Appendix K

Sound Studies

Sound Modeling Assessment

ReGenerate
RENEWABLE ENERGY CONSULTING

Sound Modeling Assessment

PROJECT: LAKESIDE SOLAR/BESS (MI)

DATE: AUGUST 7, 2025

REGENERATE CONSULTING
3413 NEST AVE.
SHELDON, IA 51201
TEL: (712) 577-1825
E-MAIL: CHRIS@REGENERATECONSULTING.COM
WEB: WWW.REGENERATECONSULTING.COM

Contents

Revision History

Issue	Date	Revision Purpose
1	04-Aug-25	Original
2	07-Aug-25	Minor Report Edits

1. Executive Summary

The Lakeside Solar and BESS Project (Project) in western Michigan has been studied for the potential impact of sound on surrounding residences. Modeling and topographic reviews were completed to determine potential maximum results at receptor locations in and around the Project.

The Project is a solar and battery energy storage system (BESS) facility. Equipment from this facility can cause additional sound throughout the Project area and this effect was studied at sensitive locations (receptors) to quantify the potential impact before the Project is constructed.

ReGenerate used CadnaA to model the total sound pressure level at 675 receptors. Results were modeled based on Project noise sources alone with no other energy facilities (either operational or under development) found within two miles of the project.

The effect on receptors has been quantified with the results summarized below.

- Maximum sound levels during full operations are below Michigan statutory limits.
- With exact equipment specifications unknown for the project, industry-standard equipment was modeled. A +5 dB(A) tonal penalty was applied to source sound power to account for potential tonal sounds.
- Per Michigan Public Service Commission (MPSC) guidelines, a +6 dB(A) penalty was applied to sound pressure level results of receptors to account for façade pressure doubling.
- A 3m tall sound barrier was included on the northern edge of the BESS to bring all receptors within compliance.
- Maximum sound at any receptor from the Project, including the +5 dB(A) tonal penalty and the +6 dB(A) façade pressure doubling penalty, is 54.7 A-weighted decibels (dB(A)).

Appendix I shows the spatial mapping for sound results. Appendix II shows sound source coordinates provided for Lakeside Solar and BESS Project. Appendix III shows the results at each receptor analyzed for this study.

2. Introduction

The Lakeside Solar and BESS Project is being developed by Lakeside Solar, LLC (Client) in western Michigan and has retained ReGenerate Consulting (ReGenerate) to carry out an independent analysis of the sound effects caused by the Project.

The objective of this assessment is to predict the sound levels generated by the Project at all receptors within or near the Project area and in accordance with Michigan Public Service Commission (MPSC) guidelines. This potential impact includes the sound generated during Project operation assuming full capacity of relevant equipment. This report describes the Project site, modeling methodology, and results of the analysis.

ReGenerate Consulting is an independent engineering consulting agency. The principal investigator for this report, Chris Nuckols, has 25-years engineering and management experience and 20-years of wind and solar resource assessment experience working for renewable energy developers, owners, and original equipment manufacturers (OEMs), He has provided engineering support to more than 100 renewable energy projects large and small, on five continents.

The ReGenerate team are members of the Institute of Noise Control Engineering of the USA (INCE-USA), a non-profit professional organization whose primary purpose is to promote noise control solutions through an international consortium of organizations with interests in acoustics and noise control. To become members of INCE-USA, ReGenerate staff qualifications were reviewed by the INCE-USA board to ensure a minimum of five years' experience in Noise Control Engineering, involving professional practice, research, or teaching.

3. Background

Sound is commonly expressed in A-weighted [dB(A)] levels; these are an expression of the relative loudness of sounds in the air as perceived by the human ear. Typical sound levels associated with various outdoor activities are presented in Figure 1 below. [1]

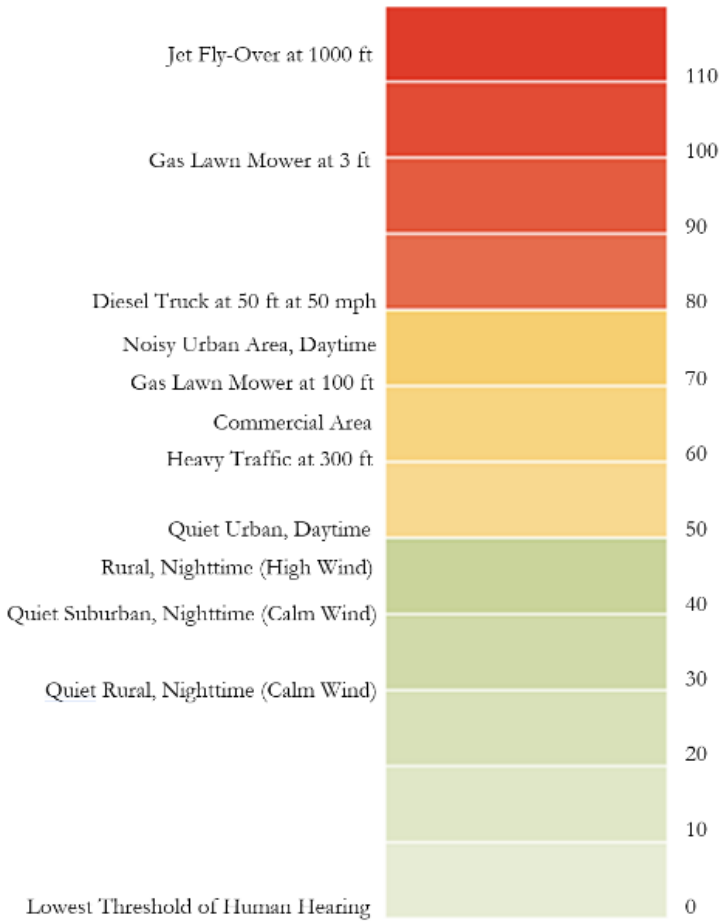

Figure 1: Sound Level of Various Outdoor Activities [dB(A)]

Sound is typically expressed using octave bands or 1/3 octave bands ranging from 32 to 16,000 hertz (Hz). Noise results are modeled for each respective octave band and then combined into a single sound emission level using the following equation [2]:

$$L_{\Sigma} = 10\ \log_{10}\left(10^{\frac{L_1}{10}} + 10^{\frac{L_2}{10}} + \cdots + 10^{\frac{L_n}{10}}\right)$$

Similarly, sound power levels from multiple sources are combined in the same way. The reason for this is because sound is expressed in decibels, which is a logarithmic scale, sound power levels cannot simply be added arithmetically.

Operational sound at solar facilities is generally low when compared to other types of power generation facilities. Additionally, solar facilities are unique in that they only operate during daytime hours when sound is generally of lower concern. Noise sources are generally confined to that of the transformers and inverters throughout the Project area.

Transformers would include the main power transformers located in the Project and utility substations as well as pad-mounted transformers installed with the inverters. From a noise perspective, transformers

are characterized by a prominence of lower frequency (120 – 480 Hz) tones which become largely imperceptible at distances more than 750 feet. [3]

Solar inverters will also produce noise, this includes the internal fans of the inverter for cooling purposes, a lower frequency humming noise during typical operation and a higher frequency noise due to capacitors during high inductive loads. Typically, electrical cabinets are situated near the center of groups of solar modules which helps to minimize noise impact on nearby receptors. Maximum sound power level specifications are provided from the manufacturer and incorporated in this analysis.

