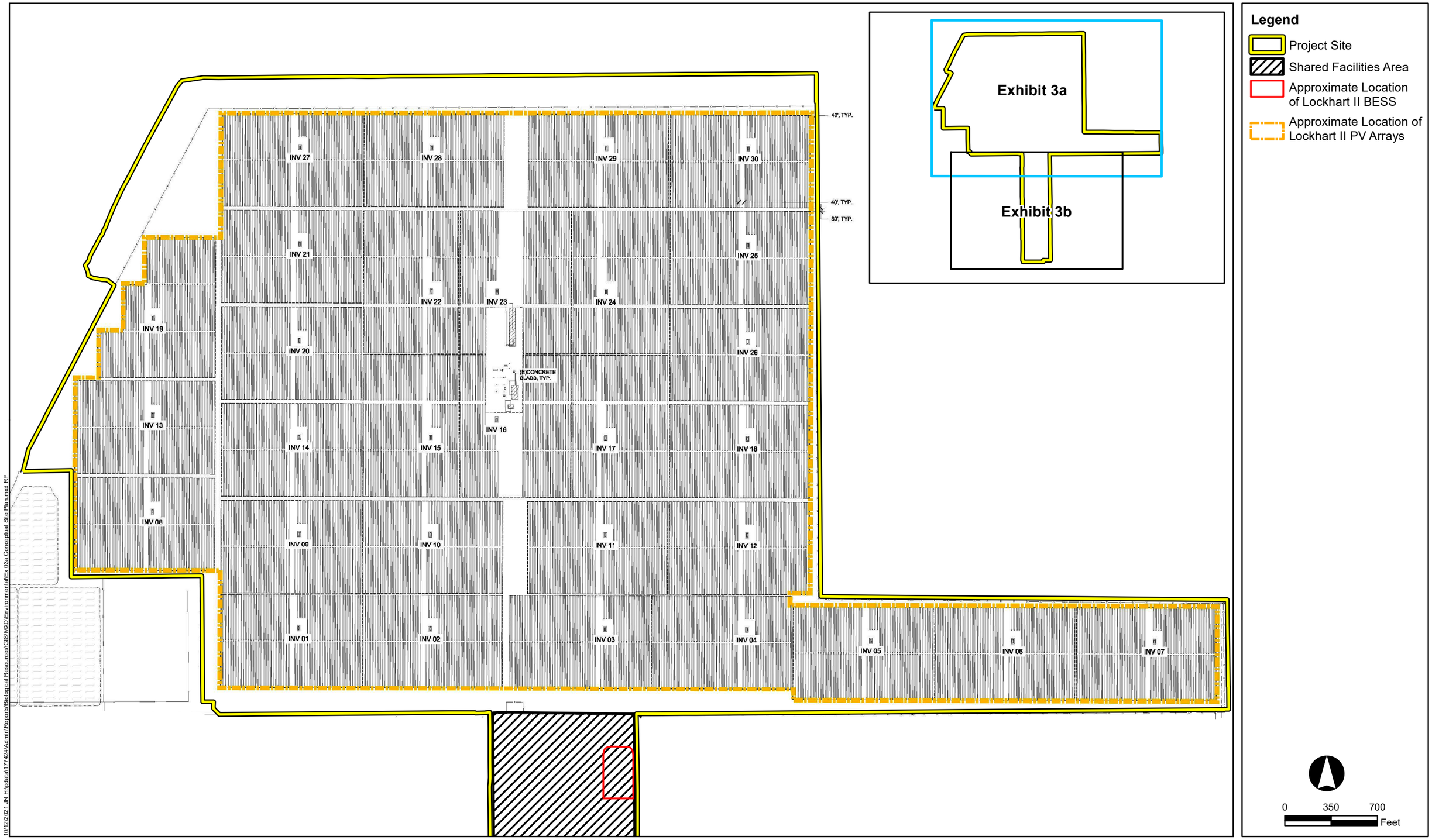
The Project includes the development of a utility scale, solar PV electricity generation and energy storage facility that would produce up to 150 megawatts (MW) of solar energy and include up to 4 gigawatt hours (GWh) of energy storage capacity rate in a battery energy storage system (BESS) within the approximately 755-acre Project Site; refer to Exhibit 3a, *Conceptual Site Plan: Solar Photovoltaic Facility* and Exhibit 3b, *Conceptual Site Plan: Shared Facilities Area*. Development includes demolition of existing SEGS X concrete foundations (as needed) to allow for construction of Project facilities. Concrete from SEGS X foundations would be demolished and exported from the Project Site for proper disposal at a licensed landfill.

The Project is bordered on the south by the approved Lockhart Solar I Facility and the existing SEGS VIII and IX Solar Thermal Plants. The Project would share existing operations and maintenance (O&M) facilities with the Lockhart Solar I Facility (i.e., O&M building, warehouse and employee building) and water and septic systems as well as switchyard and electrical transmission infrastructure, and a new collector substation (approved and to be constructed) within the Shared Facilities Area to connect the Project to the existing 13.8-mile transmission line which runs to the Southern California Edison (SCE)-owned Kramer Junction substation. The Shared Facility Area includes the already approved BESS for Lockhart Solar I (County permitted), BESS for SEGS IX (CEC permitted), and would include the BESS for the Project, as these facilities are integral to the collector substation. In addition, the already approved collector substation and the existing switchyard located within the Shared Facilities Area will be upgraded, as necessary. The Project is subject to conditional use permit (CUP) approval from the County.

Project construction is anticipated to be completed over a period of approximately 14 months. Project construction activities generally fall into three main categories: (1) site preparation, (2) system installation, and (3) testing, commissioning, and cleanup.

Typical O&M activities during Project operations include, but are not limited to, facility monitoring; administration and reporting; remote operations of inverters, BESS system and other equipment; site security and management; communication protocol; repair and maintenance of solar facilities, substation, electrical transmission lines, and other Project facilities; and periodic solar panel washing.

At the end of the Project's operational term, the Applicant may determine that the Project should be decommissioned and deconstructed, or it may seek an extension of its conditional use permit. The Applicant will work with the County to ensure decommissioning of the Project after its productive lifetime complies with all applicable local, state, and federal requirements and best management practices (BMPs). Equipment would be de-energized prior to removal, salvaged (where possible), placed in appropriate shipping containers, and secured in a truck transport trailer for shipment off site to be recycled or disposed of at an appropriately licensed disposal facility. Site infrastructure would be removed, including fences and concrete pads that may support the inverters, transformers, and related equipment. The exterior fencing and gates would be removed, and materials would be recycled to the extent feasible. Project roads would be restored to their pre-construction condition to the extent feasible unless the landowner elects to retain the improved roads for access throughout the property.



LOCKHART SOLAR PV II PROJECT
NOISE TECHNICAL MEMORANDUM

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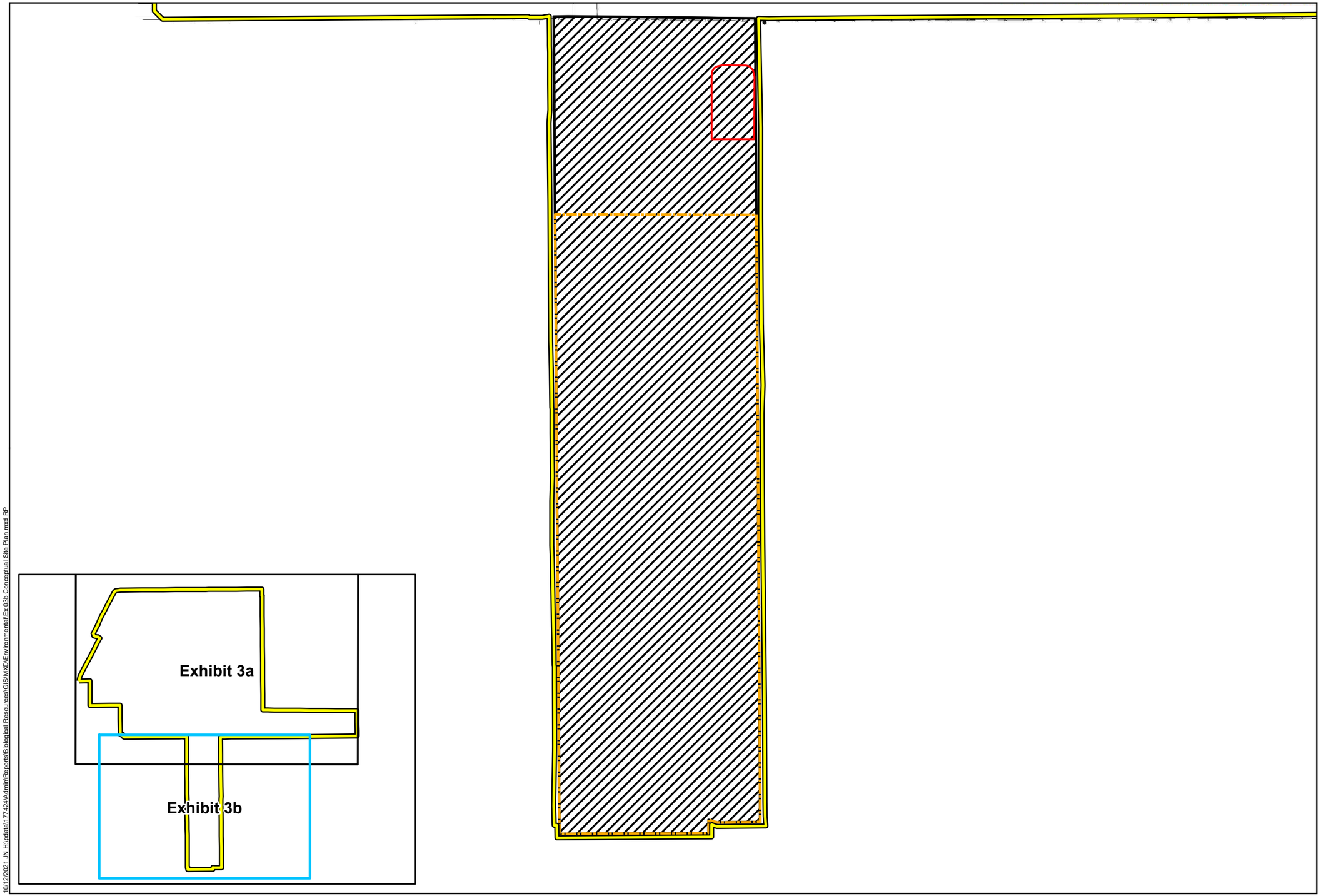
Conceptual Site Plan: Solar Photovoltaic Facility

Source: Cupertino Electric Inc.

Exhibit 3a



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Source: Cupertino Electric Inc.

LOCKHART SOLAR PV II PROJECT
NOISE TECHNICAL MEMORANDUM

Shared Facilities Area

Exhibit 3b

FUNDAMENTALS OF SOUND AND ENVIRONMENTAL NOISE

Sound is described in terms of the loudness (amplitude) of the sound and frequency (pitch) of the sound. The standard unit of measurement of the loudness of sound is the decibel (dB). Since the human ear is not equally sensitive to sound at all frequencies, a special frequency-dependent rating scale has been devised to relate noise to human sensitivity. The A-weighted decibel scale (dBA) performs this compensation by differentiating among frequencies in a manner approximating the sensitivity of the human ear.

Decibels are based on the logarithmic scale. The logarithmic scale compresses the wide range in sound pressure levels to a more usable range of numbers in a manner similar to the Richter scale used to measure earthquakes. In terms of human response to noise, a sound 10 dBA higher than another is perceived to be twice as loud and 20 dBA higher is perceived to be four times as loud, and so forth. Everyday sounds normally range from 30 dBA (very quiet) to 100 dBA (very loud). Examples of various sound levels in different environments are illustrated on Exhibit 4, *Common Environmental Noise Levels*.

Many methods have been developed for evaluating community noise to account for, among other things:

- The variation of noise levels over time;
- The influence of periodic individual loud events; and
- The community response to changes in the community noise environment.

Table 1, *Noise Descriptors*, provides a listing of methods to measure sound over a period of time.

Table 1
Noise Descriptors

Term	Definition
Decibel (dB)	The unit for measuring the volume of sound equal to 10 times the logarithm (base 10) of the ratio of the pressure of a measured sound to a reference pressure (20 micropascals).
A-Weighted Decibel (dBA)	A sound measurement scale that adjusts the pressure of individual frequencies according to human sensitivities. The scale accounts for the fact that the region of highest sensitivity for the human ear is between 2,000 and 4,000 cycles per second (hertz).
Equivalent Sound Level (L_{eq})	The sound level containing the same total energy as a time varying signal over a given time period. The L_{eq} is the value that expresses the time averaged total energy of a fluctuating sound level.
Maximum Sound Level (L_{max})	The highest individual sound level (dBA) occurring over a given time period.
Minimum Sound Level (L_{min})	The lowest individual sound level (dBA) occurring over a given time period.
Community Noise Equivalent Level (CNEL)	A rating of community noise exposure to all sources of sound that differentiates between daytime, evening, and nighttime noise exposure. These adjustments are +5 dBA for the evening, 7:00 a.m. to 10:00 p.m., and +10 dBA for the night, 10:00 p.m. to 7:00 a.m.

Table 1 (continued)
Noise Descriptors

Term	Definition
Day/Night Average (L_{dn})	The L_{dn} is a measure of the 24-hour average noise level at a given location. It was adopted by the U.S. Environmental Protection Agency for developing criteria for the evaluation of community noise exposure. It is based on a measure of the average noise level over a given time period called the L_{eq}. The L_{dn} is calculated by averaging the L_{eq}'s for each hour of the day at a given location after penalizing the "sleeping hours" (defined as 10:00 p.m. to 7:00 a.m.) by 10 dBA to account for the increased sensitivity of people to noises that occur at night.
Exceedance Level (L_n)	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% (L_{01}, L_{10}, L_{50}, L_{90}, respectively) of the time during the measurement period.
Source: Cyril M. Harris, *Handbook of Noise Control*, 1979.	

FUNDAMENTALS OF ENVIRONMENTAL GROUNDBORNE VIBRATION

Sources of groundborne vibration include natural phenomena (earthquakes, volcanic eruptions, sea waves, landslides, etc.) or man-made causes (explosions, machinery, traffic, trains, construction activities which require the use of heavy-duty equipment, etc.). Vibration sources may be continuous (e.g., factory machinery) or transient (e.g., explosions). The strength of groundborne vibration attenuates rapidly over distance. It is unusual for vibration from typical urban sources such as buses and heavy trucks to be perceptible.

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

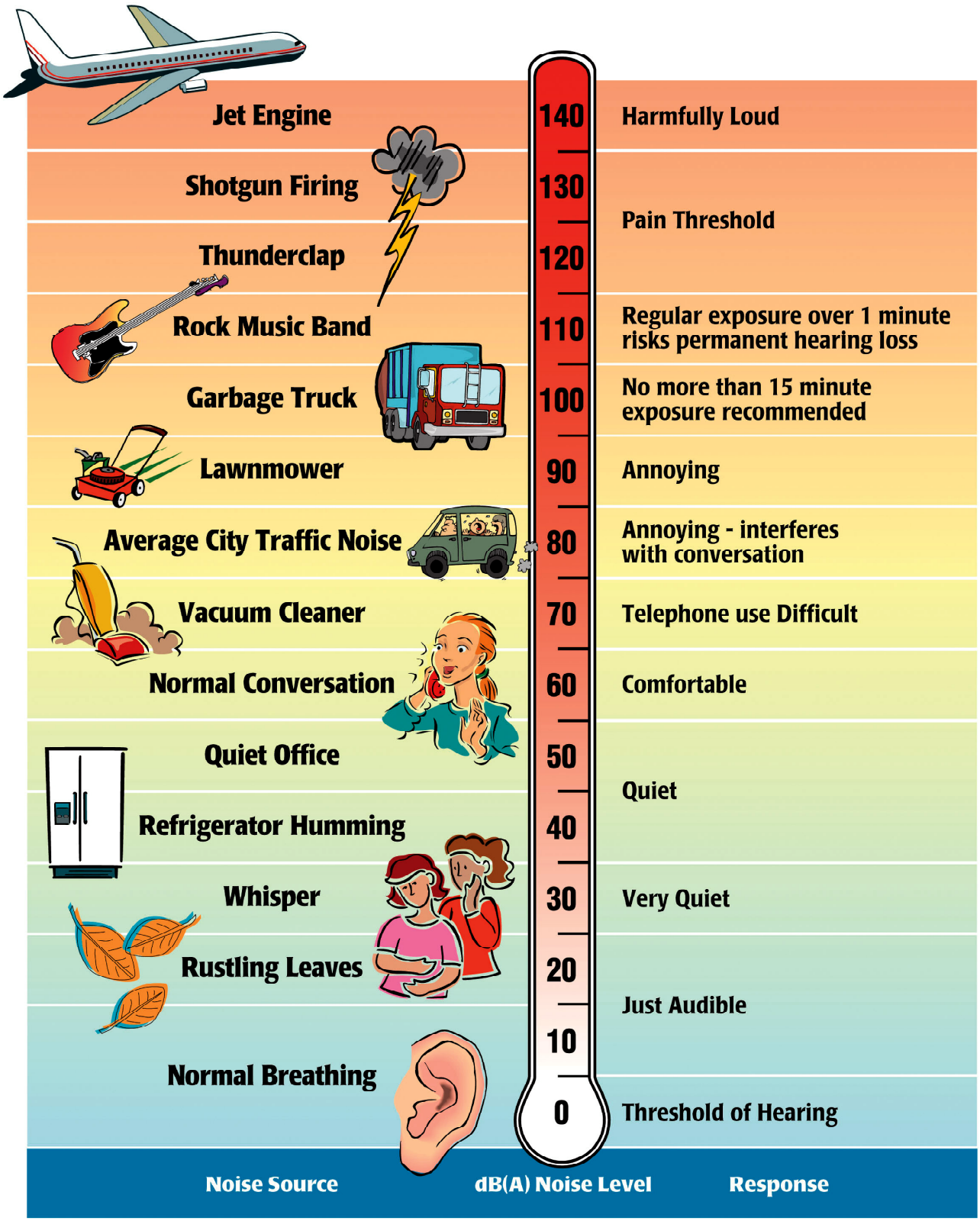
For the purposes of this analysis, a PPV descriptor with units of inches per section (inch-per-second) is used to evaluate construction-generated vibration. The Project does not include operational sources of groundborne vibration.