There are other potential sources of noise at solar projects including transmission lines, tracking motors used in some projects and wind blowing over solar modules. All these sources are generally of insignificant consequence to the overall sound pressure level and are therefore excluded from this analysis.

Battery energy storage systems (BESS) produce noise largely relating to the fan operation of the units. In addition, BESS units have associated inverters operating for the BESS units.

Solar inverters are considered as point sources of sound with locations specified by Lakeside Solar, LLC. Other equipment sound sources, including the substation main power transformers, BESS units and BESS inverters, was provided by Geronimo as polygons with exact locations to be determined. Main power transformers were assumed as the midpoint of the substation while BESS units and BESS inverters were sited uniformly throughout the BESS polygon per Geronimo's guidance. The sound pressure level from multiple sources nearby a receptor can be noticeably louder than that of a lone source. This cumulative potential impact is modeled in this analysis.

4. Project Details

The Project is a combination solar and BESS being developed near Montague, Michigan. The surrounding area consists mostly of flat agricultural land with some mix of forestry. There are scattered dwellings, buildings, and trees throughout the Project area.

The Client provided ReGenerate with the locations of Project equipment including inverters, substations, BESS units and BESS inverters along with receptors for the Project. Coordinates for equipment considered as noise sources within the Project are given in Appendix II. Coordinates for individual receptors can be found in Appendix III.

The Project is expected to include solar inverters, BESS units, BESS inverters and main power transformers as primary sources of sound but final design and selection of equipment has not yet occurred for this Project. Therefore generic sound power levels for similar equipment have been utilized for modeling purposes.

Neighboring renewable projects that are currently in operation were reviewed as part of this analysis based upon the Major Solar Projects List by Solar Energy Industries Association (SEIA) and the U.S. Wind

Turbine Database by the United States Geological Survey (USGS) [4,5]. No projects were found within 2 miles of the Project area.

5. Project Noise Regulations

Applicable standards for the Project are taken from the MCL 460.1226 [6] which specifies that:

The solar energy facility does not generate a maximum sound in excess of 55 average hourly decibels as modeled at the nearest outer wall of the nearest dwelling located on an adjacent nonparticipating property. Decibel modeling shall use the A-weighted scale as designed by the American National Standards Institute.

6. Modeling Procedures

ReGenerate used the CadnaA software [7] to model sound for this Project. This model complies with ISO 9613-2, the international standard for propagation and attenuation of industrial sound. [8]

Total sound power level was provided by the Client for significant sources of sound. These specifications are values gathered by the manufacturer according to International Electrotechnical Commission (IEC) standard 60076-10: *Determination of Sound Levels*. [9] Sound power levels utilized in modeling are shown in the table below.

Noise Source	Quantity	Height [m]	Sound Power Level [dB(A)]
Solar Inverters	44	2.6	89.6
BESS Units	192	2.6	79.0
BESS Inverters	40	3.0	88.0
Main Power Transformers	2	4.0	73.0

Table 1: Operational Sound Power Level Emission Summary

As the final equipment models were not available at the time of this study, ReGenerate used common industry sound power levels. These values are sound power level at the source of the equipment (0 ft.). Per MPSC guidelines, no uncertainty was included for the sound power level specified. There was however a +5 dB(A) tonal penalty introduced on top of these values to account for being unable to prove a tonal prominence without the octave band data. It's possible that this tonal penalty is removed once equipment selection is finalized and more specific manufacturers specifications are available.

Modeling assumptions for the sound analysis include:

- Sound modeled in accordance with ISO 9613-2.
- A ground porosity of 0 was used over water and 0.5 for all other areas.

- No uncertainty was considered for the sound power level of Project equipment.
- Receptor height used was 4 m.
- Sound source height is the top of the source.
- Standard atmospheric conditions (Temperature=10°C and Relative Humidity=70%) are assumed.
- All point sources are operating at full capacity and their maximum sound power level.
- Noise sources are considered omnidirectional.
- Miscellaneous attenuation was set to zero.
- Dampening effects from vegetation and solar modules were ignored.
- A +5 dB(A) tonal penalty is added to source sound power levels.
- A +6 dB(A) penalty is added to modeling results to account for façade pressure doubling of outer walls versus free field sound pressure level.
- A sound barrier 3m in height and approximately 213m in length was included along the northern edge of the BESS area for noise reduction, reflection was categorized as an absorbing barrier with a 0.6 absorption coefficient.

This base-case run for both models is still likely to produce estimates higher than those which will be experienced. Factors that will lower the potential impact, but not modeled include:

- Transformers and/or inverters operating at lower sound emission.
- Impact of vegetation in dampening of sound.

7. Modeling Results

The effect on receptors has been quantified using the methodology described above and the maximum value of potential sound at any receptor location was found to be 54.7 dB(A). A summary of the Project only results can be seen in the table below.

Sound Pressure Level [dB(A)]	Participating		Non-Participating		Total	
	№ Receptors	% of Receptors	№ Receptors	% of Receptors	№ Receptors	% of Receptors
0 to 30	0	0.00%	28	4.22%	28	4.15%
30.1 to 40	0	0.00%	324	48.80%	324	48.00%
40.1 to 45	0	0.00%	158	23.80%	158	23.41%
45.1 to 50	9	81.82%	113	17.02%	122	18.07%
50.1 to 55	2	18.18%	41	6.17%	43	6.37%
55.1 or more	0	0.00%	0	0.00%	0	0.00%

Table 2: Sound Emission Results Summary

It should be noted again that these results include a +5 dB(A) penalty applied to the equipment sound power level and a +6 dB(A) penalty applied to the receptor results for façade pressure doubling. Both of these penalties were applied per MPSC guidelines for sound modeling parameters. In addition, a sound

barrier was included on the northern edge of the BESS to reduce one specific receptor (R-075) below the allowable limits. Detailed results can be found in Appendix III, these results include values both with and without the sound barrier.

8. Conclusions

The maximum value of sound at any receptor location based on the operational sources was found to be 54.7 dB(A). All receptors are below the 55 dB(A) limit at non-participating receptors set forth in the MCL 460.1226.

9. References

[1] Caltrans. (Sep 2013). Technical Noise Supplement to the Traffic Noise Analysis Protocol. Retrieved from http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013B.pdf.

[2] Sengpie Audio. (Retrieved Jun 2018). Adding acoustic levels of sound sources. Retrieved from http://www.sengpielaudio.com/calculator-spl.htm

[3] Hessler Associates, Inc. (30 Apr 2009). Existing Conditions Background Sound Surveys and Sound Emissions Assessment: Mohawk Solar, Canajoharie, NY.

[4] Solar Energy Industries Association. "Major Solar Projects List." Retrieved from https://www.seia.org/research-resources/major-solar-projects-list.

[5] United States Geological Survey. "The U.S. Wind Turbine Database." Retrieved from https://eerscmap.usgs.gov/uswtdb/.

[6] Michigan Legislature. (Retrieved Jul 2025). MCL - Section 460.1226: CLEAN AND RENEWABLE ENERGY AND ENERGY WASTE REDUCTION ACT (EXCERPT). Retrieved from https://www.legislature.mi.gov/Laws/MCL?objectName=mcl-460-1226.

[7] Data Kustik. (May 2021). CadnaA – State-of-the-art Noise Prediction Software. Retrieved from https://www.datakustik.com/products/cadnaa/cadnaa/.

[8] International Organization for Standardization (ISO) standard 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors.

[9] International Electrotechnical Commission (IEC) standard 60076-10: Determination of Sound Levels.

Appendix I – Maps

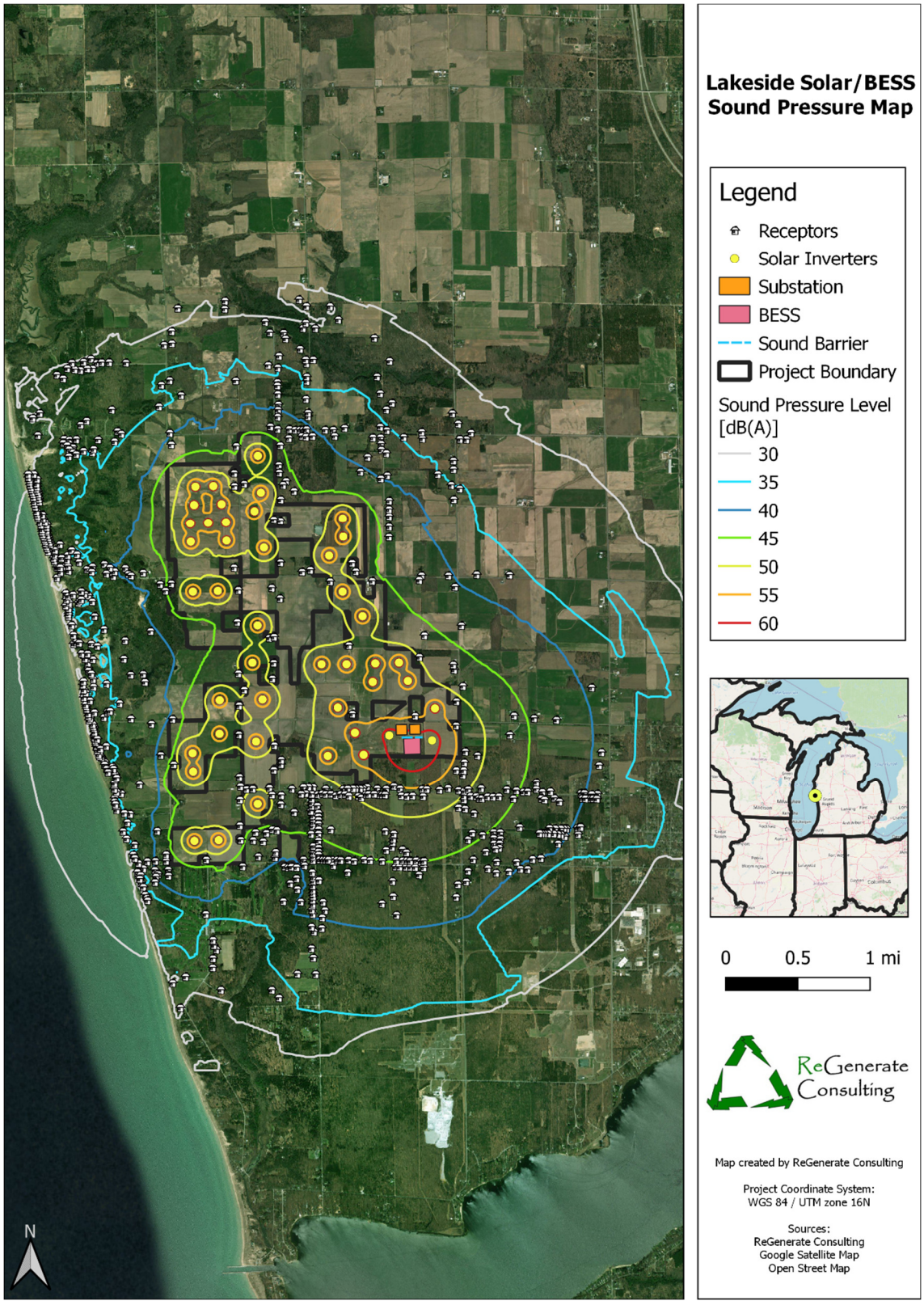

Figure 2: Sound Propagation Map of Fully Operational Project

Appendix II – Project Sound Source Coordinates (UTM WGS84 Zone 16)

X [m]	Y [m]	Noise Source
548231	4808555	BESS Inverter
548257	4808555	BESS Inverter
548283	4808555	BESS Inverter
548309	4808555	BESS Inverter
548335	4808555	BESS Inverter
548361	4808555	BESS Inverter
548231	4808529	BESS Inverter
548257	4808529	BESS Inverter
548283	4808529	BESS Inverter
548309	4808529	BESS Inverter
548335	4808529	BESS Inverter
548361	4808529	BESS Inverter
548387	4808529	BESS Inverter
548231	4808503	BESS Inverter
548257	4808503	BESS Inverter
548283	4808503	BESS Inverter
548309	4808503	BESS Inverter
548335	4808503	BESS Inverter
548361	4808503	BESS Inverter
548387	4808503	BESS Inverter
548231	4808477	BESS Inverter
548257	4808477	BESS Inverter
548283	4808477	BESS Inverter
548309	4808477	BESS Inverter
548335	4808477	BESS Inverter
548361	4808477	BESS Inverter
548387	4808477	BESS Inverter
548231	4808451	BESS Inverter
548257	4808451	BESS Inverter
548283	4808451	BESS Inverter
548309	4808451	BESS Inverter
548335	4808451	BESS Inverter
548361	4808451	BESS Inverter
548387	4808451	BESS Inverter
548231	4808425	BESS Inverter
548257	4808425	BESS Inverter

X [m]	Y [m]	Noise Source
548283	4808425	BESS Inverter
548309	4808425	BESS Inverter
548335	4808425	BESS Inverter
548361	4808425	BESS Inverter
548217	4808568	BESS
548230	4808568	BESS
548243	4808568	BESS
548256	4808568	BESS
548269	4808568	BESS
548282	4808568	BESS
548295	4808568	BESS
548308	4808568	BESS
548321	4808568	BESS
548334	4808568	BESS
548346	4808568	BESS
548359	4808568	BESS
548372	4808568	BESS
548385	4808568	BESS
548217	4808555	BESS
548230	4808555	BESS
548243	4808555	BESS
548256	4808555	BESS
548269	4808555	BESS
548282	4808555	BESS
548295	4808555	BESS
548308	4808555	BESS
548321	4808555	BESS
548334	4808555	BESS
548346	4808555	BESS
548359	4808555	BESS
548372	4808555	BESS
548385	4808555	BESS
548217	4808542	BESS
548230	4808542	BESS
548243	4808542	BESS
548256	4808542	BESS
548269	4808542	BESS
548282	4808542	BESS
548295	4808542	BESS