EXISTING NOISE SETTING

Existing Stationary Noise Levels

The Project Site is located within a rural area. The primary sources of stationary noise in the Project vicinity are related to existing operations at the SEGS VIII and IX Solar Thermal Power Plants and the adjacent Mojave Solar Thermal Plant). The noise associated with these sources may represent a single-event noise occurrence, short-term, or long-term/continuous noise.

The Shared Facilities Area includes an existing reverse osmosis and demineralizing system (RODS) to purify the brackish groundwater before use at the existing SEGS VIII and IX facilities. Currently, the RODS operates continuously, on an as-needed basis, up to approximately 18 hours per day and is part of the existing ambient noise setting at the Project Site.



Source:

Melville C. Branch and R. Dale Beland, *Outdoor Noise in the Metropolitan Environment*, 1970.

Environmental Protection Agency, *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (EPA/ONAC 550/9-74-004)*, March 1974.

7/9/2021 JN:H:\pdata\177424\Admin\Reports\Biological Resources\GIS\MXD\Environmental\Ex 04 Common Environmental Noise Levels.mxd RP

LOCKHART SOLAR PV II PROJECT
NOISE TECHNICAL MEMORANDUM

Michael Baker INTERNATIONAL

Common Environmental Noise Levels

Exhibit 4

Existing Ambient Noise Levels

In order to quantify existing ambient noise levels in the Project vicinity, Michael Baker International (Michael Baker) conducted three noise measurements on May 4, 2021; refer to Table 2, *Noise Measurements* and Exhibit 5, *Noise Measurement Locations*. The noise measurement sites were representative of typical existing noise exposure within the Project vicinity. The ten-minute measurements were taken between 11:00 a.m. and 12:30 p.m. Short-term (L_{eq}) measurements are considered representative of the noise levels in the Project vicinity.

Table 2
Noise Measurements

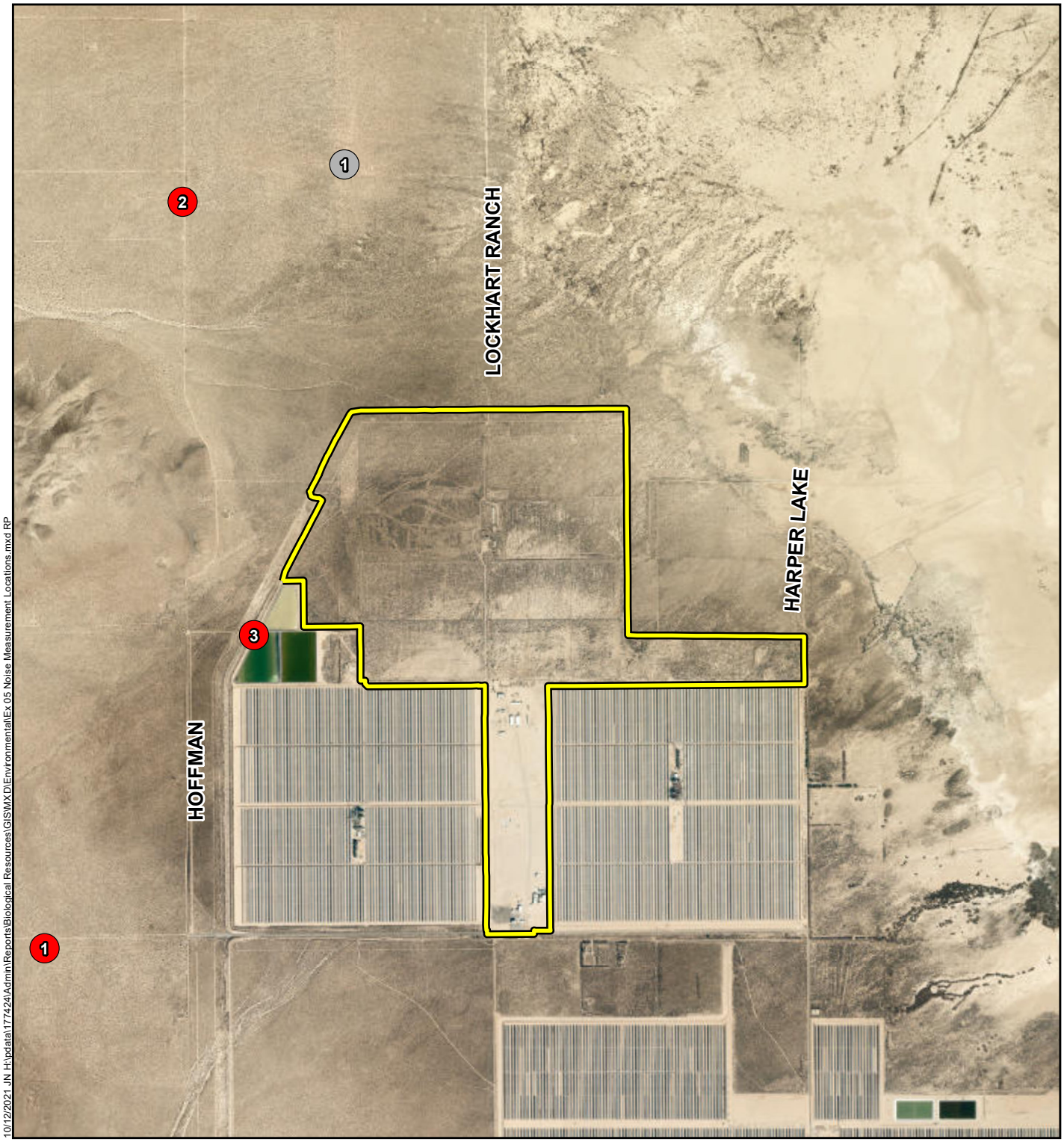
Site No.	Location	L_{eq} (dBA)	L_{min} (dBA)	L_{max} (dBA)	Peak (dBA)	Time
1	Along east-west trending rural road, approximately 1.2-mile southwest of the Project Site.	37.4	19.7	58.2	79.3	11:11 a.m.
2	Along Hoffman Road, approximately one-mile northwest of Project Site and 0.5-mile southwest of rural residential use.	29.1	18.3	51.5	77.8	11:38 a.m.
3	Adjacent to SEGS VIII and IX Solar Thermal Power Plant ponds.	41.9	28.5	58.4	83.9	12:07 p.m.

Source: Michael Baker International, May 4, 2021 (refer to Appendix A).

Meteorological conditions consisted of clear skies, warm temperatures, with light wind speeds (0 to 3 miles per hour), and low humidity. Measured daytime noise levels ranged from 29.1 to 41.9 dBA L_{eq}. Noise monitoring equipment used for the ambient noise survey consisted of a Brüel & Kjær Hand-held Analyzer Type 2250 equipped with a Type 4189 pre-polarized microphone. The monitoring equipment complies with applicable requirements of the American National Standards Institute (ANSI) for Type I (precision) sound level meters.

Noise Sensitive Receptors

Noise-sensitive land uses are generally considered to include single and multiple family residential areas, group homes, parks, and open space lands where quiet is a basis for use. Additional land uses such as schools, churches, libraries, and other places where low interior noise levels are essential are also considered noise-sensitive land uses. The nearest potential sensitive receptor to the Project Site is a potential residential use located approximately 4,320 feet to the north; refer to Exhibit 5. Michael Baker did not verify that this is an inhabited residence due to its remote location. Although inhabitation of this structure was not verifiable, this location is the closest potential noise sensitive receptor and therefore the most conservative assumed sensitive land use. The next potential sensitive receptor is located further than 8,000 feet (1.6 miles) from the Project Site. Due to the distance of the second potential sensitive receptor, noise levels were calculated at the property line of the closest potential sensitive receptor.



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- Project Site
- Noise Measurement Locations
- Sensitive Receptor Location

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0 1,250 2,500 Feet

Source: Esri, 2020

LOCKHART SOLAR PV II PROJECT
NOISE TECHNICAL MEMORANDUM

Noise Measurement Locations

Exhibit 5

REGULATORY SETTING

Federal

Occupational Safety and Health Administration (OSHA)

With the Occupational Safety and Health Act of 1970, Congress created OSHA to ensure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education, and assistance. The Act requires protection against the effects of noise exposure for employees when sound levels exceed 90 dBA over an eight-hour period. If such controls fail to reduce sound levels to within acceptable levels, personal protective equipment is required. Additionally, a Hearing Conservation Program must be instituted by the employers whenever employee noise exposure equals or exceeds an eight-hour time-weighted average sound level of 85 dBA. The Hearing Conservation Program requirements consist of periodic area and personal noise monitoring, performance and evaluation of audiograms, provision of hearing protection, annual employee training, and record keeping.

State

California Noise Control Act of 1973

California Health and Safety Code (HSC) Sections 46000 through 46080, known as the California Noise Control Act, find that excessive noise is a serious hazard to public health and welfare and that exposure to certain levels of noise can result in physiological, psychological, and economic damage. The California Noise Control Act also finds that there is a continuous and increasing bombardment of noise in urban, suburban, and rural areas. The California Noise Control Act declares that the State has a responsibility to protect the health and welfare of its citizens through the control, prevention, and abatement of noise. It is the policy of the state to provide an environment for all Californians that is free from noise that jeopardizes their health or welfare.

State Office of Planning and Research

The State Office of Planning and Research's *Noise Element Guidelines* include recommended exterior and interior noise level standards for local jurisdictions to identify and prevent the creation of incompatible land uses due to noise. The *Noise Element Guidelines* contain a land use compatibility table that describes the compatibility of various land uses with a range of environmental noise levels in terms of the CNEL. The guidelines also present adjustment factors that may be used to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

Local

County of San Bernardino

County of San Bernardino Policy Plan

The *County of San Bernardino Policy Plan* (County General Plan), adopted October 27, 2020, establishes goals and policies to ensure that County residents are protected from excessive noise. The following lists applicable noise goals and policies obtained from the County General Plan Hazards Element:

Goal HZ-2: Human-Generated Hazards

Human-generated Hazards. People and the natural environment protected from exposure to hazardous materials, excessive noise, and other human-generated hazards

Policy HZ-2.7. Truck delivery areas. We encourage truck delivery areas to be located away from residential properties and require associated noise impacts to be mitigated.

Policy HZ-2.9. Control sound at the source. We prioritize noise mitigation measures that control sound at the source before buffers, soundwalls, and other perimeter measures.

Codified Ordinances of the County of San Bernardino

Chapter 83.01, Section 83.01.080, *Noise,* of the Codified Ordinances of the County of San Bernardino (San Bernardino County Code) establishes standards concerning acceptable noise levels for both noise-sensitive land uses and for noise-generating land uses. The following sections of the San Bernardino County Code are applicable to the Project.

§ 83.01.080 – Noise.

(c) Noise Standards for Stationary Noise Sources.

(1) Noise Standards. Table 83-2 (Table 3, *Noise Standards for Stationary Noise Sources)* *describes the noise standards for emanations from a stationary noise source, as it affects adjacent properties:*

Table 3
San Bernardino County Noise Standards for Stationary Noise Sources

Affected Land Uses (*Receiving Noise*)	7:00 a.m. – 10:00 p.m. L_{eq}	10:00 p.m. – 7 :00 a.m. L_{eq}
Residential	55 dB(A)	45 dB(A)
Professional Services	55 dB(A)	55 dB(A)
Other Commercial	60 dB(A)	60 dB(A)
Industrial	70 dB(A)	70 dB(A)

Table 3 (continued)
San Bernardino County Noise Standards for Stationary Noise Sources

Notes: L_{eq} = (Equivalent Energy Level). The sound level corresponding to a steady-state sound level containing the same total energy as a time-varying signal over a given sample period, typically one, eight or 24 hours. dB(A) = (A-weighted Sound Pressure Level). The sound pressure level, in decibels, as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound, placing greater emphasis on those frequencies within the sensitivity range of the human ear. L_{dn} = (Day-Night Noise Level). The average equivalent A-weighted sound level during a 24-hour day obtained by adding 10 decibels to the hourly noise levels measured during the night (from 10:00 p.m. to 7:00 a.m.). In this way L_{dn} takes into account the lower tolerance of people for noise during nighttime periods.
Source: Codified Ordinances of the County of San Bernardino, Section 83.01.080, Table 83-2.

(2) Noise Limit Categories. No person shall operate or cause to be operated a source of sound at a location or allow the creation of noise on property owned, leased, occupied, or otherwise controlled by the person, which causes the noise level, when measured on another property, either incorporated or unincorporated, to exceed any one of the following:

(A) The noise standard for the receiving land use as specified in Subdivision (b) (Noise-Impacted Areas), above, for a cumulative period of more than 30 minutes in any hour.

(B) The noise standard plus five dB(A) for a cumulative period of more than 15 minutes in any hour.

(C) The noise standard plus ten dB(A) for a cumulative period of more than five minutes in any hour.

(D) The noise standard plus 15 dB(A) for a cumulative period of more than one minute in any hour.

(E) The noise standard plus 20 dB(A) for any period of time.

*(d) Noise Standards for Adjacent Mobile Noise Sources. Noise from mobile sources may affect adjacent properties adversely. When it does, the noise shall be mitigated for any new development to a level that shall not exceed the standards described in the following Table 83-3 (*Table 4*, Noise Standards for Adjacent Mobile Noise Sources).*

(e) Increases in Allowable Noise Levels. If the measured ambient level exceeds any of the first four noise limit categories in Subdivision (d)(2), above, the allowable noise exposure standard shall be increased to reflect the ambient noise level. If the ambient noise level exceeds the fifth noise limit category in Subdivision (d)(2), above, the maximum allowable noise level under this category shall be increased to reflect the maximum ambient noise level.

(f) Reductions in Allowable Noise Levels. If the alleged offense consists entirely of impact noise or simple tone noise, each of the noise levels in Table 83-2 (Noise Standards for Stationary Noise Sources; Table 3) shall be reduced by five dB(A).

(g) Exempt Noise. The following sources of noise shall be exempt from the regulations of this Section:

(1) Motor vehicles not under the control of the commercial or industrial use.

(2) Emergency equipment, vehicles, and devices.

(3) Temporary construction, maintenance, repair, or demolition activities between 7:00 a.m. and 7:00 p.m., except Sundays and Federal holidays.

Table 4
Noise Standards for Adjacent Mobile Noise Sources

Land Use		L_{dn} (or CNEL) dB(A)[4]	
Categories	**Uses**	**Interior[1]**	**Exterior[2]**
Residential	Single and multi-family, duplex, mobile homes	45	60[3]
Commercial	Hotel, motel, transient housing	45	60[3]
	Commercial retail, bank, restaurant	50	N/A
	Office building, research and development, professional offices	45	65
	Amphitheater, concert hall, auditorium, movie theater	45	N/A
Institutional/Public	Hospital, nursing home, school classroom, religious institution, library	45	65
Open Space	Park	N/A	65

Notes:
1. The indoor environment shall exclude bathrooms, kitchens, toilets, closets and corridors.
2. The outdoor environment shall be limited to:
   - Hospital/office building patios
   - Hotel and motel recreation areas
   - Mobile home parks
   - Multi-family private patios or balconies
   - Park picnic areas
   - Private yard of single-family dwellings
   - School playgrounds
3. An exterior noise level of up to 65 dB(A) (or CNEL) shall be allowed provided exterior noise levels have been substantially mitigated through a reasonable application of the best available noise reduction technology, and interior noise exposure does not exceed 45 dB(A) (or CNEL) with windows and doors closed. Requiring that windows and doors remain closed to achieve an acceptable interior noise level shall necessitate the use of air conditioning or mechanical ventilation.
4. CNEL = (Community Noise Equivalent Level). The average equivalent A-weighted sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night from 10:00 p.m. to 7:00 a.m.

Source: Codified Ordinances of the County of San Bernardino, Section 83.01.080, Table 83-3.

§ 83.01.090 Vibration.

(a) Vibration Standard. No ground vibration shall be allowed that can be felt without the aid of instruments at or beyond the lot line, nor shall any vibration be allowed which produces a particle velocity greater than or equal to two-tenths inches per second measured at or beyond the lot line.

(b) Vibration Measurement. Vibration velocity shall be measured with a seismograph or other instrument capable of measuring and recording displacement and frequency, particle velocity, or acceleration. Readings shall be made at points of maximum vibration along any lot line next to a parcel within a residential, commercial and industrial land use zoning district.

(c) Exempt Vibrations. The following sources of vibration shall be exempt from the regulations of this Section.

(1) Motor vehicles not under the control of the subject use.

(2) Temporary construction, maintenance, repair, or demolition activities between 7:00 a.m. and 7:00 p.m., except Sundays and Federal holidays.

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) THRESHOLDS

The environmental analysis in this memorandum is patterned after the Initial Study Checklist recommended by the *CEQA Guidelines*. The issues presented in the Initial Study Checklist have been utilized as thresholds of significance in this section. Accordingly, a project may have a significant adverse impact related to noise and vibration if it would do any of the following:

- Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies (refer to Impact NOI-1);

- Generation of excessive groundborne vibration or groundborne noise levels (refer to Impact NOI-2); and/or

- For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels (refer to Impact NOI-3).

IMPACT ANALYSIS

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

Less Than Significant Impact.

Construction Noise Impacts

Construction Activities

Project construction is anticipated to be completed over a period of approximately 14 months. Project construction activities generally fall into three main categories: (1) site preparation, (2) system installation, and (3) testing, commissioning, and cleanup. Table 5, *Maximum Noise Levels Generated by Standard Construction Equipment*, reflects maximum sound levels (L_{max}) that could be expected from the equipment-types listed at a reference distance of 50 feet from the noise source, which are the highest individual sound occurring at an individual time period. Operating cycles for the listed types of construction equipment may involve one or two minutes of full power operation followed by three to four minutes at lower power settings. Other sources of construction noise could include random incidents, which would last less than one minute (such as dropping large pieces of equipment or the hydraulic movement of machinery lifts).