X [m]	Y [m]	Noise Source
548308	4808542	BESS
548321	4808542	BESS
548334	4808542	BESS
548346	4808542	BESS
548359	4808542	BESS
548372	4808542	BESS
548385	4808542	BESS
548217	4808529	BESS
548230	4808529	BESS
548243	4808529	BESS
548256	4808529	BESS
548269	4808529	BESS
548282	4808529	BESS
548295	4808529	BESS
548308	4808529	BESS
548321	4808529	BESS
548334	4808529	BESS
548346	4808529	BESS
548359	4808529	BESS
548372	4808529	BESS
548385	4808529	BESS
548217	4808517	BESS
548230	4808517	BESS
548243	4808517	BESS
548256	4808517	BESS
548269	4808517	BESS
548282	4808517	BESS
548295	4808517	BESS
548308	4808517	BESS
548321	4808517	BESS
548334	4808517	BESS
548346	4808517	BESS
548359	4808517	BESS
548372	4808517	BESS
548385	4808517	BESS
548217	4808504	BESS
548230	4808504	BESS
548243	4808504	BESS
548256	4808504	BESS

X [m]	Y [m]	Noise Source
548269	4808504	BESS
548282	4808504	BESS
548295	4808504	BESS
548308	4808504	BESS
548321	4808504	BESS
548334	4808504	BESS
548346	4808504	BESS
548359	4808504	BESS
548372	4808504	BESS
548385	4808504	BESS
548217	4808491	BESS
548230	4808491	BESS
548243	4808491	BESS
548256	4808491	BESS
548269	4808491	BESS
548282	4808491	BESS
548295	4808491	BESS
548308	4808491	BESS
548321	4808491	BESS
548334	4808491	BESS
548346	4808491	BESS
548359	4808491	BESS
548372	4808491	BESS
548385	4808491	BESS
548217	4808478	BESS
548230	4808478	BESS
548243	4808478	BESS
548256	4808478	BESS
548269	4808478	BESS
548282	4808478	BESS
548295	4808478	BESS
548308	4808478	BESS
548321	4808478	BESS
548334	4808478	BESS
548346	4808478	BESS
548359	4808478	BESS
548372	4808478	BESS
548385	4808478	BESS
548217	4808465	BESS

X [m]	Y [m]	Noise Source
548230	4808465	BESS
548243	4808465	BESS
548256	4808465	BESS
548269	4808465	BESS
548282	4808465	BESS
548295	4808465	BESS
548308	4808465	BESS
548321	4808465	BESS
548334	4808465	BESS
548346	4808465	BESS
548359	4808465	BESS
548372	4808465	BESS
548385	4808465	BESS
548217	4808452	BESS
548230	4808452	BESS
548243	4808452	BESS
548256	4808452	BESS
548269	4808452	BESS
548282	4808452	BESS
548295	4808452	BESS
548308	4808452	BESS
548321	4808452	BESS
548334	4808452	BESS
548346	4808452	BESS
548359	4808452	BESS
548372	4808452	BESS
548385	4808452	BESS
548217	4808439	BESS
548230	4808439	BESS
548243	4808439	BESS
548256	4808439	BESS
548269	4808439	BESS
548282	4808439	BESS
548295	4808439	BESS
548308	4808439	BESS
548321	4808439	BESS
548334	4808439	BESS
548346	4808439	BESS
548359	4808439	BESS

X [m]	Y [m]	Noise Source
548372	4808439	BESS
548385	4808439	BESS
548217	4808426	BESS
548230	4808426	BESS
548243	4808426	BESS
548256	4808426	BESS
548269	4808426	BESS
548282	4808426	BESS
548295	4808426	BESS
548308	4808426	BESS
548321	4808426	BESS
548334	4808426	BESS
548346	4808426	BESS
548359	4808426	BESS
548372	4808426	BESS
548385	4808426	BESS
548217	4808413	BESS
548230	4808413	BESS
548243	4808413	BESS
548256	4808413	BESS
548269	4808413	BESS
548282	4808413	BESS
548295	4808413	BESS
548308	4808413	BESS
548321	4808413	BESS
548334	4808413	BESS
548346	4808413	BESS
548359	4808413	BESS
548372	4808413	BESS
548385	4808413	BESS
548217	4808400	BESS
548230	4808400	BESS
548243	4808400	BESS
548256	4808400	BESS
548269	4808400	BESS
548282	4808400	BESS
548295	4808400	BESS
548308	4808400	BESS
548321	4808400	BESS

X [m]	Y [m]	Noise Source
548334	4808400	BESS
546083	4811398	Solar Inverter
545884	4811391	Solar Inverter
546225	4810989	Solar Inverter
546025	4810983	Solar Inverter
546231	4810782	Solar Inverter
545832	4810770	Solar Inverter
546614	4811324	Solar Inverter
546542	4811115	Solar Inverter
547532	4810826	Solar Inverter
547375	4810614	Solar Inverter
546577	4809835	Solar Inverter
546632	4809010	Solar Inverter
546560	4808541	Solar Inverter
546152	4808627	Solar Inverter
545852	4808411	Solar Inverter
545859	4808205	Solar Inverter
546134	4810220	Solar Inverter
545855	4810211	Solar Inverter
547290	4809403	Solar Inverter
547569	4809402	Solar Inverter
547890	4809413	Solar Inverter
548154	4809421	Solar Inverter
547861	4809205	Solar Inverter
548253	4809217	Solar Inverter
547759	4808393	Solar Inverter
547359	4808381	Solar Inverter
546648	4810705	Solar Inverter
546580	4811736	Solar Inverter
548555	4808911	Solar Inverter
547472	4808920	Solar Inverter
546154	4809001	Solar Inverter
547526	4811032	Solar Inverter
547748	4809938	Solar Inverter
545869	4811184	Solar Inverter
546176	4811194	Solar Inverter
546578	4807838	Solar Inverter
546519	4809420	Solar Inverter
547525	4810211	Solar Inverter

X [m]	Y [m]	Noise Source
547662	4808639	Solar Inverter
546143	4807434	Solar Inverter
548045	4808609	Solar Inverter
548523	4808554	Solar Inverter
545825	4810976	Solar Inverter
545872	4807425	Solar Inverter
548182	4808672	Main Power Transformer (Substation)
548333	4808678	Main Power Transformer (Substation)

Appendix III – Individual Receptor Results (UTM WGS84 Zone 16)

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-001	546406	4807144	Non-participating	42.4	42.4
R-002	546385	4807439	Non-participating	46.1	46.1
R-003	546001	4807220	Non-participating	47.0	47.0
R-004	545553	4807204	Non-participating	42.8	42.8
R-005	545553	4807277	Non-participating	43.4	43.4
R-006	545576	4807105	Non-participating	42.0	42.0
R-007	545454	4807539	Non-participating	41.3	41.3
R-008	546523	4807435	Non-participating	43.8	43.8
R-009	546580	4807255	Non-participating	41.7	41.7
R-010	546550	4807525	Non-participating	44.7	44.7
R-011	546375	4807601	Non-participating	46.1	46.1
R-012	546768	4807245	Non-participating	40.4	40.4
R-013	546774	4807303	Non-participating	40.8	40.8
R-014	546635	4807422	Non-participating	42.6	42.6
R-015	546672	4807516	Non-participating	43.6	43.6
R-016	546737	4807556	Non-participating	43.9	43.9
R-017	546787	4807547	Non-participating	43.5	43.5
R-018	546377	4807888	Non-participating	48.6	48.6
R-019	546448	4808006	Non-participating	48.6	48.6
R-020	546519	4808010	Participating	49.4	49.4
R-021	546381	4808036	Non-participating	47.7	47.7
R-022	546370	4808149	Non-participating	47.5	47.5
R-023	546705	4808018	Non-participating	48.6	48.6
R-024	546734	4807943	Non-participating	49.2	49.2
R-025	546754	4808227	Non-participating	47.7	47.7
R-026	546833	4808291	Non-participating	47.8	47.8
R-027	546836	4808340	Non-participating	48.0	48.0
R-028	546760	4808502	Participating	49.6	49.6
R-029	546876	4807140	Non-participating	39.4	39.4
R-030	546916	4807132	Non-participating	39.6	39.6
R-031	546951	4807139	Non-participating	39.6	39.6
R-032	547009	4807133	Non-participating	39.6	39.6
R-033	545637	4808288	Non-participating	48.6	48.6
R-034	545494	4808393	Non-participating	40.8	40.8
R-035	545389	4808741	Non-participating	38.5	38.5

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-036	545624	4808795	Non-participating	40.5	40.5
R-037	546364	4808622	Non-participating	50.7	50.7
R-038	546367	4808946	Non-participating	50.1	50.1
R-039	546424	4809121	Non-participating	49.8	49.8
R-040	546358	4809304	Non-participating	49.5	49.5
R-041	546738	4809246	Non-participating	49.5	49.4
R-042	546752	4809420	Participating	49.2	49.0
R-043	546702	4809699	Participating	49.7	49.6
R-044	546756	4809710	Non-participating	48.9	48.8
R-045	546346	4809876	Non-participating	48.1	48.0
R-046	546357	4810233	Participating	48.1	48.0
R-047	545610	4810306	Non-participating	45.9	45.9
R-048	546310	4810484	Participating	48.2	48.1
R-049	546730	4810257	Non-participating	46.3	46.1
R-050	546823	4810140	Non-participating	46.5	46.2
R-051	546827	4810541	Non-participating	47.6	47.5
R-052	547160	4810457	Non-participating	48.1	47.9
R-053	547069	4810436	Non-participating	47.1	46.8
R-054	547382	4810329	Non-participating	50.2	50.1
R-055	547626	4810534	Non-participating	48.9	48.7
R-056	547668	4810441	Non-participating	48.6	48.3
R-057	547851	4810334	Participating	47.1	46.5
R-058	546827	4811010	Participating	48.0	47.9
R-059	546753	4811023	Non-participating	49.1	49.1
R-060	546315	4811401	Non-participating	49.1	49.0
R-061	546424	4811427	Non-participating	49.0	49.0
R-062	546313	4811547	Participating	47.2	47.2
R-063	546336	4811848	Non-participating	44.2	44.1
R-064	546796	4812039	Non-participating	42.7	42.6
R-065	546921	4811937	Non-participating	43.0	42.9
R-066	546825	4811856	Non-participating	45.4	45.3
R-067	546809	4811635	Non-participating	47.0	46.9
R-068	546814	4811551	Non-participating	47.0	46.9
R-069	546891	4811457	Non-participating	45.8	45.7
R-070	546857	4811413	Non-participating	46.8	46.7
R-071	546979	4811345	Non-participating	45.9	45.8
R-072	546831	4811250	Non-participating	48.3	48.3
R-073	547591	4809617	Non-participating	51.1	50.6

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-074	548377	4809487	Non-participating	51.1	49.7
R-075	548330	4808830	Non-participating	58.5	54.7
R-076	547630	4808852	Participating	53.9	53.7
R-077	548791	4808993	Non-participating	52.3	51.0
R-078	548787	4808723	Participating	54.4	54.1
R-079	547793	4808029	Non-participating	52.1	52.1
R-080	547906	4808012	Non-participating	52.8	52.8
R-081	547748	4808013	Non-participating	51.6	51.6
R-082	547716	4808011	Non-participating	51.3	51.3
R-083	547666	4808013	Non-participating	51.0	50.9
R-084	547636	4808013	Non-participating	50.7	50.7
R-085	547529	4808007	Non-participating	50.0	50.0
R-086	547332	4808010	Non-participating	48.8	48.8
R-087	547193	4808028	Non-participating	48.1	48.1
R-088	547140	4808031	Non-participating	47.8	47.8
R-089	547084	4808027	Non-participating	47.6	47.6
R-090	548006	4808009	Non-participating	53.6	53.6
R-091	545580	4807040	Non-participating	41.3	41.3
R-092	545427	4807103	Non-participating	40.3	40.3
R-093	545463	4807058	Non-participating	40.6	40.6
R-094	545440	4807029	Non-participating	40.1	40.1
R-095	545429	4806968	Non-participating	39.6	39.6
R-096	545299	4807122	Non-participating	35.3	35.3
R-097	545233	4807080	Non-participating	34.6	34.6
R-098	545256	4807023	Non-participating	34.4	34.4
R-099	545272	4806961	Non-participating	34.2	34.2
R-100	545269	4807046	Non-participating	34.7	34.7
R-101	545260	4807004	Non-participating	34.4	34.4
R-102	545298	4806914	Non-participating	36.8	36.8
R-103	545320	4806827	Non-participating	33.8	33.8
R-104	545340	4806791	Non-participating	33.7	33.7
R-105	545346	4806764	Non-participating	33.6	33.6
R-106	545626	4805845	Non-participating	29.6	29.6
R-107	545770	4805915	Non-participating	33.9	33.9
R-108	545712	4805570	Non-participating	32.3	32.3
R-109	546164	4805767	Non-participating	30.5	30.5
R-110	546731	4805767	Non-participating	31.4	31.4
R-111	546811	4805680	Non-participating	31.5	31.5

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-112	547221	4805943	Non-participating	36.9	36.9
R-113	547017	4805947	Non-participating	36.8	36.8
R-114	547194	4806126	Non-participating	37.8	37.8
R-115	547202	4806417	Non-participating	39.2	39.2
R-116	547174	4806470	Non-participating	39.5	39.5
R-117	547288	4806455	Non-participating	39.5	39.5
R-118	546072	4806016	Non-participating	31.6	31.6
R-119	546075	4806119	Non-participating	32.2	32.2
R-120	546113	4806217	Non-participating	32.8	32.8
R-121	546084	4806265	Non-participating	33.1	33.1
R-122	546075	4806324	Non-participating	33.4	33.4
R-123	545996	4806612	Non-participating	36.2	36.2
R-124	547189	4806613	Non-participating	40.2	40.2
R-125	547179	4806660	Non-participating	40.5	40.5
R-126	546860	4806755	Non-participating	37.2	37.2
R-127	547054	4806750	Non-participating	40.8	40.8
R-128	547189	4806722	Non-participating	40.8	40.8
R-129	547187	4806771	Non-participating	41.1	41.1
R-130	547193	4806812	Non-participating	41.3	41.3
R-131	547190	4806845	Non-participating	41.5	41.5
R-132	547189	4806880	Non-participating	41.7	41.6
R-133	547187	4806932	Non-participating	41.9	41.9
R-134	547302	4806747	Non-participating	41.1	41.1
R-135	547016	4806889	Non-participating	38.4	38.4
R-136	546936	4806955	Non-participating	38.6	38.6
R-137	547007	4807011	Non-participating	38.9	38.9
R-138	547198	4806983	Non-participating	42.2	42.2
R-139	547193	4807020	Non-participating	42.4	42.4
R-140	547257	4806990	Non-participating	42.4	42.3
R-141	547182	4807077	Non-participating	42.7	42.7
R-142	547324	4806655	Non-participating	40.6	40.6
R-143	547174	4806232	Non-participating	38.3	38.3
R-144	547293	4806573	Non-participating	40.2	40.1
R-145	547959	4806730	Non-participating	41.7	41.7
R-146	548123	4806603	Non-participating	40.9	40.9
R-147	548083	4806810	Non-participating	42.3	42.2
R-148	548077	4806980	Non-participating	43.4	43.4
R-149	548112	4807139	Non-participating	44.6	44.6