Table 5
Maximum Noise Levels Generated by Standard Construction Equipment

Equipment Type	Actual L_{max} at 50 Feet (dBA)
Backhoe	78
Bulldozer	82
Compactor	83
Compressor	78
Concrete/Industrial Saws	90
Concrete Mixer	79
Concrete Pump	81
Crane	81
Dump Truck	76
Excavator	81
Flatbed Truck	74
Generator	81
Grader	85
Loader	79
Paver	77
Pile Driver (impact)	101
Pile Driver (sonic)	96
Pump	81
Roller	80
Scraper	85

Table 5 (continued)
Maximum Noise Levels Generated by Standard Construction Equipment

Equipment Type	Actual L_{max} at 50 Feet (dBA)
Tractor	84
Welder	74
Source: Federal Highway Administration, *Roadway Construction Noise Model User's Guide*, January 2006.	

Construction noise is difficult to quantify because of the many variables involved, including the specific equipment types, size of equipment used, percentage of time each piece is in operation, condition of each piece of equipment, and number of pieces that would operate at any given time across the Project Site. Construction equipment produce maximum noise levels when equipment is operating under full power conditions (i.e., the equipment engine at maximum speed). However, equipment used on construction sites typically operates under less than full power conditions, or part power. To more accurately characterize construction-period noise levels, the average (L_{eq}) noise level associated with each construction category is calculated based on the quantity, type, and usage factors for each type of equipment that would be used during each construction category. These noise levels are typically associated with multiple pieces of equipment simultaneously operating on part power. The estimated Project construction noise levels at the nearest noise-sensitive receptor is presented in Table 6, *Estimated Project Construction Noise Levels at Nearest Sensitive Receptor*. To present a conservative analysis, the estimated noise levels were calculated for a scenario in which all construction equipment were assumed to operate simultaneously for each construction category (i.e., site preparation, system installation, and testing/commissioning/cleanup). In addition, construction noise levels were conservatively calculated based on the distance from the Project Site boundary to the property line of the nearest sensitive receptor.

Table 6
Estimated Project Construction Noise Levels at Nearest Sensitive Receptor

Nearest Sensitive Receptor to Project Site	Estimated Exterior Construction Noise Level (dBA L_{eq})[1,2,3]		
	Site Preparation	System Installation	Testing/Commissioning/ Cleanup
Residence[4] (approximately 4,320 feet to the north)	45.7	55.9	46.1

Notes:
1. These noise levels conservatively assume the simultaneous operation of all construction equipment at the same precise location.
2. The construction categories would include the following:
   - Site Preparation: perimeter fence installation, demolition of existing structures, clearing/grading;
   - System Installation: trenching, BESS, and gen-tie installation; and
   - Testing/Commissioning/Cleanup.
3. Modeled construction equipment simultaneously operating in the same precise location include the following:
   - Site Preparation: front end loader, excavator, concrete saw, and dump truck;
   - System Installation: front end loader, crane, excavator, grader, tractor, dump truck, dozer, scraper, and vibratory pile driver; and
   - Testing/Commissioning/Cleanup: front end loader, grader, dozer, excavator, dump truck, and roller.
4. Distances measured are approximate and from the exterior Project Site boundary to the property line of the nearest sensitive receptor.

Source: Federal Highway Administration, *Roadway Construction Noise Model (FHWA-HEP-05-054)*, January 2006; refer to Appendix A for modeling assumptions.

Section 83.01.080 of the San Bernardino County Code exempts construction activities from the noise standard providing that such activities take place between the hours of 7:00 a.m. to 7:00 p.m. except Sundays and Federal holidays. Construction would primarily occur during daylight hours, Monday through Friday, between 7:00 a.m. and 6:00 p.m., as required to meet the construction schedule. However, there may be potential need for work to occur outside of daylight hours. Such work could include testing of electrical equipment such as underground cables or running a small pump or portable generator to flush the transformer system. Any construction work performed outside of the normal work schedule would be required to conform to the County Noise Ordinance. Any construction work performed outside of the normal work schedule would not result in substantial noise levels beyond the Project Site boundary.

As depicted in Table 6, the closest potential residential receptor could be exposed to temporary and intermittent noise levels up to 55.9 dBA. It should be noted that the County does not have construction noise standards for residential uses. However, Project construction noise levels would be below the Federal Transit Administration's 80 dBA construction standard for residential uses.[1] As previously noted, noise levels presented in Table 6 are conservative, as these noise levels assume the simultaneous operation of all construction equipment at the same precise location. In reality, construction equipment would be used throughout the Project Site and would not be concentrated at the point closest to the nearest sensitive receptor. Therefore, impacts would be less than significant.

Construction Traffic

Construction activities would also cause increased noise along access routes to and from the Project Site due to movement of equipment and workers, as well as hauling trips. Project Site preparation activities would include demolition of approximately 6,388 tons of material to be exported, which would result in approximately 632 hauling trips.[2] Grading at the Project Site would require approximately 100,000 cubic yards of cut and 100,000 cubic yards of fill, balanced on-site. Grading activities would also include import of approximately 20,000 cubic yards of engineered materials (i.e., road base, cement stabilization materials, riprap, etc.), which would result in approximately 2,500 hauling trips.[3] It is anticipated that construction worker trips would be a maximum of 40 trips per day, and vendor trips would equate to a total of 10 trips per day.[4] As a result, mobile source noise would increase along access routes to and from the Project Site during construction. However, mobile traffic noise from construction trips would be temporary and would cease upon completion of Project construction. Further, San Bernardino County Code Section 83.01.080 exempts construction activities from the noise standard providing that such activities take place between the hours of 7:00 a.m. to 7:00 p.m. except Sundays and Federal holidays. Therefore, upon compliance with the County's allowable construction hours (San Bernardino County Code Section 83.01.080), short-term noise impacts from construction traffic would be less than significant.

Operation and Maintenance Noise Impacts

Operation and maintenance of the Project would include permanent and temporary noise sources associated with the solar PV systems, electrical collection lines, gen-tie power lines, BESS, and maintenance activities.

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[1] Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, dated September 2018.

[2] Based on California Emissions Estimator Model version 2016.3.2 (CalEEMod) outputs provided in the *Lockhart Solar PV II Project – Air Quality Technical Memorandum* prepared by Michael Baker International, June 2021.

[3] Ibid.

[4] Ibid.

Solar PV Systems

The solar PV arrays would include operation of single-axis tracking systems. Single-axis tracking systems employ a motor mechanism that would allow the arrays to track the path of the sun throughout the day. In the morning, the panels would face the east. Throughout the day, the panels would slowly move to the upright position at noon and on to the west at sundown. The panels would reset to the east in the evening or early morning to receive sunlight at sunrise. The Project would include up to 3,600 tracker motors which could operate simultaneously. Noise from each tracker motor is approximately 40 dBA at 10 feet from the source.[5,6] During daylight hours, the tracking system motors would operate for a short period of time (normally two seconds) and pause for a longer period of time (about five minutes) before operating again. After sunset and before sunrise the next day, the array must reset to face easterly; this reset motion occurs once daily and takes approximately three minutes. Composite noise levels of the tracker motors, based on the logarithmic addition of sound energy, collectively would be approximately 75.6 dBA at 10 feet from the source. The nearest sensitive noise receptor to any tracker would be the potential residence located approximately 4,320 feet to the north of the Project Site. At this distance, noise levels associated with solar PV array trackers would be approximately 22.4 dBA and well below the County's daytime and nighttime noise standards of 55 dBA and 45 dBA, respectively, for residential uses.[7] Due to the dispersed layout of the tracker motors across the Project Site, their distance from sensitive receptors, and the intermittent noise generating activity, impacts would be less than significant in this regard.

Electrical Collection Lines

The Project includes installation of electrical collection lines to connect to the permitted, but not yet constructed, Lockhart I Solar Facility collector substation. Audible noise from transmission lines are a function of the line voltage, the conductor design, and weather conditions. Corona noise from 220 kV lines has been reported at 40 dBA immediately below the line.[8] Overhead and underground collection systems will be built throughout the Project Site. Even though overhead electrical lines that would be installed as part of the Project would have the potential to emit electrical discharge (or corona discharge), audible noise from corona discharge is expected to be within the range of 40 dBA or below. Therefore, noise levels associated with electrical collection lines would be inaudible at the nearest sensitive receptor, located approximately 4,320 feet to the north of the Project Site. Impacts would be less than significant in this regard.

Gen-tie Power Line

The existing 220 kV on-site gen-tie line will connect the power generated from the Project to the existing switchyard located at the southern edge of the Shared Facilities Area. The existing on-site gen-tie line will be upgraded as needed for the Project. Similar to the electrical collection lines, the gen-tie line would generate audible corona noise (i.e., 40 dBA immediately below the line). As the nearest sensitive receptor is located approximately 4,320 feet to the north of the Project Site, noise levels associated with the gen-tie power line would be inaudible. Impacts would be less than significant in this regard.

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[5] Based on specifications provided by Cupertino Electric, Inc., on September 20, 2021.
[6] County of San Diego, *Desert Green Solar Farm Noise Assessment*, February 20, 2013.
[7] See calculation provided in Appendix A.
[8] Based on studies conducted by the Electric Power Research Institute (EPRI) (1978 and 1987).

Battery Energy Storage System (BESS)

Additional permanent noise sources from the Project Site would include small-scale inverters, medium voltage transformers, and BESS. Small-scale inverters and medium voltage transformers would emit nominal noise levels that would attenuate over distance, resulting in inaudible noise at the nearest sensitive receptor. The primary noise source associated with BESS operations would be the use of HVAC units (the BESS does not generate noise itself). The Project includes a BESS, which would require approximately 132 HVAC units to operate simultaneously. Standard HVAC units for similar energy storage projects produce 68 dBA at a distance of 50 feet during full operation.[9] The BESS would be located in the Shared Facilities Area; refer to Exhibit 3b. The nearest sensitive receptor property line would be located approximately 10,000 feet to the northwest of the Project BESS facilities. At this distance, noise levels from the BESS HVAC units are estimated at approximately 22 dBA, which is well below the County's daytime (55 dBA L_{eq}) and nighttime (45 dBA L_{eq}) outdoor stationary noise standard for residential uses; therefore, impacts would be less than significant.

Maintenance Activities

The County approved the Lockhart Solar I Facility (CUP Project #201900125) in 2019, which contemplated that existing SEGS operations staff would continue operation of the Lockhart Solar I Facility. Lockhart Solar I Facility operations staff would also support operations for the Project; therefore, no additional operations staff would be required. As such, the Project would generate minimal periodic operational vehicle trips internal to the Project Site for required maintenance activities and would not increase personnel daily trips external to the site when compared to existing conditions. Project maintenance activities would include solar panel washing one to four times per year and it was assumed that the Project would generate approximately 40 trips per year associated with panel washing activities. These activities are not expected to occur on a daily basis and would not generate a significant amount of traffic or create a substantial increase of vehicular noise in the area. Any increase in traffic would be minimal and sporadic; therefore, impacts from vehicular noise would be less than significant.

The existing RODS within the Shared Facilities Area will be used, as needed, to remove particles suspended in groundwater prior to Project solar panel cleaning, one to four times per year. Project use of the existing RODS will not result in additional equipment or create a substantial increase in stationary source noise from the Shared Facilities Area above existing conditions. Therefore, potential noise impacts from Project maintenance activities would be less than significant.

Decommissioning

When the Project is decommissioned, equipment operation and site restoration activities would result in a temporary increase in ambient noise levels in the Project vicinity. Given the fact that much of the construction equipment necessary to construct the Project would also be required for Project decommissioning, it is reasonable to assume that noise generated from decommissioning activities would be similar in nature to construction activities. Similar to the construction noise analysis above, Project decommissioning would potentially result in increased noise levels compared to existing conditions. However, San Bernardino County Code Section 83.01.080 exempts construction activities from the noise standard providing that such activities take place between the hours of 7:00 a.m. to 7:00 p.m. except

[9] Kern County Planning and Natural Resources Department, *Acoustical Assessment for the AVEP Project*, August 5, 2020.

Sundays and Federal holidays. Therefore, upon compliance with the County's allowable construction hours (San Bernardino County Code Section 83.01.080), short-term noise impacts from decommissioning activities would be less than significant.

Mitigation Measures: No mitigation is required.

NOI-2 Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

Less Than Significant Impact.

Construction

Project construction, including site preparation and testing/commissioning/cleanup would not require blasting; however, impact-post driving or drilling would be utilized for system installation (i.e. installation of the PV arrays foundations support posts) and could cause vibration impacts at close distances. While these construction activities would result in some minor amounts of groundborne vibration, such groundborne vibration would attenuate rapidly from the source and would not be generally perceptible outside of the construction areas.

Groundborne vibration generated during construction activities is exempt between the hours of 7:00 a.m. to 7:00 p.m. (except Sundays and Federal holidays) pursuant to San Bernardino County Code Section 83.01.090. However, the Federal Transit Administration (FTA) has published standard vibration velocities for construction equipment operations. In general, the FTA architectural damage criterion for continuous vibrations (i.e., 0.2 inch/second) appears to be conservative. The types of construction vibration impact include human annoyance and building damage. Human annoyance occurs when construction vibration rises significantly above the threshold of human perception for extended periods of time. Building damage can be cosmetic or structural. This distance can vary substantially depending on the soil composition and underground geological layer between vibration source and receiver. The vibration produced by construction equipment, is illustrated in Table 7, *Typical Vibration Levels for Common Construction Equipment*.

Table 7
Typical Vibration Levels for Common Construction Equipment

Equipment		Reference peak particle velocity at 25 feet (inch-per-second)	Approximate peak particle velocity at 4,320 feet (inch-per-second)[1]
Pile Driver (Impact)	*Upper Range*	1.518	0.001
	Typical	0.644	<0.001
Pile Driver (Sonic)	*Upper Range*	0.000	<0.001
	Typical	0.000	<0.001
Auger/Drill Rigs		0.089	<0.001
Jackhammer		0.035	<0.001
Vibratory Hammer		0.035	<0.001
Vibratory Roller		0.210	<0.001

Table 7 (continued)
Typical Vibration Levels for Common Construction Equipment

Equipment	Reference peak particle velocity at 25 feet (inch-per-second)	Approximate peak particle velocity at 4,320 feet (inch-per-second)[1]
Large Bulldozer	0.089	<0.001
Loaded Trucks	0.076	<0.001
Small Bulldozer	0.003	<0.001

Notes:
1. Calculated using the following formula:

$PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$

where: PPV (equip) = the peak particle velocity in inch-per-second of the equipment adjusted for the distance
PPV (ref) = the reference vibration level in inch-per-second from Table 7-4 of the FTA *Transit Noise and Vibration Impact Assessment Manual*
D = the distance from the equipment to the receiver

Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, September 2018.

Groundborne noise and vibration decreases rapidly with distance. As indicated in Table 7, based on the FTA data, vibration velocities from typical heavy construction equipment operations that would be used during Project construction range from 0.003 to 1.518 inch-per-second peak particle velocity (PPV) at 25 feet from the source of activity. It should be noted, however, that post driving would only occur during construction of the PV modules on-site. The nearest noise-sensitive receptor to the Project Site is a potential residence located approximately 4,320 feet to the north. At this distance, vibration velocities would be imperceptible (i.e., up to 0.001 inch-per-second PPV). Therefore, the 0.2 inch-per-second PPV significance threshold and the 0.4 inch-per-second PPV human annoyance criteria would not be exceeded as a result of Project construction activities. Thus, no sources of groundborne vibration or groundborne noise would be expected to affect sensitive receptors in the Project vicinity, and there would not be any potential for excessive exposure of persons to or generation of groundborne vibration levels. Impacts would be less than significant.

Operation and Maintenance

The Project would have operation and maintenance components, such as HVAC systems for the BESS, maintenance vehicles, small-scale inverters, and medium voltage transformers, that would not generate noticeable groundborne vibration levels. Project operations would not involve any sources capable of generating perceptible levels of vibration in the surrounding area. There would be no permanent source or potential to change vibration levels, except during unscheduled maintenance or repair activities, which would be similar to construction activities. Regular maintenance trucks could generate 0.076 inch-per-second PPV a distance of 25 feet (refer Table 7). Pursuant to San Bernardino County Code Section 83.01.090, groundborne vibration shall not exceed 0.2 inch-per-second PPV at the nearest property line within a residential, commercial and industrial land use zoning district. Land use zoning districts surrounding the Project Site include Resource Conservation (RC) and Rural Living (RL), which allow

residential uses.[10] Although residential land use zoning districts surround the Project Site, regular maintenance trucks would not generate groundborne vibration levels exceeding the County's 0.2 inch-per-second PPV vibration threshold at the Project boundary. Further, as the nearest noise-sensitive receptor is located over 4,000 feet from the Project Site, operational vibration levels at the nearest off-site receptors would be imperceptible. Thus, the County's 0.2 inch-per-second PPV vibration threshold would not be exceeded and impacts would be less than significant.

Decommissioning

When the Project is decommissioned, equipment operation and site restoration activities could result in temporary vibration impacts at close distances. Given the fact that much of the construction equipment necessary to construct the Project would also be required for Project decommissioning, it is reasonable to assume that vibration generated from decommissioning activities would be similar in nature to construction activities. As with the construction activities described above, decommissioning activities would not be expected to generate groundborne noise that would affect sensitive receptors in the Project vicinity, and there would not be any potential for excessive exposure of persons to or generation of groundborne vibration levels. Impacts would be less than significant.

Mitigation Measures: No mitigation is required.

NOI-3 For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels??

No Impact. The nearest airport to the Project Site is the Sun Hill Ranch Airport located approximately 20 miles to the southwest. The Project Site is not located within the vicinity of a private airstrip or related facilities. No impact would occur in this regard.

Mitigation Measures: No mitigation is required.

[10] The RC (Resource Conservation) land use zoning district provides sites for open space and recreational activities, single-family homes on very large parcels and similar and compatible uses. The RL (Rural Living) land use zoning district provides sites for rural residential uses, incidental agricultural uses, and similar and compatible uses.