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-150	548155	4807139	Non-participating	44.6	44.6
R-151	548227	4807136	Non-participating	44.6	44.6
R-152	548277	4807136	Non-participating	44.6	44.6
R-153	548329	4807135	Non-participating	44.6	44.6
R-154	548373	4807050	Non-participating	43.9	43.9
R-155	548424	4807132	Non-participating	44.5	44.5
R-156	548787	4806802	Non-participating	41.6	41.6
R-157	548806	4806943	Non-participating	42.5	42.4
R-158	548899	4806975	Non-participating	42.5	42.4
R-159	548920	4807094	Non-participating	43.2	43.1
R-160	549140	4807120	Non-participating	42.6	42.5
R-161	549233	4807072	Non-participating	41.9	41.9
R-162	549375	4807087	Non-participating	41.5	41.4
R-163	549503	4807115	Non-participating	37.5	37.4
R-164	549584	4807112	Non-participating	36.5	36.5
R-165	545433	4807205	Non-participating	40.6	40.6
R-166	545343	4807199	Non-participating	36.1	36.1
R-167	545244	4807179	Non-participating	35.1	35.1
R-168	545186	4807275	Non-participating	35.0	35.0
R-169	545202	4807237	Non-participating	35.0	35.0
R-170	545201	4807387	Non-participating	35.5	35.5
R-171	545111	4807454	Non-participating	29.7	29.7
R-172	545072	4807536	Non-participating	31.8	31.8
R-173	545121	4807634	Non-participating	35.4	35.4
R-174	545151	4807728	Non-participating	35.9	35.9
R-175	545086	4807738	Non-participating	35.4	35.4
R-176	545001	4807774	Non-participating	33.2	33.2
R-177	544980	4807905	Non-participating	32.3	32.3
R-178	544978	4807867	Non-participating	33.3	33.3
R-179	544988	4807837	Non-participating	34.2	34.2
R-180	545052	4807958	Non-participating	35.8	35.8
R-181	545000	4807975	Non-participating	32.0	32.0
R-182	544976	4808008	Non-participating	34.0	34.0
R-183	544977	4808073	Non-participating	35.2	35.2
R-184	544988	4808171	Non-participating	35.4	35.4
R-185	545001	4808137	Non-participating	35.4	35.4
R-186	544870	4808314	Non-participating	34.1	34.1
R-187	544867	4808286	Non-participating	33.4	33.4

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-188	544892	4808242	Non-participating	32.4	32.4
R-189	544958	4808265	Non-participating	35.2	35.2
R-190	544965	4808239	Non-participating	35.3	35.3
R-191	544905	4808203	Non-participating	32.5	32.5
R-192	544830	4808370	Non-participating	34.2	34.2
R-193	544812	4808381	Non-participating	34.0	34.0
R-194	544802	4808399	Non-participating	34.0	34.0
R-195	544818	4808444	Non-participating	34.3	34.3
R-196	544773	4808508	Non-participating	34.0	34.0
R-197	544774	4808485	Non-participating	34.0	34.0
R-198	544784	4808446	Non-participating	34.0	34.0
R-199	544821	4808465	Non-participating	34.2	34.2
R-200	544885	4808494	Non-participating	34.8	34.8
R-201	544768	4808537	Non-participating	34.0	34.0
R-202	544762	4808556	Non-participating	33.8	33.8
R-203	544759	4808577	Non-participating	34.0	34.0
R-204	544753	4808611	Non-participating	34.0	34.0
R-205	544752	4808593	Non-participating	34.0	34.0
R-206	544785	4808573	Non-participating	34.2	34.2
R-207	544756	4808652	Non-participating	34.0	34.0
R-208	544751	4808693	Non-participating	34.0	34.0
R-209	544744	4808711	Non-participating	34.0	34.0
R-210	544735	4808738	Non-participating	33.9	33.9
R-211	547191	4807212	Non-participating	43.5	43.5
R-212	547084	4807221	Non-participating	43.2	43.2
R-213	547096	4807154	Non-participating	43.0	43.0
R-214	547195	4807250	Non-participating	43.7	43.7
R-215	547189	4807292	Non-participating	43.9	43.9
R-216	547198	4807337	Non-participating	44.2	44.2
R-217	547195	4807369	Non-participating	44.4	44.4
R-218	547169	4807505	Non-participating	45.1	45.1
R-219	547187	4807595	Non-participating	45.6	45.6
R-220	547192	4807633	Non-participating	45.9	45.8
R-221	547193	4807680	Non-participating	46.1	46.1
R-222	547189	4807708	Non-participating	46.3	46.3
R-223	547165	4807760	Non-participating	46.5	46.5
R-224	547178	4807819	Non-participating	46.8	46.8
R-225	547177	4807852	Non-participating	47.0	47.0

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-226	547177	4807898	Non-participating	47.3	47.3
R-227	547176	4807950	Non-participating	47.5	47.5
R-228	547107	4807960	Non-participating	47.3	47.3
R-229	547060	4807952	Non-participating	47.2	47.2
R-230	546980	4807749	Non-participating	46.3	46.3
R-231	546837	4807937	Non-participating	47.6	47.6
R-232	546832	4807836	Non-participating	47.7	47.7
R-233	546954	4808008	Non-participating	47.2	47.2
R-234	547245	4807946	Non-participating	47.8	47.8
R-235	547293	4807955	Non-participating	48.2	48.1
R-236	547333	4807950	Non-participating	48.3	48.3
R-237	547390	4807952	Non-participating	48.7	48.7
R-238	547239	4807818	Non-participating	47.1	47.1
R-239	547251	4807739	Non-participating	46.6	46.6
R-240	547251	4807698	Non-participating	46.4	46.4
R-241	547252	4807659	Non-participating	46.2	46.2
R-242	547252	4807615	Non-participating	45.9	45.9
R-243	547389	4807555	Non-participating	46.0	46.0
R-244	547253	4807556	Non-participating	45.6	45.6
R-245	547252	4807508	Non-participating	45.3	45.3
R-246	547251	4807429	Non-participating	44.8	44.8
R-247	547253	4807349	Non-participating	44.4	44.4
R-248	547252	4807308	Non-participating	44.1	44.1
R-249	547253	4807272	Non-participating	43.9	43.9
R-250	547265	4807220	Non-participating	43.7	43.6
R-251	547302	4807217	Non-participating	43.7	43.7
R-252	547332	4807215	Non-participating	43.8	43.8
R-253	547403	4807216	Non-participating	43.9	43.9
R-254	547361	4807216	Non-participating	43.8	43.8
R-255	547417	4807155	Non-participating	43.6	43.6
R-256	547460	4807216	Non-participating	44.1	44.0
R-257	547499	4807215	Non-participating	44.1	44.1
R-258	547577	4807079	Non-participating	43.5	43.4
R-259	547587	4807218	Non-participating	44.4	44.3
R-260	547649	4807204	Non-participating	44.4	44.4
R-261	547762	4807218	Non-participating	44.8	44.7
R-262	547828	4807211	Non-participating	44.8	44.8
R-263	547961	4807203	Non-participating	45.0	45.0

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-264	548006	4807326	Non-participating	46.0	46.0
R-265	548120	4807209	Non-participating	45.2	45.2
R-266	548188	4807331	Non-participating	46.3	46.3
R-267	548189	4807208	Non-participating	45.2	45.2
R-268	548232	4807299	Non-participating	46.0	46.0
R-269	548238	4807207	Non-participating	45.2	45.2
R-270	548274	4807206	Non-participating	45.2	45.2
R-271	548342	4807211	Non-participating	45.2	45.2
R-272	548394	4807196	Non-participating	45.1	45.0
R-273	548427	4807204	Non-participating	45.1	45.1
R-274	548072	4807359	Non-participating	46.4	46.4
R-275	548080	4807413	Non-participating	46.9	46.9
R-276	548084	4807450	Non-participating	47.3	47.3
R-277	548092	4807508	Non-participating	47.8	47.8
R-278	547995	4807538	Non-participating	47.9	47.9
R-279	547577	4808010	Non-participating	50.3	50.3
R-280	547446	4807934	Non-participating	48.8	48.8
R-281	547498	4807947	Non-participating	49.3	49.2
R-282	547547	4807949	Non-participating	49.6	49.6
R-283	547591	4807929	Non-participating	49.7	49.7
R-284	547697	4807928	Non-participating	50.4	50.4
R-285	547729	4807911	Non-participating	50.4	50.4
R-286	547783	4807949	Non-participating	51.2	51.2
R-287	547811	4807949	Non-participating	51.4	51.4
R-288	547924	4807944	Non-participating	52.1	52.1
R-289	547873	4807951	Non-participating	51.8	51.8
R-290	547964	4807943	Non-participating	52.4	52.4
R-291	547995	4807944	Non-participating	52.6	52.6
R-292	548092	4808039	Non-participating	54.7	54.7
R-293	548161	4808012	Non-participating	54.6	54.6
R-294	548175	4807934	Non-participating	53.3	53.3
R-295	548239	4807926	Non-participating	53.4	53.4
R-296	548301	4807932	Non-participating	53.5	53.5
R-297	548419	4807925	Non-participating	53.2	53.2
R-298	548409	4808007	Non-participating	54.6	54.6
R-299	548459	4808006	Non-participating	54.4	54.3
R-300	548602	4807999	Non-participating	53.2	53.2
R-301	548697	4808017	Non-participating	52.5	52.5

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-302	548813	4807994	Non-participating	51.1	51.1
R-303	548813	4807800	Non-participating	49.3	49.2
R-304	548977	4807221	Non-participating	43.8	43.8
R-305	548920	4807443	Non-participating	45.6	45.6
R-306	548966	4807518	Non-participating	46.0	46.0
R-307	549081	4807492	Non-participating	45.2	45.2
R-308	548986	4807735	Non-participating	47.5	47.5
R-309	548887	4807787	Non-participating	48.6	48.6
R-310	548875	4807889	Non-participating	49.6	49.6
R-311	548872	4807932	Non-participating	50.0	50.0
R-312	548788	4808224	Non-participating	53.6	53.6
R-313	548877	4807983	Non-participating	50.4	50.4
R-314	548922	4808002	Non-participating	50.1	50.1
R-315	549066	4808016	Non-participating	48.8	48.8
R-316	548949	4807929	Non-participating	49.3	49.3
R-317	549011	4807926	Non-participating	48.7	48.7
R-318	549044	4807903	Non-participating	48.3	48.3
R-319	549074	4807902	Non-participating	48.0	48.0
R-320	549137	4807923	Non-participating	47.6	47.6
R-321	549197	4807920	Non-participating	47.1	47.1
R-322	549263	4807923	Non-participating	46.6	46.6
R-323	549351	4808003	Non-participating	46.2	46.2
R-324	549458	4807992	Non-participating	45.3	45.3
R-325	549538	4807976	Non-participating	44.6	44.6
R-326	549426	4807900	Non-participating	45.2	45.2
R-327	549681	4808007	Non-participating	43.7	43.7
R-328	549584	4807978	Non-participating	44.3	44.3
R-329	549682	4808085	Non-participating	43.9	43.9
R-330	549749	4807971	Non-participating	43.1	43.1
R-331	549738	4807903	Non-participating	43.0	43.0
R-332	549881	4807906	Non-participating	42.1	42.0
R-333	549774	4807888	Non-participating	42.7	42.7
R-334	549837	4807980	Non-participating	42.5	42.5
R-335	549939	4807866	Non-participating	41.6	41.6
R-336	550179	4807960	Non-participating	40.3	40.3
R-337	550217	4807961	Non-participating	40.1	40.1
R-338	550195	4807902	Non-participating	40.1	40.1
R-339	550228	4807901	Non-participating	39.9	39.9

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-340	550363	4807953	Non-participating	39.2	39.2
R-341	550299	4807947	Non-participating	39.6	39.6
R-342	550291	4807898	Non-participating	39.6	39.5
R-343	550315	4807900	Non-participating	39.4	39.4
R-344	550356	4807898	Non-participating	39.2	39.2
R-345	550381	4808279	Non-participating	39.5	39.5
R-346	550408	4808425	Non-participating	39.4	39.4
R-347	550148	4807502	Non-participating	39.4	39.4
R-348	550141	4807574	Non-participating	39.7	39.7
R-349	550175	4807583	Non-participating	39.5	39.5
R-350	550015	4807564	Non-participating	40.3	40.3
R-351	549988	4807566	Non-participating	40.5	40.5
R-352	549952	4807566	Non-participating	40.7	40.7
R-353	549891	4807566	Non-participating	41.0	41.0
R-354	549998	4807480	Non-participating	40.1	40.1
R-355	549956	4807499	Non-participating	40.4	40.4
R-356	549923	4807503	Non-participating	40.6	40.6
R-357	549874	4807508	Non-participating	40.9	40.9
R-358	549828	4807570	Non-participating	41.4	41.4
R-359	549812	4807509	Non-participating	41.2	41.2
R-360	549768	4807511	Non-participating	41.5	41.5
R-361	549741	4807511	Non-participating	41.6	41.6
R-362	549716	4807513	Non-participating	41.8	41.8
R-363	549495	4807581	Non-participating	43.3	43.3
R-364	549205	4807526	Non-participating	44.8	44.7
R-365	549278	4807523	Non-participating	44.3	44.3
R-366	549206	4807458	Non-participating	44.3	44.3
R-367	549281	4807447	Non-participating	43.9	43.8
R-368	549208	4807398	Non-participating	44.0	43.9
R-369	549273	4807397	Non-participating	43.6	43.6
R-370	549267	4807351	Non-participating	43.4	43.4
R-371	549226	4807339	Non-participating	43.5	43.5
R-372	549117	4807307	Non-participating	43.8	43.8
R-373	549239	4807196	Non-participating	42.6	42.6
R-374	549460	4807193	Non-participating	41.6	41.6
R-375	549639	4807224	Non-participating	40.1	40.1
R-376	549732	4807236	Non-participating	39.7	39.7
R-377	549924	4807397	Non-participating	40.2	40.2