REFERENCES

Documents

1. County of San Bernardino, *County of San Bernardino Countywide Plan,* adopted October 27, 2020.

2. County of San Bernardino, *Codified Ordinances of the County of San Bernardino,* March 23, 2021.

3. County of San Diego, *Desert Green Solar Farm Noise Assessment*, February 20, 2013.

4. Federal Highway Administration, *Roadway Construction Noise Model (FHWA-HEP-05-054)*, January 2006.

5. Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, September 2018.

6. Michael Baker International, *Lockhart Solar PV II Project – Air Quality Technical Memorandum*, June 2021.

Websites / Programs

1. Google Earth, 2021.

Appendix A
Noise Data

Site Number: NM-1			
Recorded By: Danielle Regimbal			
Job Number: 178416			
Date: 5/4/2021			
Time: 11:11 AM			
Location: Along east-west trending rural road, approximately 1.2-mile southwest of the project site.			
Source of Peak Noise: Plane flying overhead.			
Noise Data			
Leq (dB)	**Lmax(dB)**	**Lmin (dB)**	**Peak (dB)**
37.4	58.2	19.7	79.3

Equipment						
Category	**Type**	**Vendor**	**Model**	**Serial No.**	**Cert. Date**	**Note**
Sound	Sound Level Meter	**Brüel & Kjær**	**2250**	**3011133**	**04/08/2019**	
	Microphone	**Brüel & Kjær**	**4189**	**3086765**	**04/08/2019**	
	Preamp	**Brüel & Kjær**	**ZC 0032**	**25380**	**04/08/2019**	
	Calibrator	**Brüel & Kjær**	**4231**	**2545667**	**04/08/2019**	

Weather Data			
Est.	**Duration:** 10 minutes	**Sky:** Sunny/Clear	
	Note: dBA Offset = 0.01	**Sensor Height (ft):** 5 ft	
	Wind Ave Speed (mph / m/s)	**Temperature (degrees Fahrenheit)**	**Barometer Pressure (inches)**
	SW 3 mph	81	29.9 inHg

Photo of Measurement Location

2250

Instrument:		2250
Application:		BZ7225 Version 4.7.4
Start Time:		05/04/2021 11:11:42
End Time:		05/04/2021 11:21:42
Elapsed Time:		00:10:00
Bandwidth:		1/3-octave
Max Input Level:		142.17

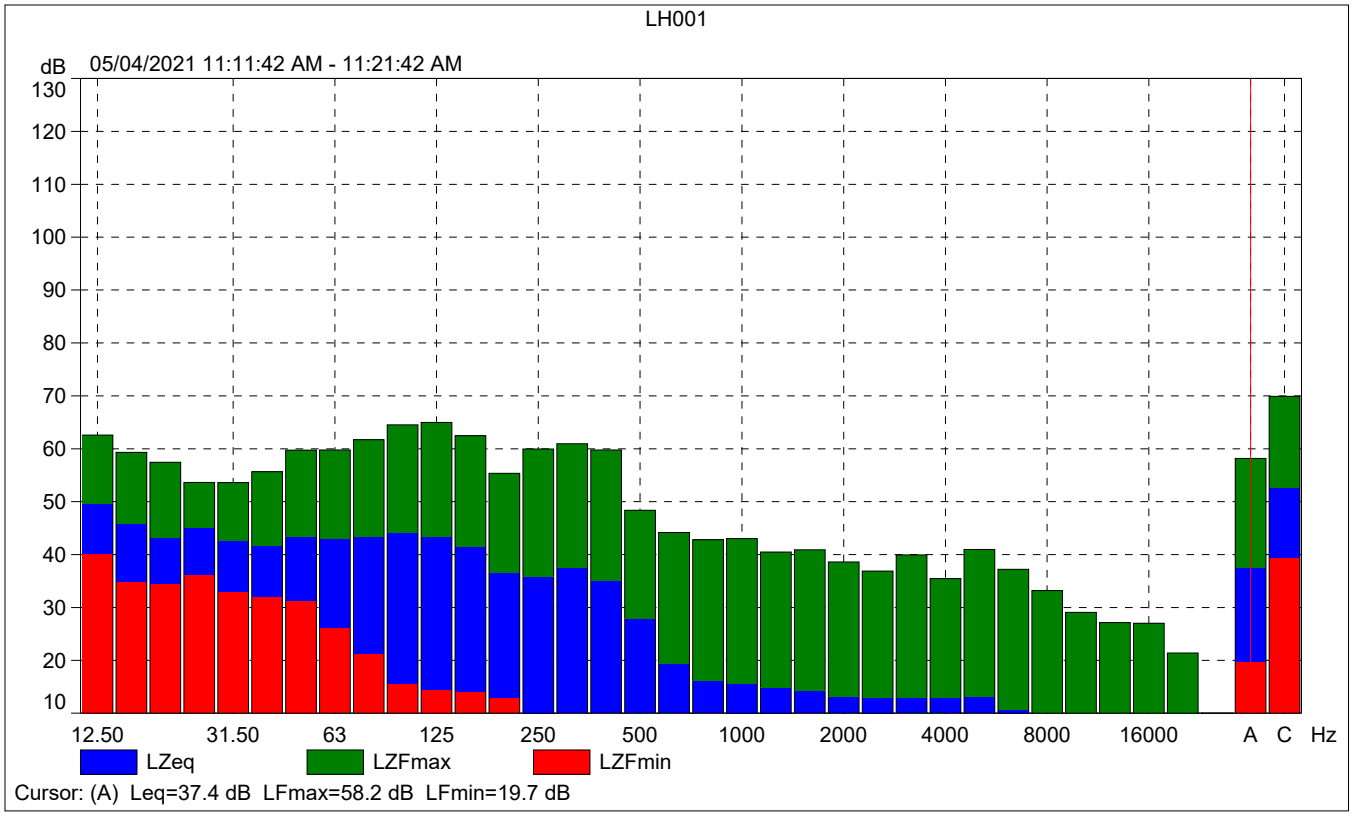
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	Z

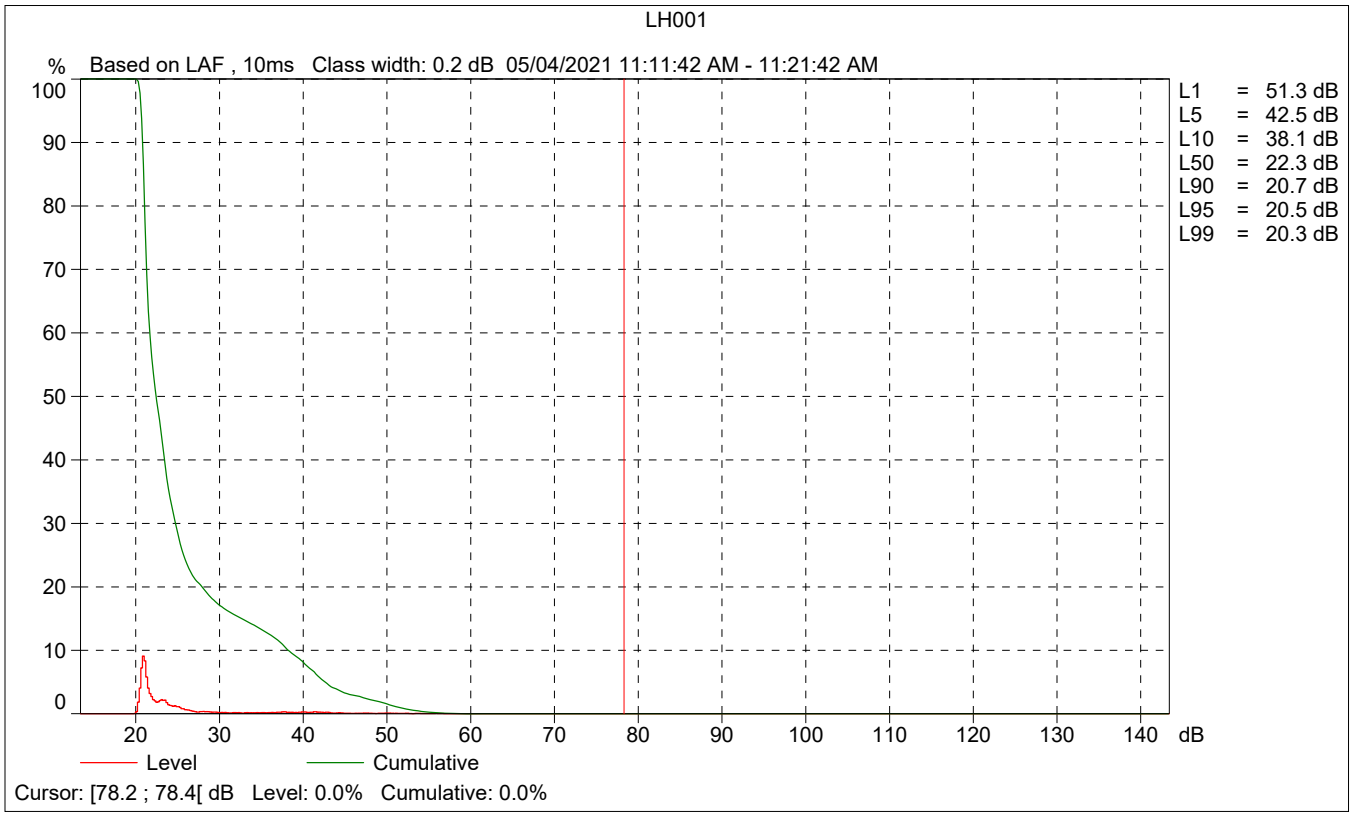
Instrument Serial Number:		3011133
Microphone Serial Number:		3086765
Input:		Top Socket
Windscreen Correction:		UA-1650
Sound Field Correction:		Free-field

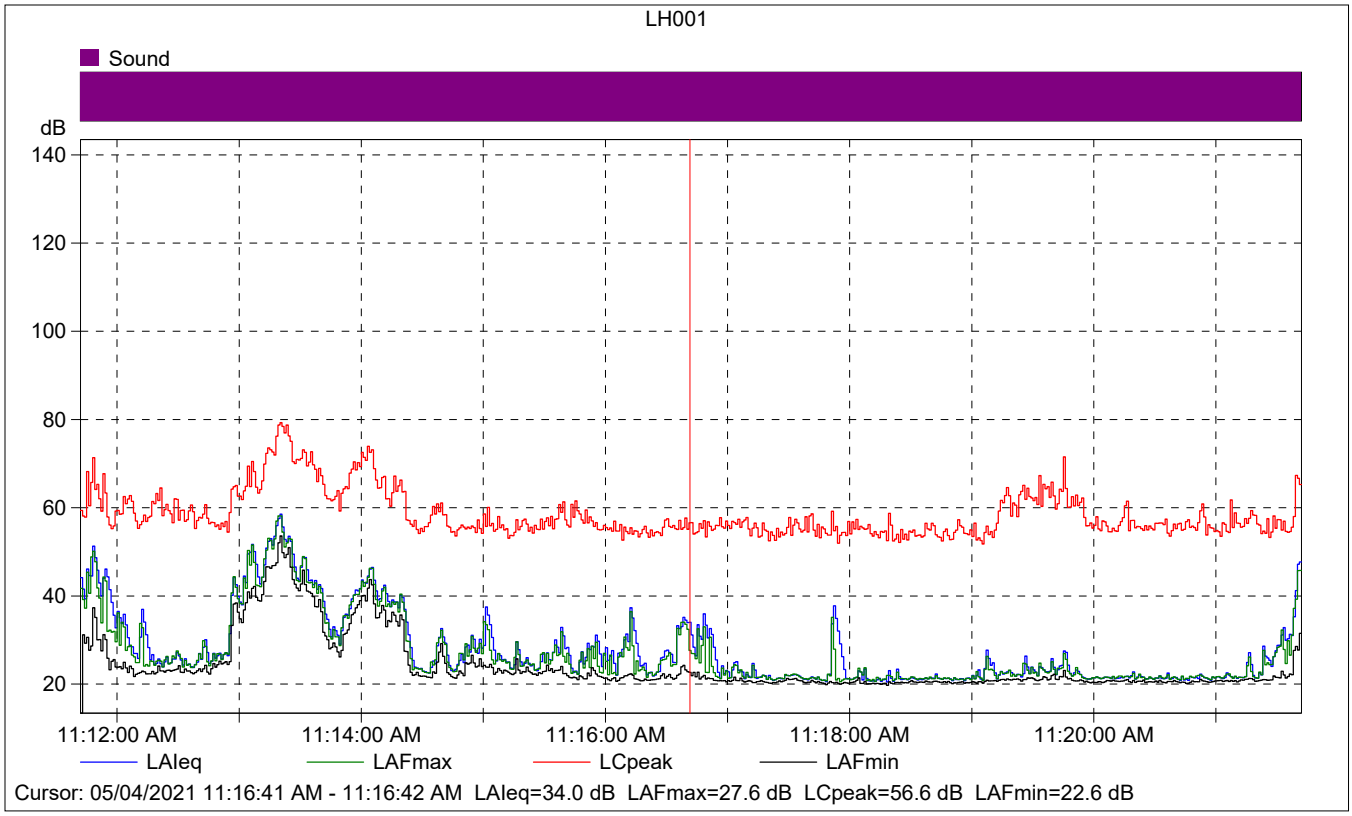
Calibration Time:		05/04/2021 08:03:36
Calibration Type:		External reference
Sensitivity:		43.354082852602 mV/Pa

LH001

	Start time	End time	Elapsed time	Overload [%]	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value				0.00	37.4	58.2	19.7
Time	11:11:42 AM	11:21:42 AM	0:10:00				
Date	05/04/2021	05/04/2021					


LH001
dB
05/04/2021 11:11:42 AM - 11:21:42 AM
130
120
110
100
90
80
70
60
50
40
30
20
10
12.50
31.50
63
125
250
500
1000
2000
4000
8000
16000
A
C
Hz
LZeq
LZFmax
LZFmin
Cursor: (A) Leq=37.4 dB LFmax=58.2 dB LFmin=19.7 dB


LH001
%
Based on LAF , 10ms Class width: 0.2 dB 05/04/2021 11:11:42 AM - 11:21:42 AM
100
90
80
70
60
50
40
30
20
10
0
20
30
40
50
60
70
80
90
100
110
120
130
140
dB
L1 = 51.3 dB
L5 = 42.5 dB
L10 = 38.1 dB
L50 = 22.3 dB
L90 = 20.7 dB
L95 = 20.5 dB
L99 = 20.3 dB
Level
Cumulative
Cursor: [78.2 ; 78.4[dB Level: 0.0% Cumulative: 0.0%



LH001

	Start time	Elapsed time	LAIeq [dB]	LAFmax [dB]	LAFmin [dB]
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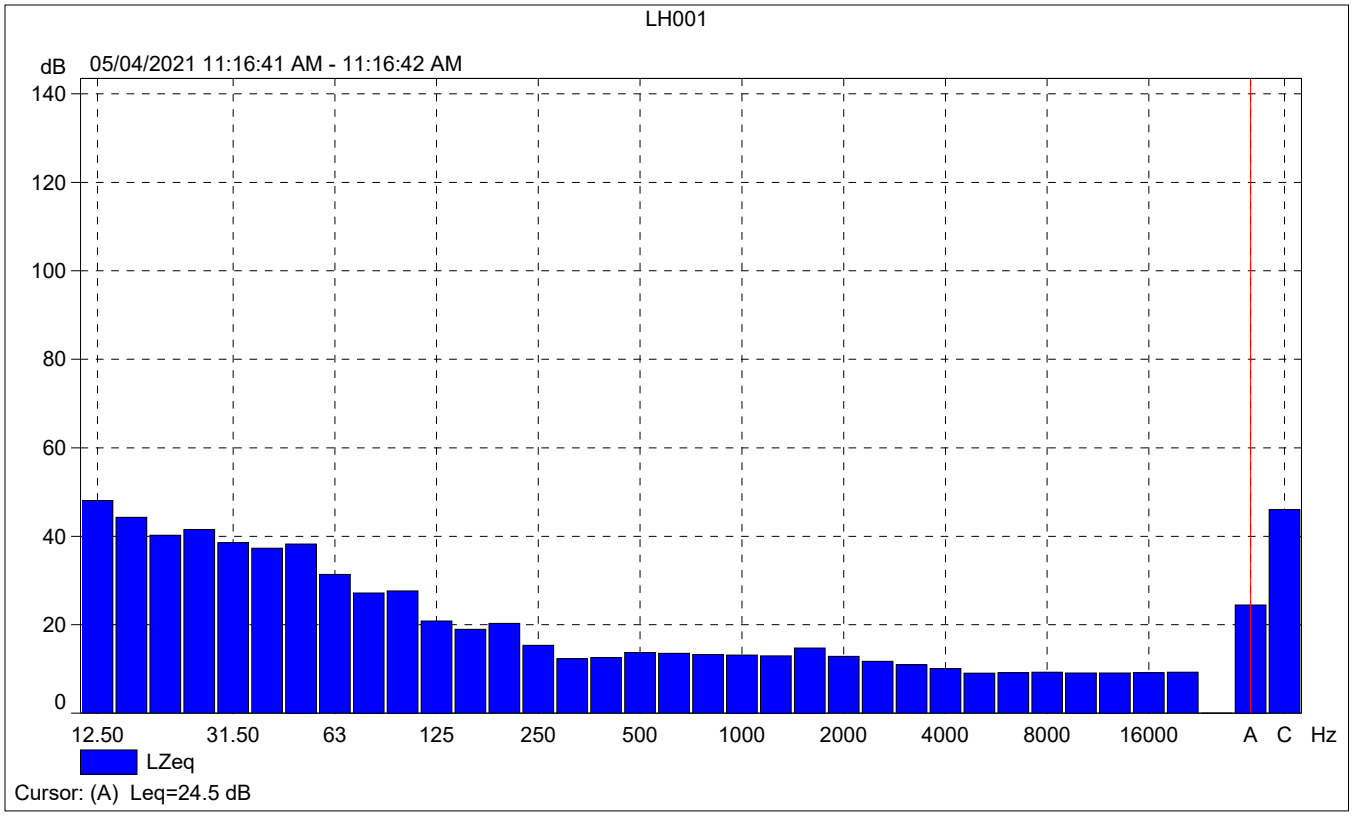
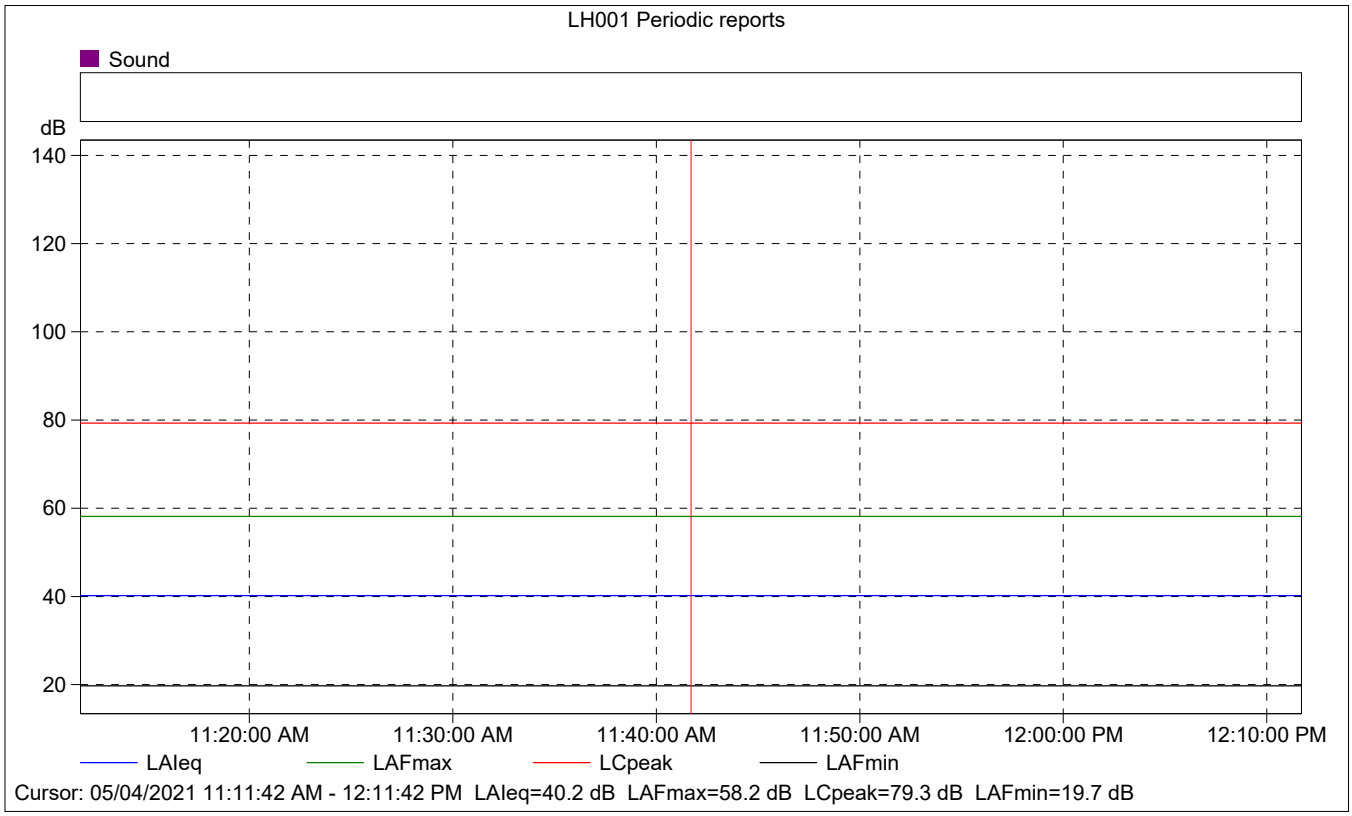
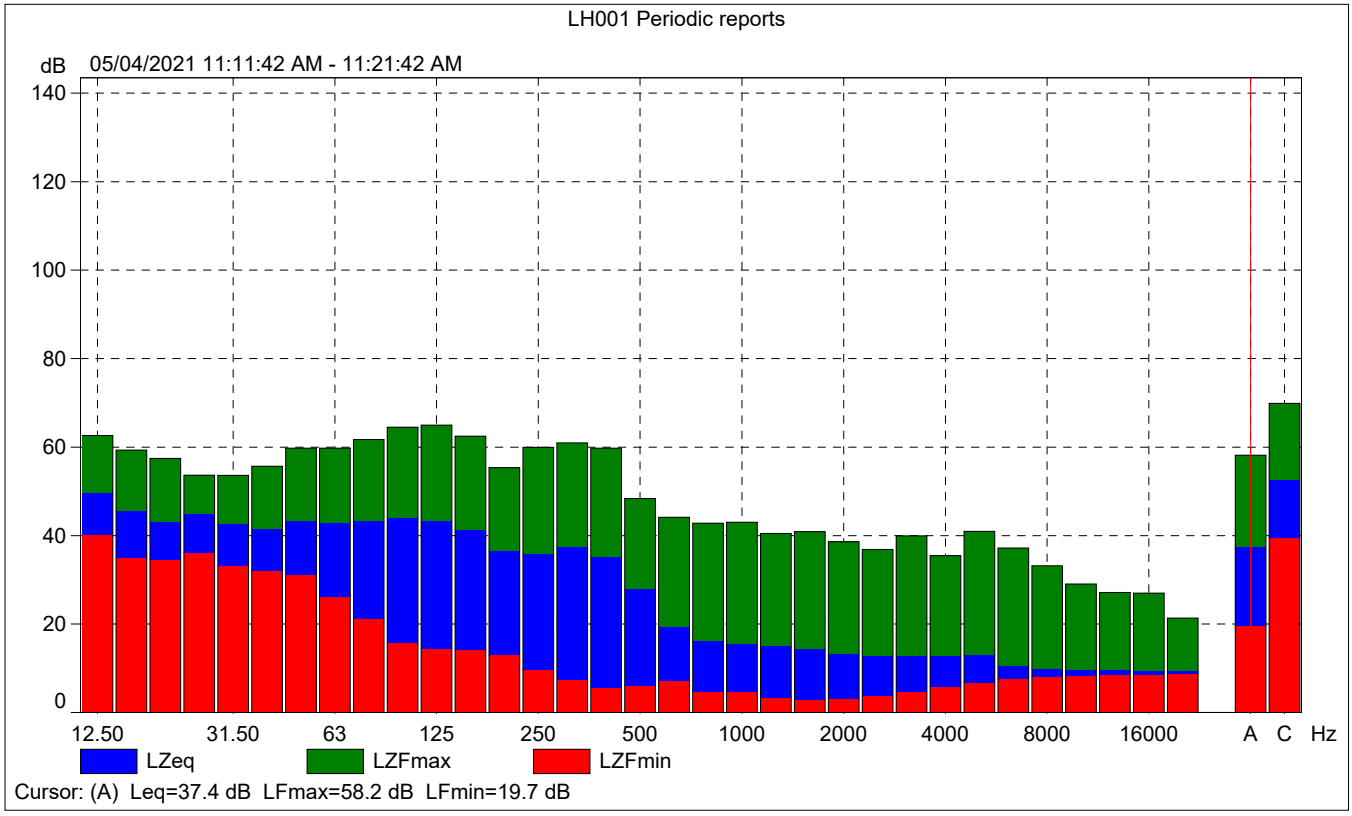
Date	05/04/2021				


LH001
dB
05/04/2021 11:16:41 AM - 11:16:42 AM
140
120
100
80
60
40
20
0
12.50
31.50
63
125
250
500
1000
2000
4000
8000
16000
A
C
Hz
LZeq
Cursor: (A) Leq=24.5 dB

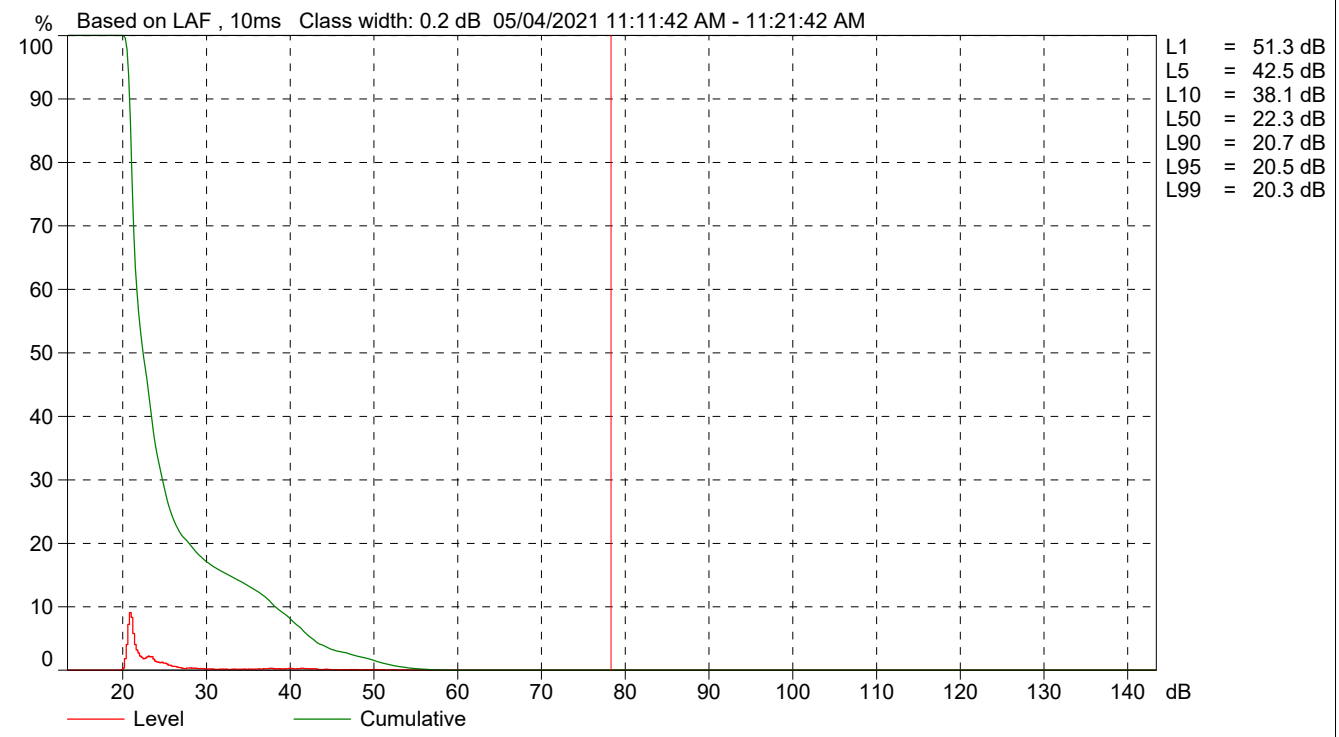

LH001 Periodic reports
Sound
dB
140
120
100
80
60
40
20
11:20:00 AM
11:30:00 AM
11:40:00 AM
11:50:00 AM
12:00:00 PM
12:10:00 PM
LAIeq
LAFmax
LCpeak
LAFmin
Cursor: 05/04/2021 11:11:42 AM - 12:11:42 PM LAIeq=40.2 dB LAFmax=58.2 dB LCpeak=79.3 dB LAFmin=19.7 dB

LH001 Periodic reports

	Start time	Elapsed time	Overload [%]	LAIeq [dB]	LAFmax [dB]	LAFmin [dB]
Value			0.00	40.2	58.2	19.7
Time	11:11:42 AM	0:10:00				
Date	05/04/2021					



LH001 Periodic reports



Cursor: [78.2 ; 78.4[dB Level: 0.0% Cumulative: 0.0%

Site Number: NM-2			
Recorded By: Danielle Regimbal			
Job Number: 178416			
Date: 5/4/2021			
Time: 11:38 AM			
Location: Along Hoffman Road, approximately one-mile northwest of project site and 0.5-mile southwest of rural residential use.			
Source of Peak Noise: Not applicable.			
Noise Data			
Leq (dB)	**Lmax(dB)**	**Lmin (dB)**	**Peak (dB)**
29.1	51.5	18.3	77.8

Equipment						
Category	**Type**	**Vendor**	**Model**	**Serial No.**	**Cert. Date**	**Note**
Sound	Sound Level Meter	**Brüel & Kjær**	**2250**	**3011133**	**04/08/2019**	
	Microphone	**Brüel & Kjær**	**4189**	**3086765**	**04/08/2019**	
	Preamp	**Brüel & Kjær**	**ZC 0032**	**25380**	**04/08/2019**	
	Calibrator	**Brüel & Kjær**	**4231**	**2545667**	**04/08/2019**	

Weather Data			
Est.	**Duration:** 10 minutes	**Sky:** Sunny/Clear	
	Note: dBA Offset = 0.01	**Sensor Height (ft):** 5 ft	
	Wind Ave Speed (mph / m/s)	**Temperature (degrees Fahrenheit)**	**Barometer Pressure (inches)**
	SW 2 mph	84	29.9 inHg

Photo of Measurement Location

2250

Instrument:		2250
Application:		BZ7225 Version 4.7.4
Start Time:		05/04/2021 11:39:01
End Time:		05/04/2021 11:49:01
Elapsed Time:		00:10:00
Bandwidth:		1/3-octave
Max Input Level:		142.17

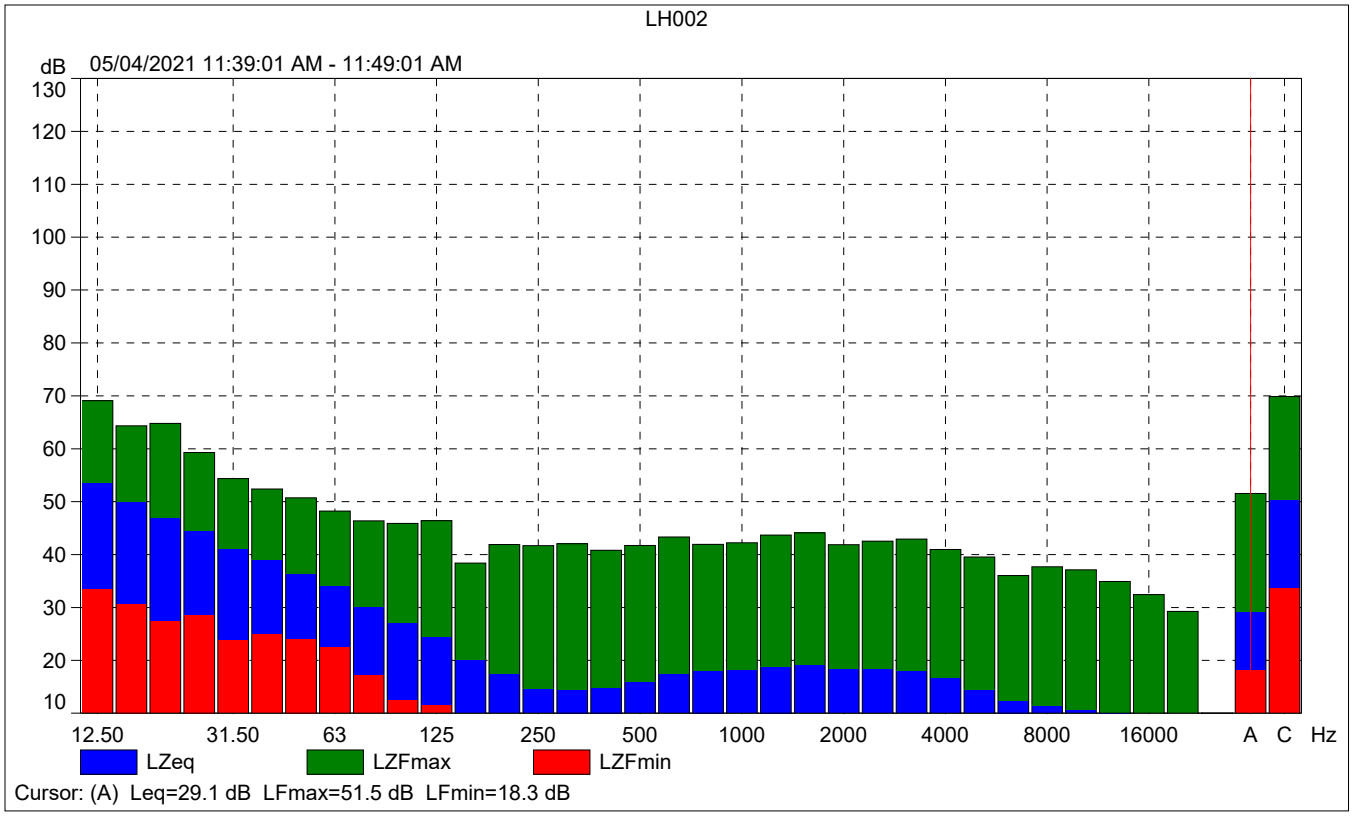
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	Z

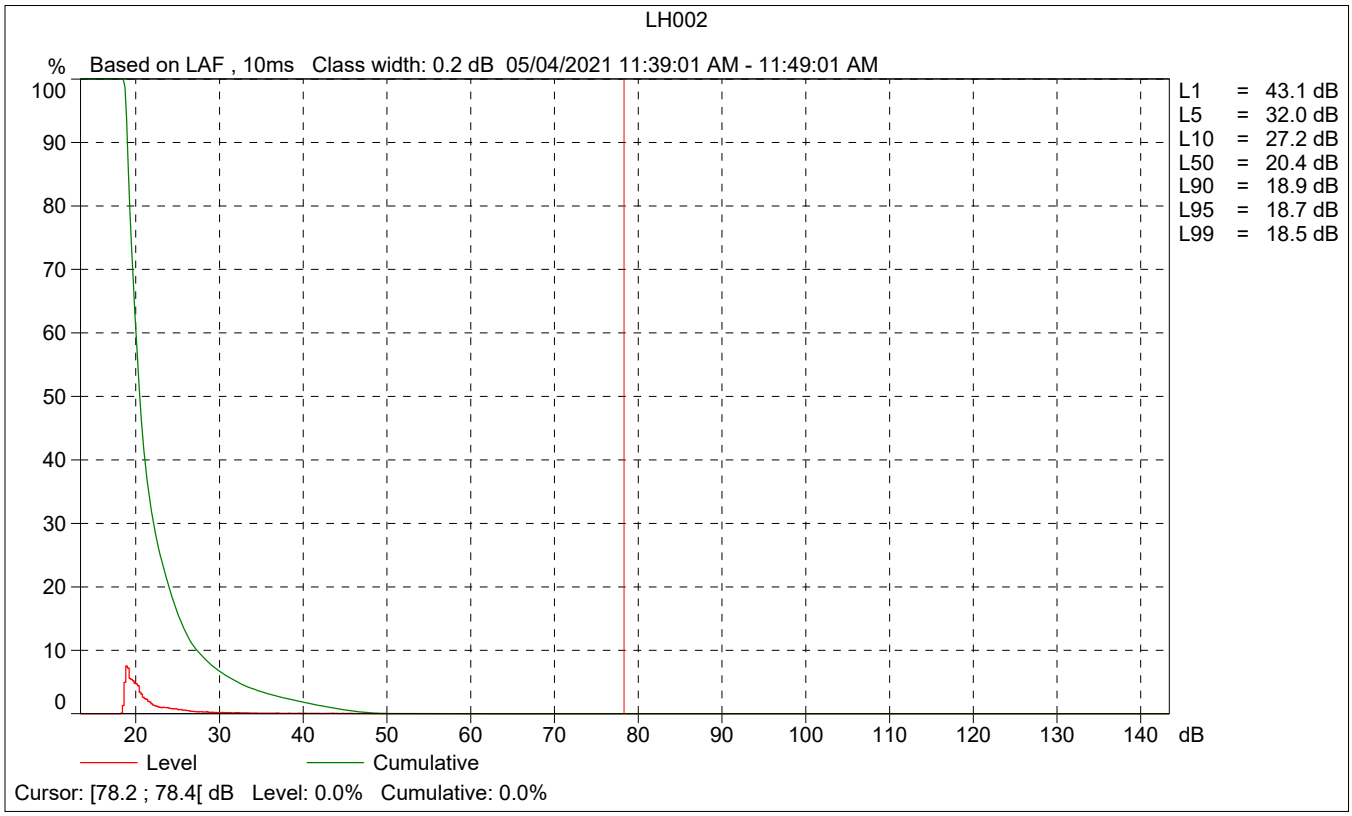
Instrument Serial Number:		3011133
Microphone Serial Number:		3086765
Input:		Top Socket
Windscreen Correction:		UA-1650
Sound Field Correction:		Free-field

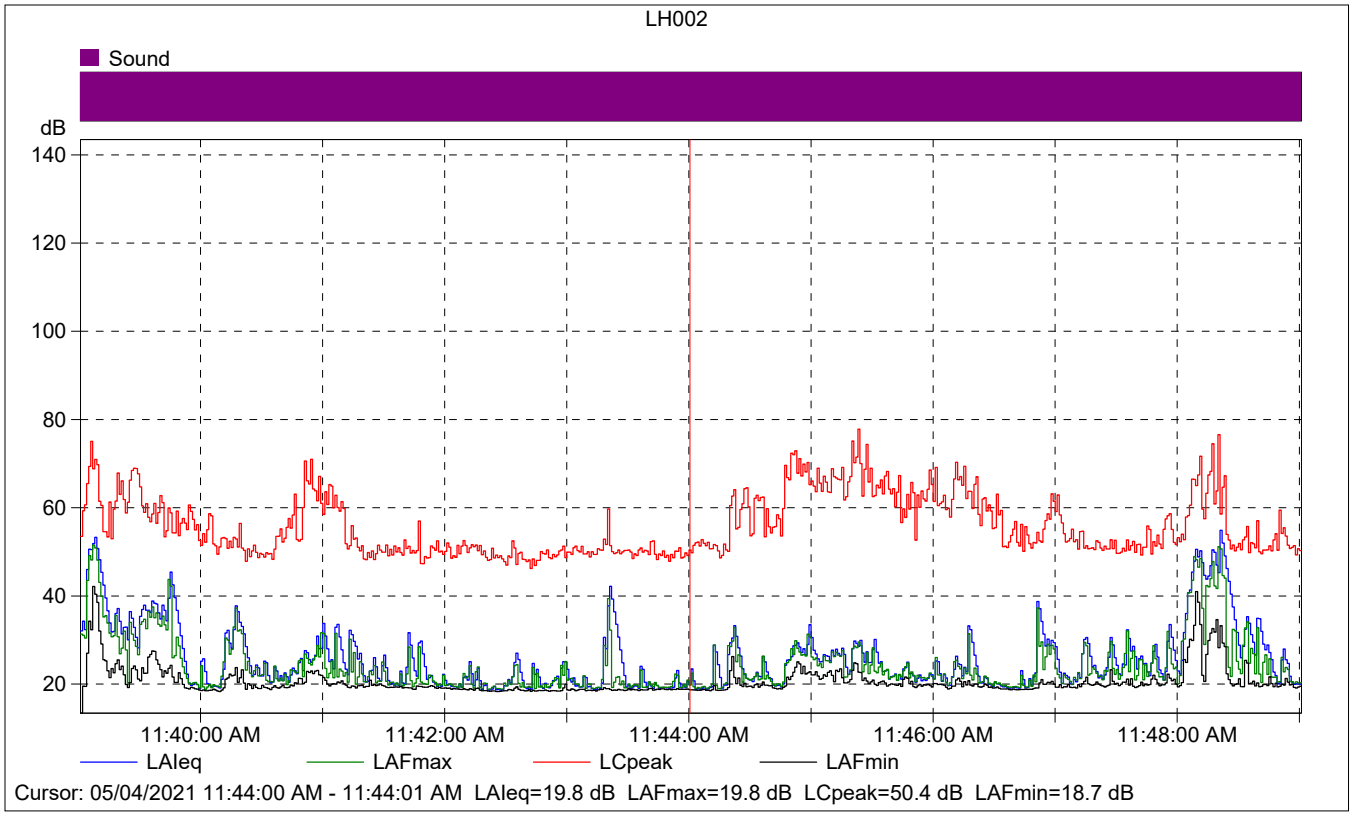
Calibration Time:		05/04/2021 08:03:36
Calibration Type:		External reference
Sensitivity:		43.354082852602 mV/Pa

LH002

	Start time	End time	Elapsed time	Overload [%]	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value				0.00	29.1	51.5	18.3
Time	11:39:01 AM	11:49:01 AM	0:10:00				
Date	05/04/2021	05/04/2021					

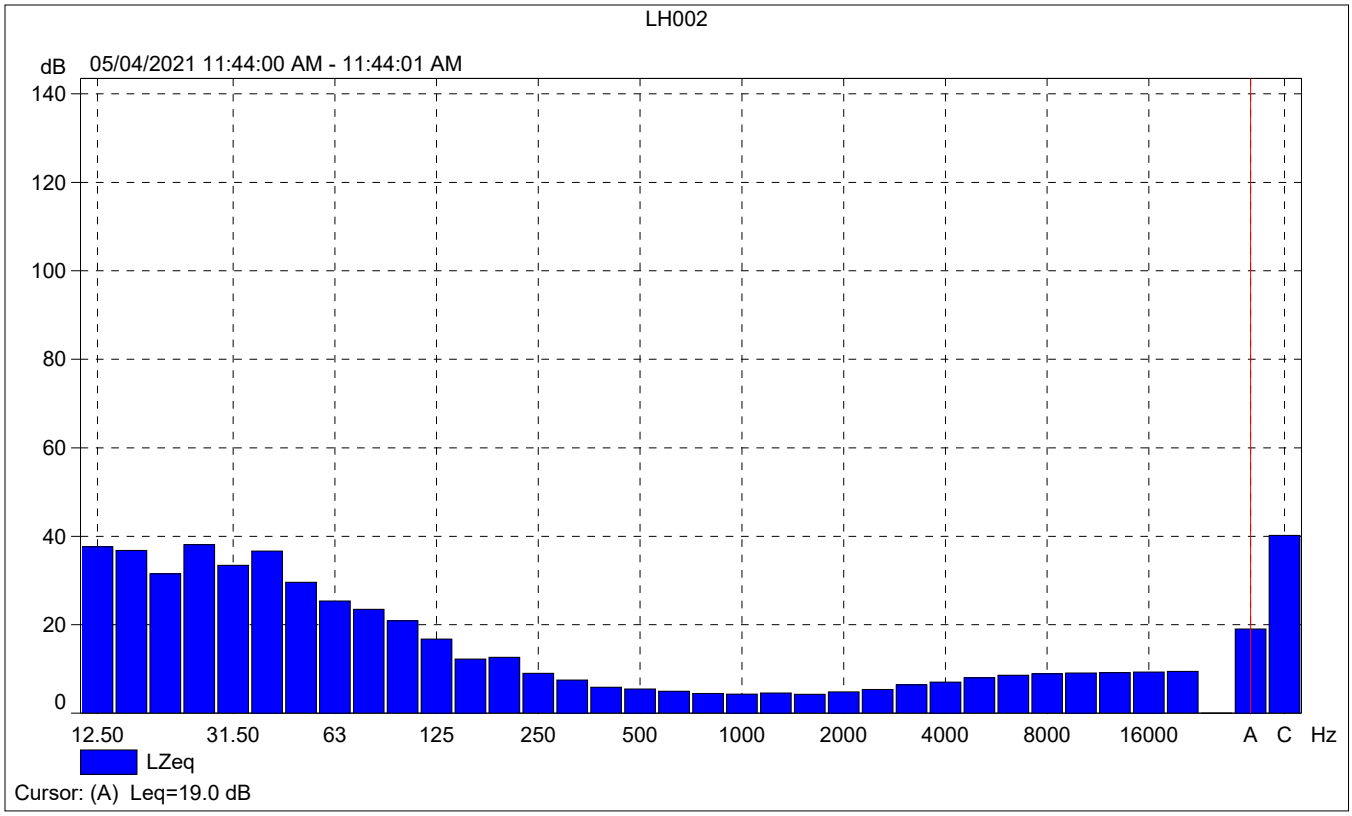

LH002
dB
05/04/2021 11:39:01 AM - 11:49:01 AM
130
120
110
100
90
80
70
60
50
40
30
20
10
12.50
31.50
63
125
250
500
1000
2000
4000
8000
16000
A
C
Hz
LZeq
LZFmax
LZFmin
Cursor: (A) Leq=29.1 dB LFmax=51.5 dB LFmin=18.3 dB

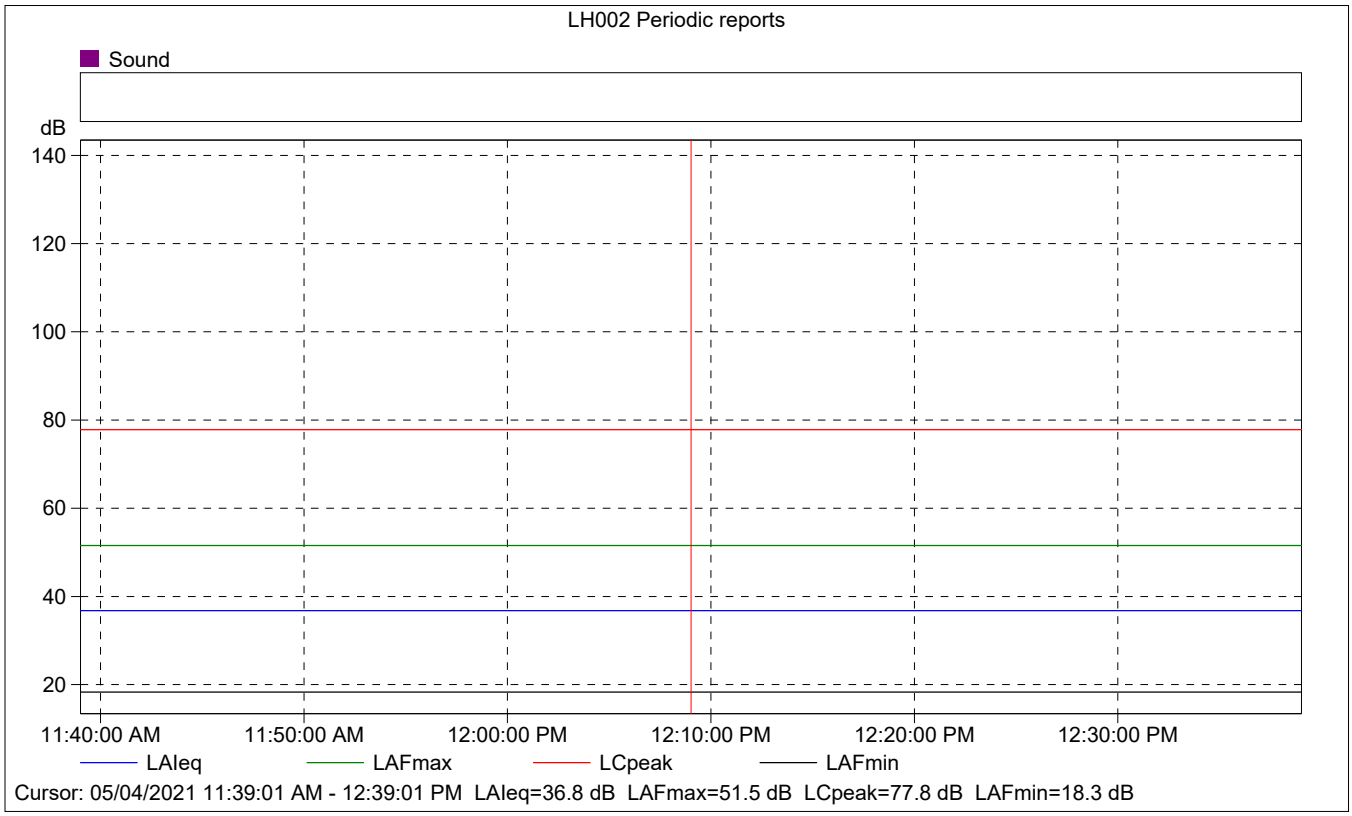

LH002
%
Based on LAF , 10ms Class width: 0.2 dB 05/04/2021 11:39:01 AM - 11:49:01 AM
100
90
80
70
60
50
40
30
20
10
0
20
30
40
50
60
70
80
90
100
110
120
130
140
dB
L1 = 43.1 dB
L5 = 32.0 dB
L10 = 27.2 dB
L50 = 20.4 dB
L90 = 18.9 dB
L95 = 18.7 dB
L99 = 18.5 dB
Level
Cumulative
Cursor: [78.2 ; 78.4[dB Level: 0.0% Cumulative: 0.0%



LH002

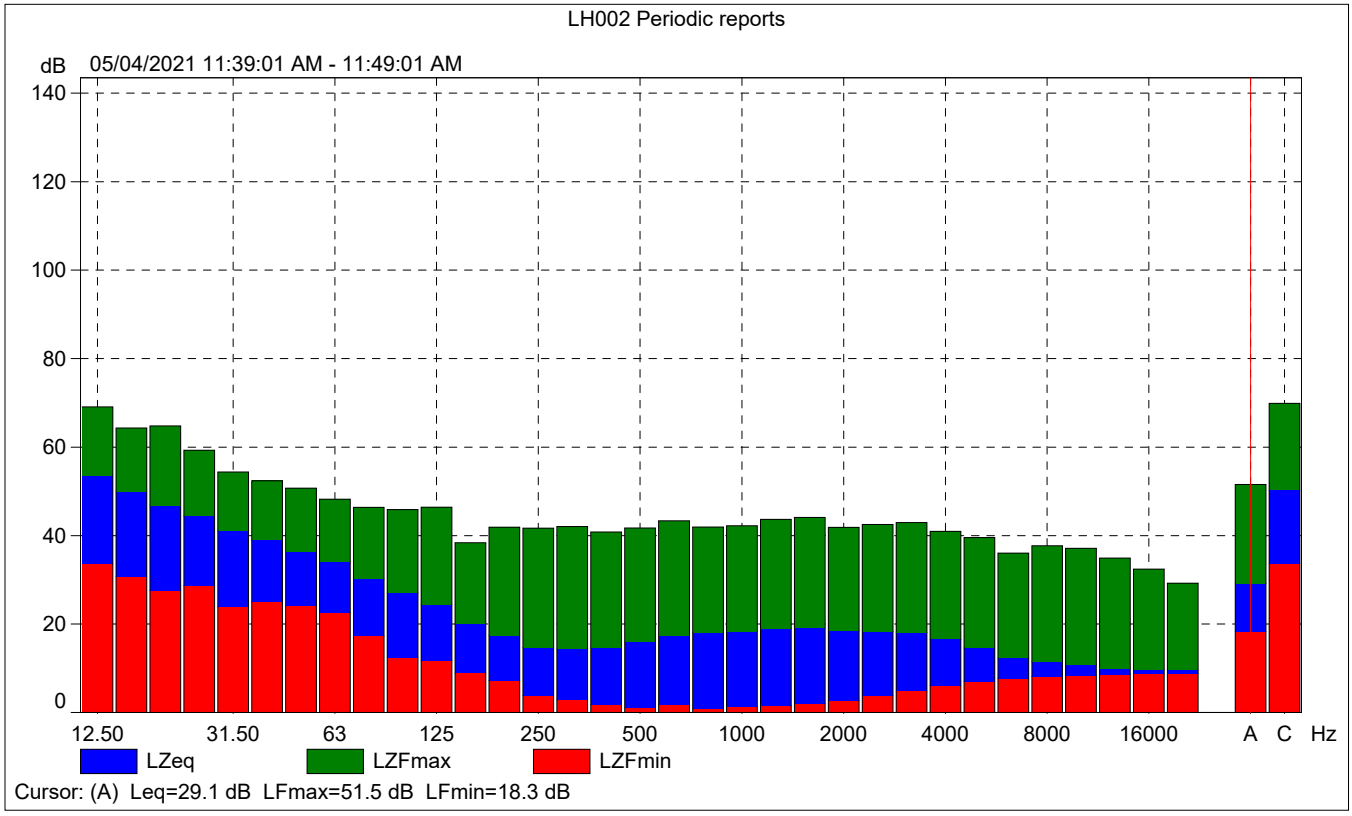
	Start time	Elapsed time	LAIeq [dB]	LAFmax [dB]	LAFmin [dB]
Value			19.8	19.8	18.7
Time	11:44:00 AM	0:00:01			
Date	05/04/2021				


LH002
dB
05/04/2021 11:44:00 AM - 11:44:01 AM
140
120
100
80
60
40
20
0
12.50
31.50
63
125
250
500
1000
2000
4000
8000
16000
A
C
Hz
LZeq
Cursor: (A) Leq=19.0 dB

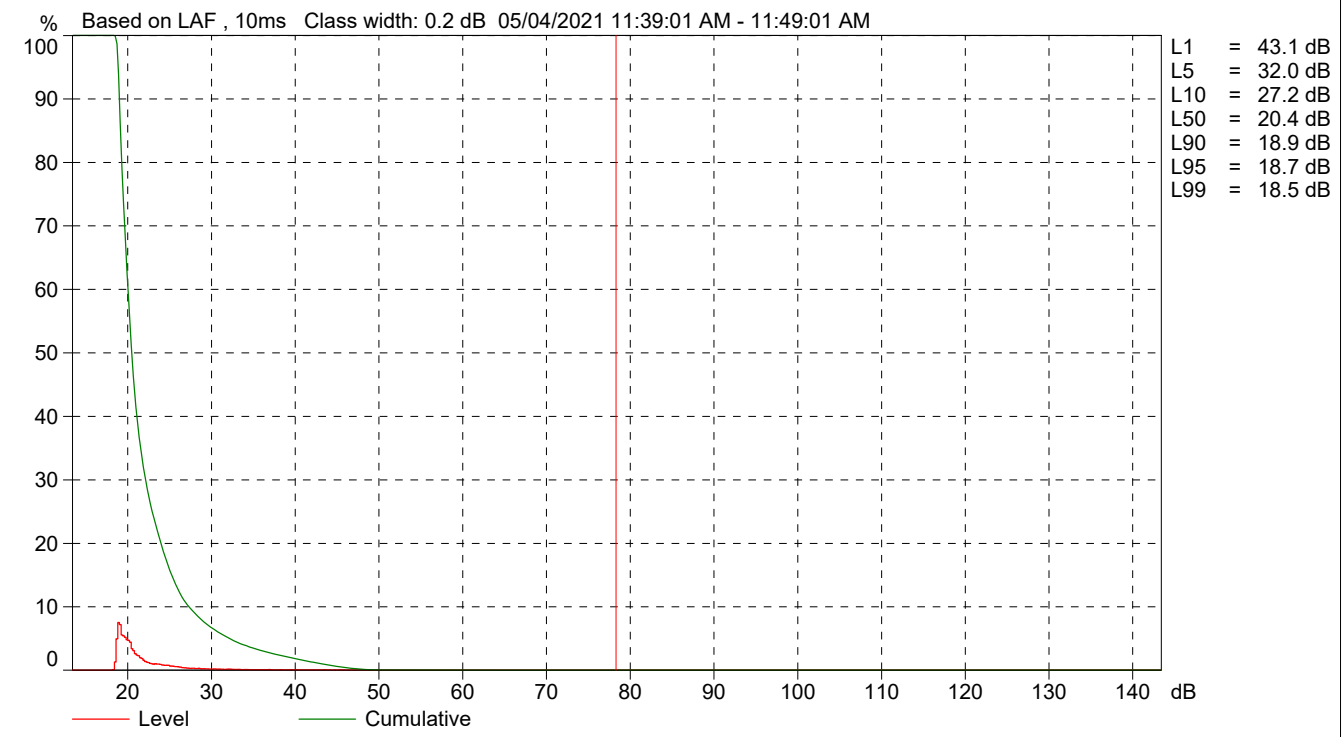

LH002 Periodic reports
Sound
dB
140
120
100
80
60
40
20
11:40:00 AM
11:50:00 AM
12:00:00 PM
12:10:00 PM
12:20:00 PM
12:30:00 PM
LAIeq
LAFmax
LCpeak
LAFmin
Cursor: 05/04/2021 11:39:01 AM - 12:39:01 PM LAIeq=36.8 dB LAFmax=51.5 dB LCpeak=77.8 dB LAFmin=18.3 dB

LH002 Periodic reports

	Start time	Elapsed time	Overload [%]	LAIeq [dB]	LAFmax [dB]	LAFmin [dB]
Value			0.00	36.8	51.5	18.3
Time	11:39:01 AM	0:10:00				
Date	05/04/2021					



LH002 Periodic reports



Cursor: [78.2 ; 78.4[dB Level: 0.0% Cumulative: 0.0%

Site Number: NM-3			
Recorded By: Danielle Regimbal			
Job Number: 178416			
Date: 5/4/2021			
Time: 12:07 PM			
Location: Adjacent to IX Solar Thermal Power Plant ponds.			
Source of Peak Noise: Operations at the IX Solar Thermal Power Plants			
Noise Data			
Leq (dB)	**Lmax(dB)**	**Lmin (dB)**	**Peak (dB)**
41.9	58.4	28.5	83.9

Equipment						
Category	**Type**	**Vendor**	**Model**	**Serial No.**	**Cert. Date**	**Note**
Sound	Sound Level Meter	**Brüel & Kjær**	**2250**	**3011133**	**04/08/2019**	
	Microphone	**Brüel & Kjær**	**4189**	**3086765**	**04/08/2019**	
	Preamp	**Brüel & Kjær**	**ZC 0032**	**25380**	**04/08/2019**	
	Calibrator	**Brüel & Kjær**	**4231**	**2545667**	**04/08/2019**	

Weather Data			
Est.	**Duration:** 10 minutes	**Sky:** Sunny/Clear	
	Note: dBA Offset = 0.01	**Sensor Height (ft):** 5 ft	
	Wind Ave Speed (mph / m/s)	**Temperature (degrees Fahrenheit)**	**Barometer Pressure (inches)**
	SSE 2 mph	84	29.9 inHg

Photo of Measurement Location

2250

Instrument:		2250
Application:		BZ7225 Version 4.7.4
Start Time:		05/04/2021 12:07:35
End Time:		05/04/2021 12:17:35
Elapsed Time:		00:10:00
Bandwidth:		1/3-octave
Max Input Level:		142.17

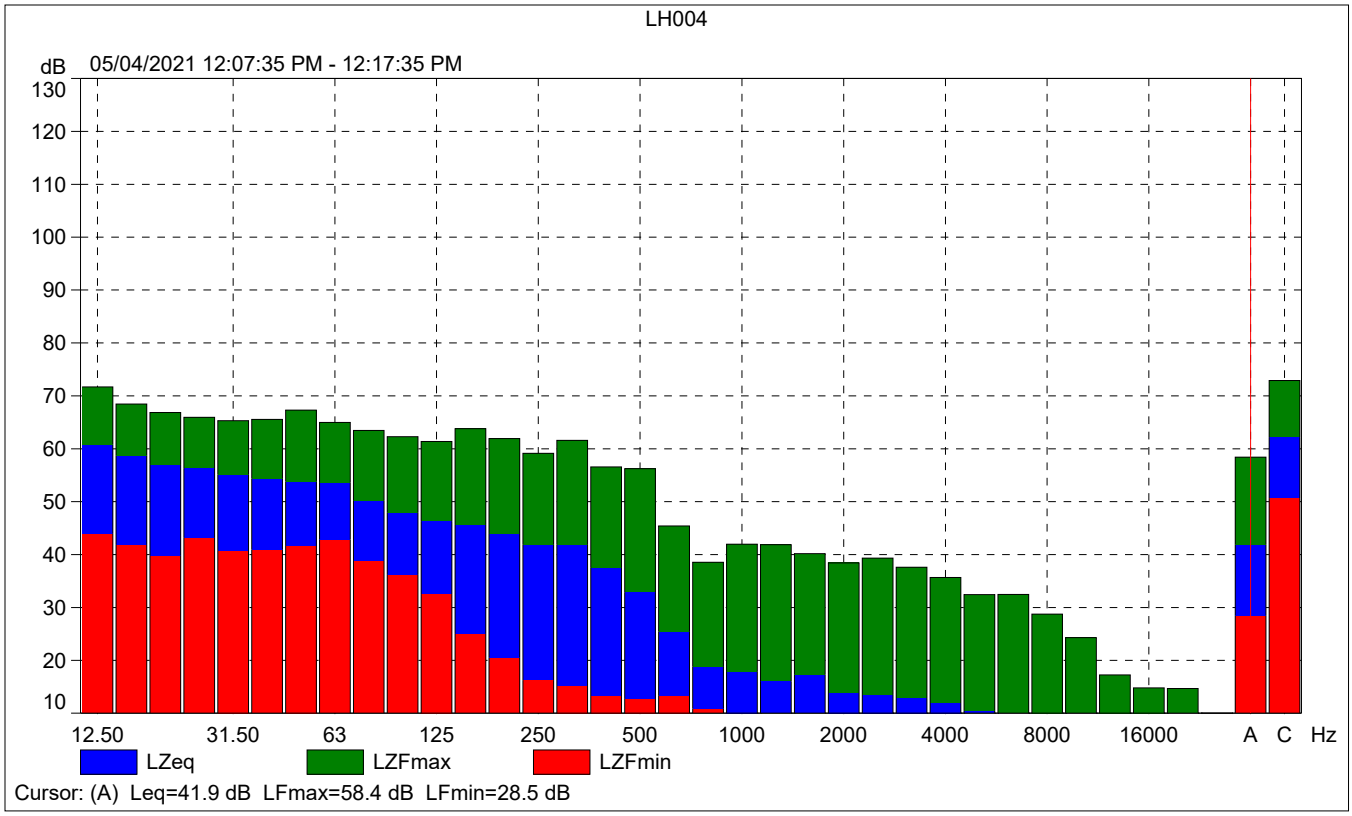
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	Z

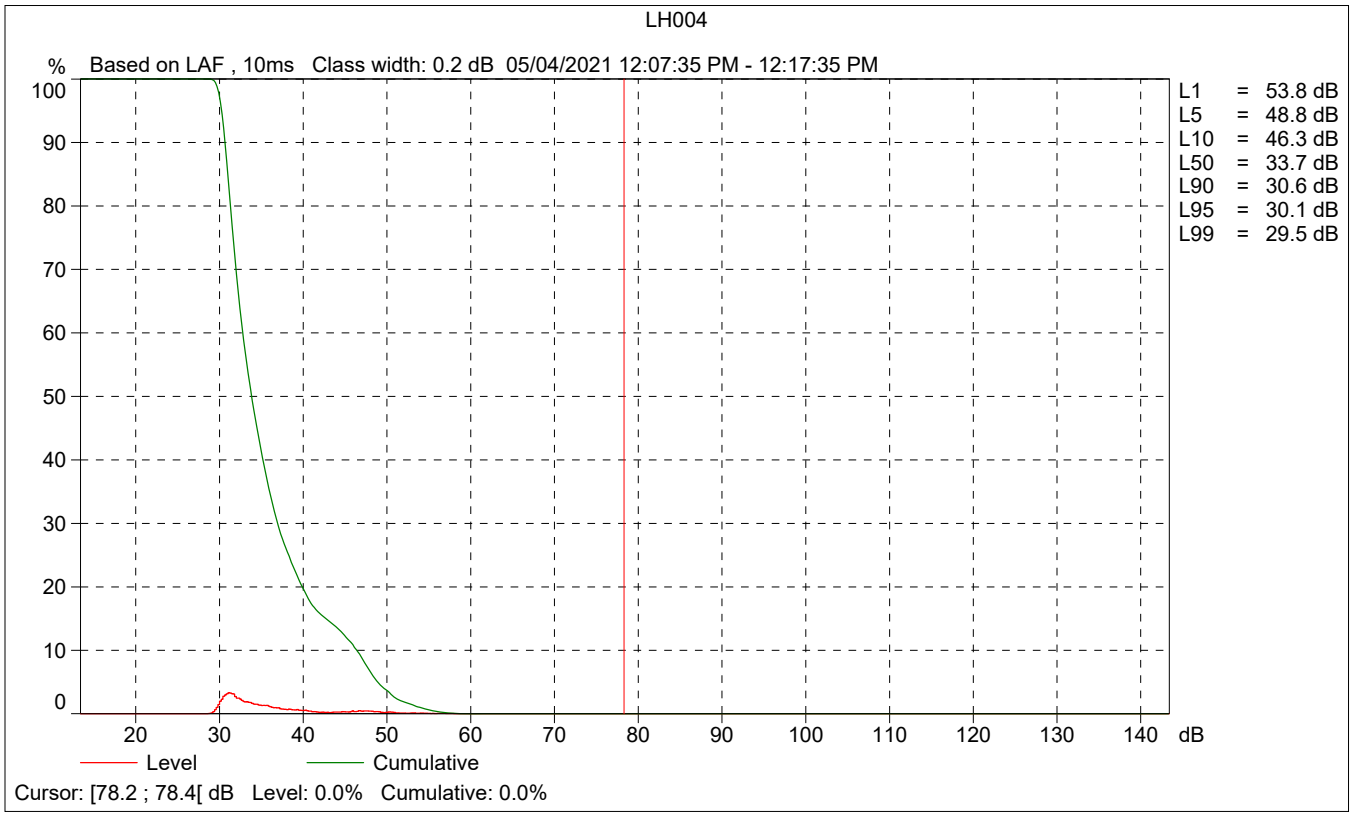
Instrument Serial Number:		3011133
Microphone Serial Number:		3086765
Input:		Top Socket
Windscreen Correction:		UA-1650
Sound Field Correction:		Free-field

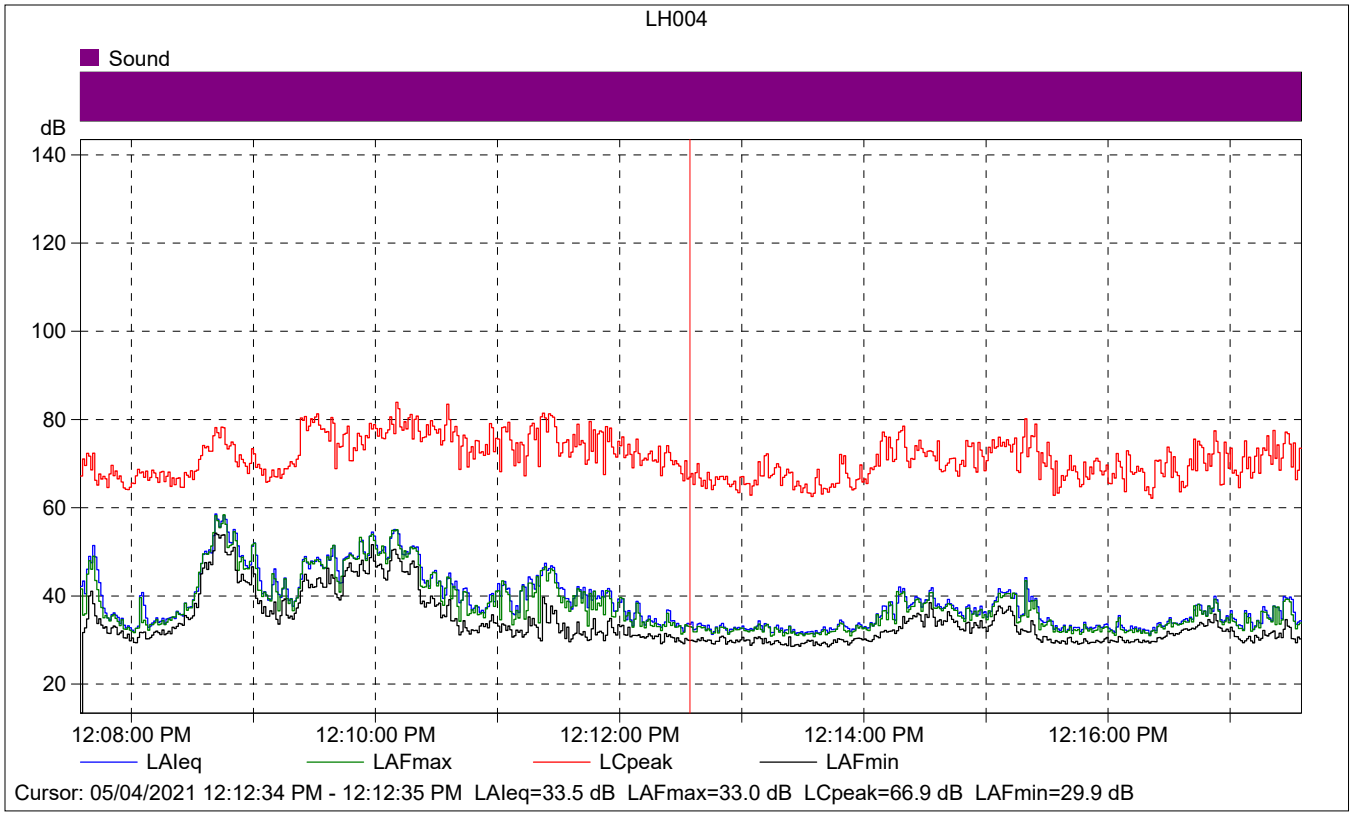
Calibration Time:		05/04/2021 08:03:36
Calibration Type:		External reference
Sensitivity:		43.354082852602 mV/Pa

LH004

	Start time	End time	Elapsed time	Overload [%]	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value				0.00	41.9	58.4	28.5
Time	12:07:35 PM	12:17:35 PM	0:10:00				
Date	05/04/2021	05/04/2021					

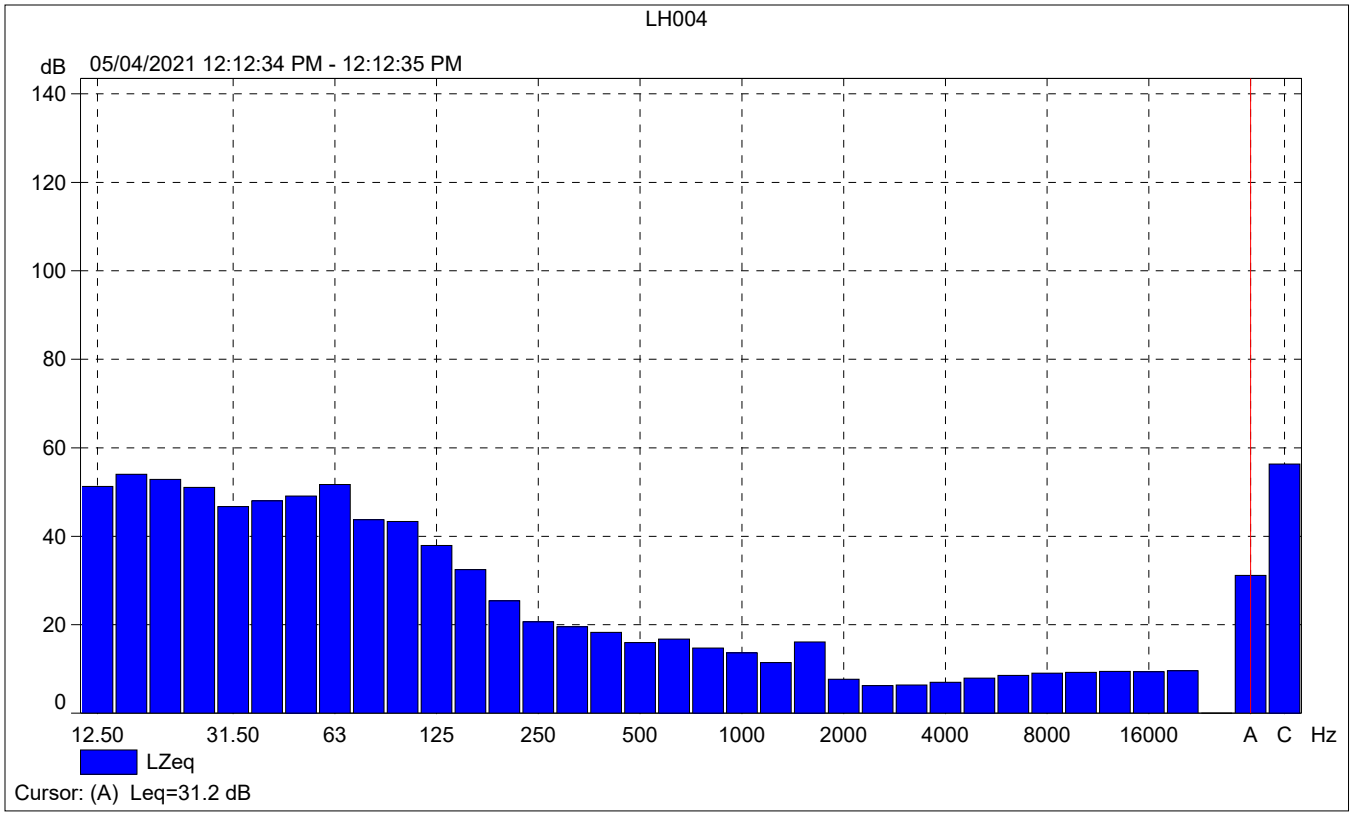

LH004
dB
05/04/2021 12:07:35 PM - 12:17:35 PM
130
120
110
100
90
80
70
60
50
40
30
20
10
12.50
31.50
63
125
250
500
1000
2000
4000
8000
16000
A
C
Hz
LZeq
LZFmax
LZFmin
Cursor: (A) Leq=41.9 dB LFmax=58.4 dB LFmin=28.5 dB

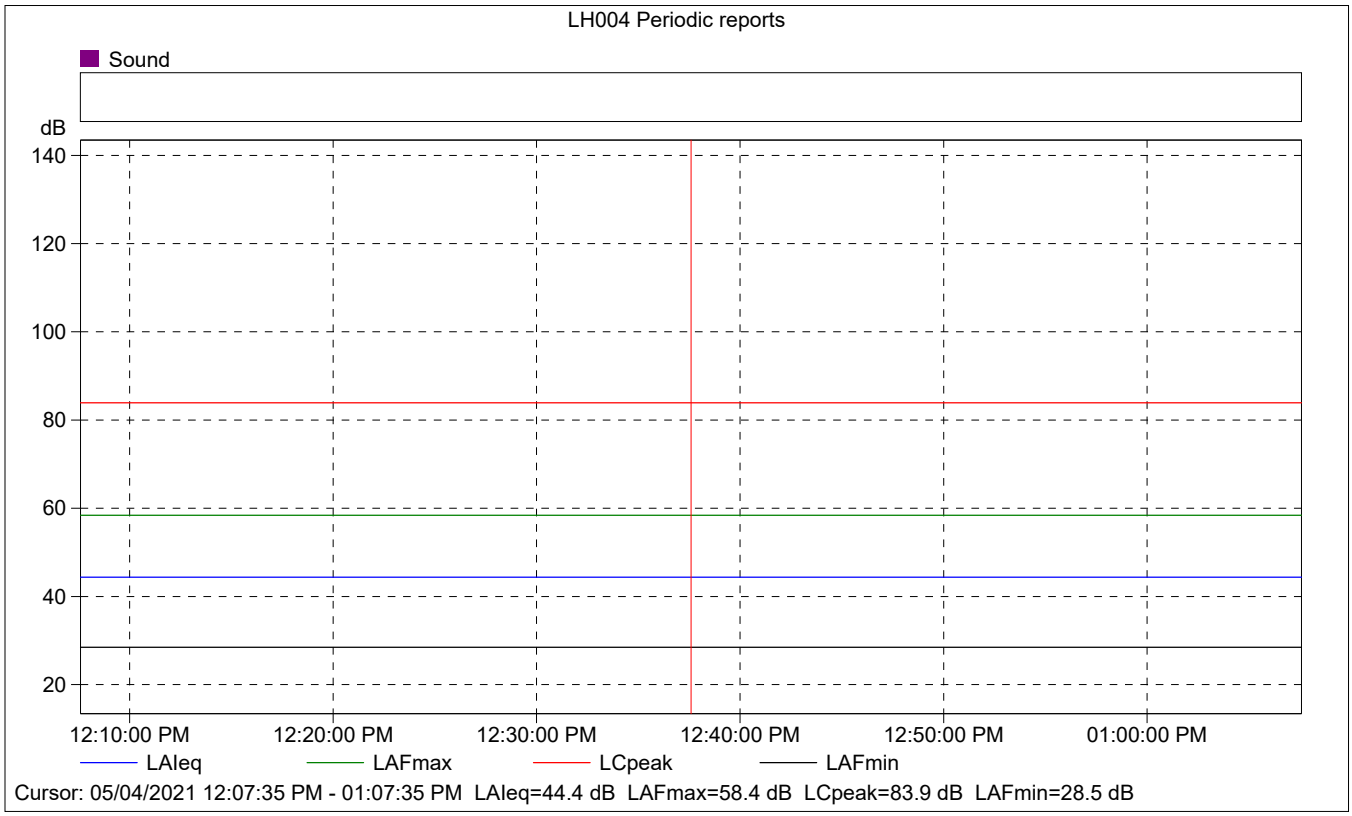

LH004
%
Based on LAF , 10ms Class width: 0.2 dB 05/04/2021 12:07:35 PM - 12:17:35 PM
100
90
80
70
60
50
40
30
20
10
0
20
30
40
50
60
70
80
90
100
110
120
130
140
dB
L1 = 53.8 dB
L5 = 48.8 dB
L10 = 46.3 dB
L50 = 33.7 dB
L90 = 30.6 dB
L95 = 30.1 dB
L99 = 29.5 dB
Level
Cumulative
Cursor: [78.2 ; 78.4[dB Level: 0.0% Cumulative: 0.0%



LH004

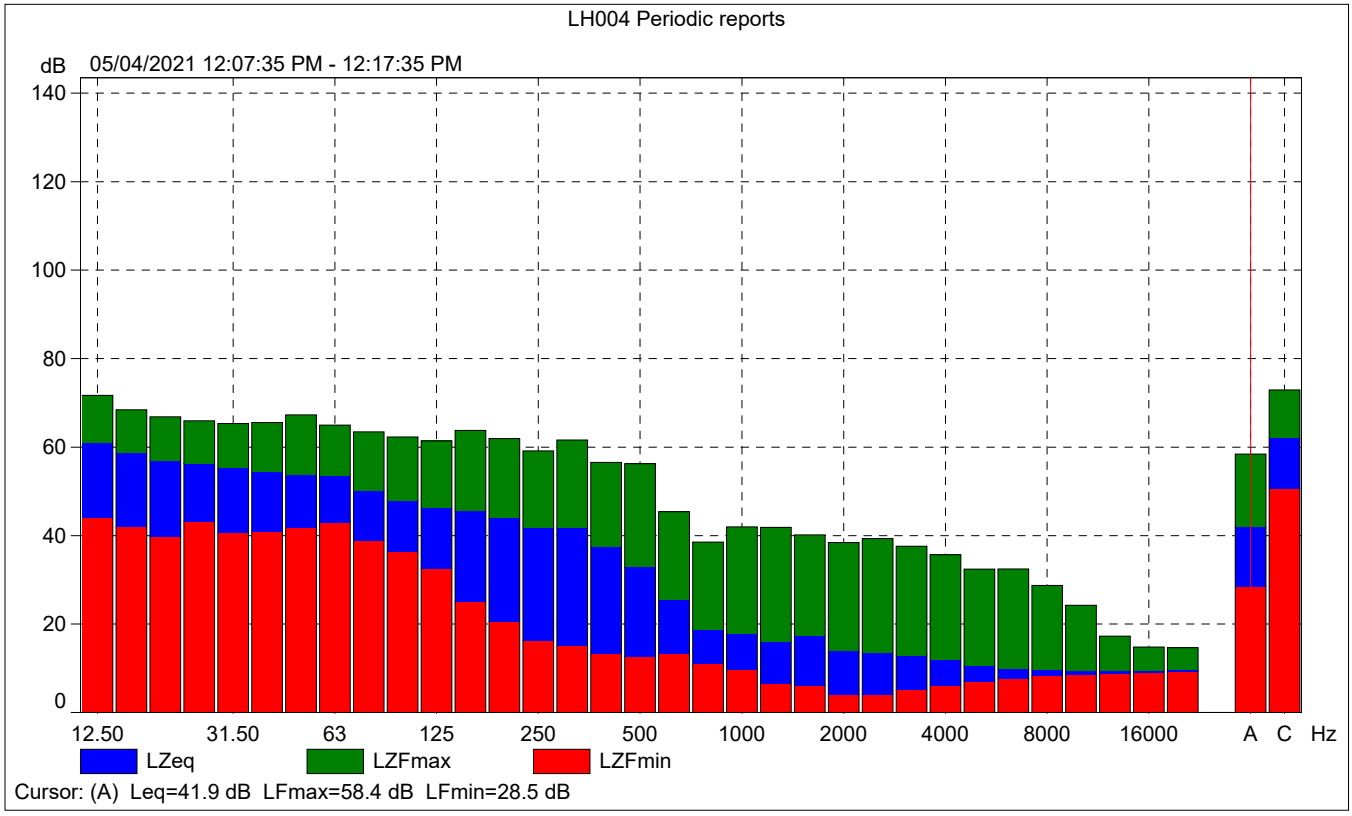
	Start time	Elapsed time	LAIeq [dB]	LAFmax [dB]	LAFmin [dB]
Value			33.5	33.0	29.9
Time	12:12:34 PM	0:00:01			
Date	05/04/2021				


LH004
dB
05/04/2021 12:12:34 PM - 12:12:35 PM
140
120
100
80
60
40
20
0
12.50
31.50
63
125
250
500
1000
2000
4000
8000
16000
A
C
Hz
LZeq
Cursor: (A) Leq=31.2 dB

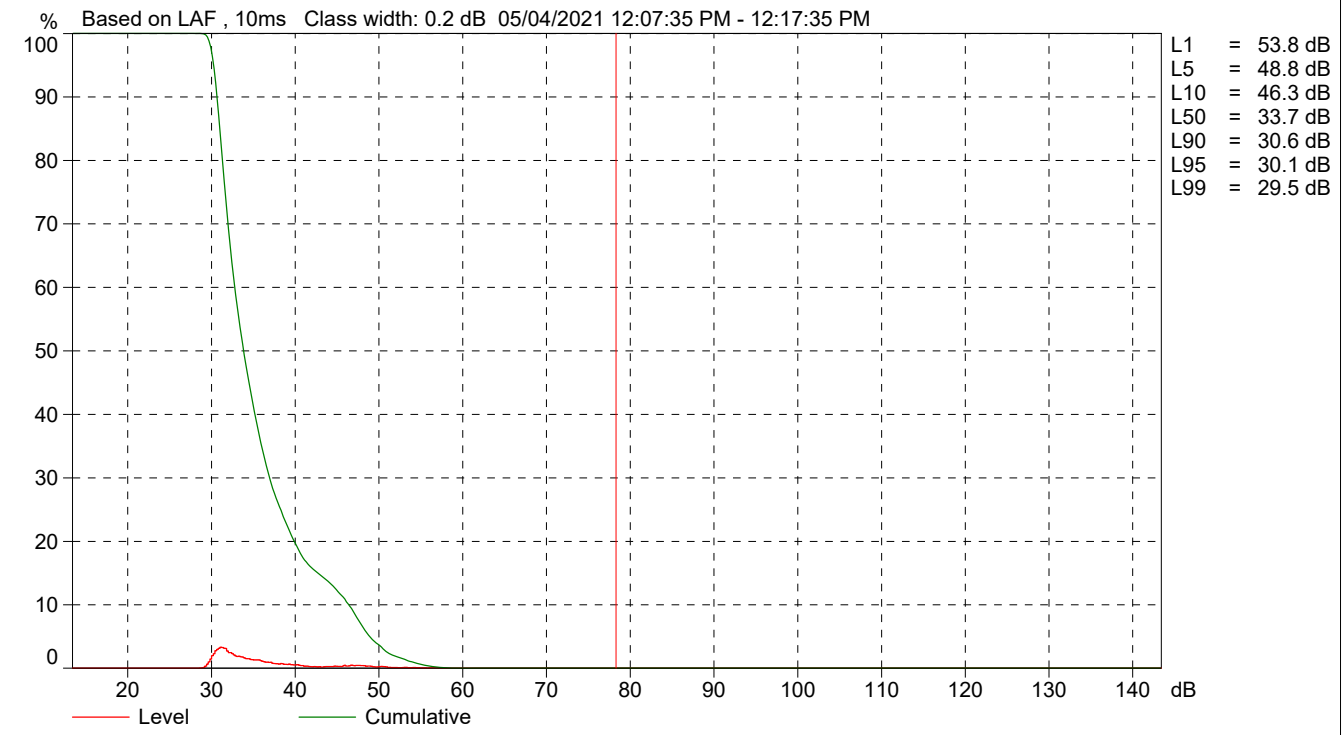

LH004 Periodic reports
Sound
dB
140
120
100
80
60
40
20
12:10:00 PM
12:20:00 PM
12:30:00 PM
12:40:00 PM
12:50:00 PM
01:00:00 PM
LAIeq
LAFmax
LCpeak
LAFmin
Cursor: 05/04/2021 12:07:35 PM - 01:07:35 PM LAIeq=44.4 dB LAFmax=58.4 dB LCpeak=83.9 dB LAFmin=28.5 dB

LH004 Periodic reports

	Start time	Elapsed time	Overload [%]	LAIeq [dB]	LAFmax [dB]	LAFmin [dB]
Value			0.00	44.4	58.4	28.5
Time	12:07:35 PM	0:10:00				
Date	05/04/2021					



LH004 Periodic reports



Cursor: [78.2 ; 78.4[dB Level: 0.0% Cumulative: 0.0%

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 6/10/2021
Case Description: Site Preparation

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Northern Residence	Residential	1	1	1

Equipment

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Front End Loader	No	40		79.1	4320	0
Excavator	No	40		80.7	4320	0
Concrete Saw	No	20		89.6	4320	0
Dump Truck	No	40		76.5	4320	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Front End Loader	40.4	36.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	42	38	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Concrete Saw	50.8	43.9	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	37.7	33.7	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	50.8	45.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 6/10/2021
Case Description: System Installation

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Northern Residence	Residential	1	1	1

Equipment

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Front End Loader	No	40		79.1	4320	0
Crane	No	16		80.6	4320	0
Excavator	No	40		80.7	4320	0
Grader	No	40	85		4320	0
Tractor	No	40	84		4320	0
Dump Truck	No	40		76.5	4320	0
Dozer	No	40		81.7	4320	0
Scraper	No	40		83.6	4320	0
Vibratory Pile Driver	No	20		100.8	4320	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Front End Loader	40.4	36.4	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	41.8	33.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	42	38	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader	46.3	42.3	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	45.3	41.3	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	37.7	33.7	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	42.9	39	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Scraper	44.8	40.9	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	62.1	55.1	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	62.1	55.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 6/10/2021
Case Description: Cleanup/Testing/Restoration

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Northern Residence	Residential	1	1	1

Equipment

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Front End Loader	No	40		79.1	4320	0
Grader	No	40	85		4320	0
Dozer	No	40		81.7	4320	0
Excavator	No	40		80.7	4320	0
Dump Truck	No	40		76.5	4320	0
Roller	No	20		80	4320	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Front End Loader	40.4	36.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader	46.3	42.3	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	42.9	39	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	42	38	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	37.7	33.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	41.3	34.3	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	46.3	46.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Tracker Motor Combined Noise Level

$$L_{\Sigma} = 10 \cdot \log_{10}(n) + L_1$$

Reference Noise Level:[1]	40	dBA
Reference Distance:	10	feet
Number of Sources:	3,600	(total number of tracker motors)
Total Noise Level (at 10 feet):	75.6	dBA
Distance to Receptor:	4,320	feet
Noise Level at Receptor:[2, 3]	22.4	dBA

1. Reference noise level of 40 dbA @ 10' provided by Cupertino Electric, Inc., on September 20, 2021.
2. Calculated with the inverse square law: $dBA_2 = dBA_1 + 20\ Log_{10}\left(\frac{d_1}{d_2}\right)$

   where: dBA_1 = Reference Noise Level, dBA_2 = Estimated Noise Level, d_1 = Reference Distance, and d_2 = Receptor Location Distance
3. Conservatively assumes all trackers are the same distance from the receptor.