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-378	548861	4808174	Non-participating	52.2	52.2
R-379	548871	4808223	Non-participating	52.4	52.4
R-380	548879	4808310	Non-participating	52.9	52.9
R-381	549025	4808387	Non-participating	51.0	51.0
R-382	548890	4808432	Non-participating	53.2	53.2
R-383	549385	4808619	Non-participating	47.0	47.0
R-384	549432	4808833	Non-participating	46.2	46.1
R-385	549656	4808804	Non-participating	44.4	44.4
R-386	549906	4808786	Non-participating	42.6	42.6
R-387	550298	4809146	Non-participating	39.6	39.4
R-388	549382	4810401	Non-participating	36.0	35.9
R-389	549016	4810406	Non-participating	37.7	37.5
R-390	548862	4809163	Non-participating	50.0	48.4
R-391	548765	4809345	Non-participating	49.2	47.3
R-392	548755	4809401	Non-participating	48.8	46.8
R-393	548433	4809728	Non-participating	48.0	46.4
R-394	548846	4809837	Non-participating	45.2	43.3
R-395	548774	4810269	Non-participating	43.1	41.4
R-396	548702	4810393	Non-participating	42.7	41.1
R-397	548401	4810395	Non-participating	43.8	42.5
R-398	548375	4810345	Non-participating	44.2	42.8
R-399	545161	4808799	Non-participating	36.6	36.6
R-400	545035	4808970	Non-participating	35.6	35.6
R-401	544859	4808815	Non-participating	34.6	34.6
R-402	544898	4808874	Non-participating	34.8	34.8
R-403	544928	4808884	Non-participating	35.0	35.0
R-404	544692	4808784	Non-participating	33.2	33.2
R-405	544707	4808804	Non-participating	33.6	33.6
R-406	544686	4808827	Non-participating	33.4	33.4
R-407	544685	4808855	Non-participating	33.5	33.5
R-408	544753	4808869	Non-participating	34.0	34.0
R-409	544668	4808907	Non-participating	33.3	33.3
R-410	544664	4808935	Non-participating	33.1	33.1
R-411	544657	4808955	Non-participating	32.4	32.4
R-412	544704	4809001	Non-participating	33.5	33.5
R-413	544642	4809067	Non-participating	30.4	30.4
R-414	544634	4809036	Non-participating	29.6	29.6
R-415	544658	4809089	Non-participating	30.0	30.0

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-416	544635	4809122	Non-participating	30.3	30.3
R-417	544625	4809176	Non-participating	31.4	31.4
R-418	544632	4809216	Non-participating	30.5	30.5
R-419	544744	4809154	Non-participating	34.0	34.0
R-420	544739	4809239	Non-participating	33.9	33.9
R-421	544889	4809188	Non-participating	35.4	35.4
R-422	544684	4809362	Non-participating	33.6	33.6
R-423	544687	4809335	Non-participating	33.6	33.6
R-424	544718	4809302	Non-participating	33.2	33.2
R-425	545081	4809465	Non-participating	35.8	35.8
R-426	545158	4809289	Non-participating	36.2	36.2
R-427	545297	4809297	Non-participating	37.8	37.8
R-428	545317	4809208	Non-participating	37.8	37.8
R-429	545094	4809672	Non-participating	36.1	36.1
R-430	544680	4809423	Non-participating	33.7	33.7
R-431	544735	4809460	Non-participating	34.0	34.0
R-432	544647	4809468	Non-participating	33.6	33.6
R-433	544609	4809526	Non-participating	33.7	33.7
R-434	544677	4809524	Non-participating	33.1	33.1
R-435	544522	4809635	Non-participating	33.0	33.0
R-436	544554	4809653	Non-participating	32.9	32.9
R-437	544583	4809644	Non-participating	33.3	33.3
R-438	544717	4809634	Non-participating	34.0	34.0
R-439	544785	4809608	Non-participating	36.1	36.1
R-440	544520	4809732	Non-participating	32.0	32.0
R-441	544860	4809795	Non-participating	35.4	35.4
R-442	545380	4809774	Non-participating	39.5	39.5
R-443	544500	4809842	Non-participating	31.4	31.4
R-444	544756	4809941	Non-participating	34.5	34.5
R-445	544465	4809941	Non-participating	30.1	30.1
R-446	544463	4809967	Non-participating	30.7	30.7
R-447	544469	4809999	Non-participating	31.1	31.0
R-448	544467	4810028	Non-participating	31.5	31.5
R-449	544431	4810059	Non-participating	31.5	31.4
R-450	544472	4810093	Non-participating	32.1	32.1
R-451	544441	4810128	Non-participating	31.6	31.6
R-452	544572	4810090	Non-participating	33.7	33.7
R-453	544434	4810198	Non-participating	30.6	30.6

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-454	544464	4810165	Non-participating	32.5	32.5
R-455	544515	4810181	Non-participating	33.0	33.0
R-456	544687	4810169	Non-participating	35.4	35.4
R-457	544644	4810191	Non-participating	36.7	36.6
R-458	544606	4810218	Non-participating	37.1	37.0
R-459	544729	4810105	Non-participating	36.3	36.3
R-460	544589	4810111	Non-participating	33.7	33.7
R-461	544607	4810128	Non-participating	33.8	33.8
R-462	544336	4810371	Non-participating	31.2	31.2
R-463	544466	4810448	Non-participating	33.3	33.3
R-464	544403	4810491	Non-participating	32.5	32.4
R-465	544375	4810434	Non-participating	32.5	32.5
R-466	544460	4810498	Non-participating	33.2	33.2
R-467	544336	4810485	Non-participating	32.5	32.5
R-468	544354	4810484	Non-participating	32.6	32.6
R-469	544373	4810484	Non-participating	32.7	32.7
R-470	544670	4810465	Non-participating	34.4	34.4
R-471	544864	4810523	Non-participating	39.5	39.5
R-472	544731	4810493	Non-participating	34.9	34.9
R-473	545097	4810477	Non-participating	40.7	40.7
R-474	545133	4810412	Non-participating	40.9	40.9
R-475	545163	4810393	Non-participating	41.1	41.1
R-476	544963	4810388	Non-participating	40.0	40.0
R-477	544980	4810440	Non-participating	40.3	40.3
R-478	544926	4810481	Non-participating	39.9	39.9
R-479	544723	4810436	Non-participating	34.6	34.5
R-480	544886	4810415	Non-participating	35.9	35.9
R-481	544307	4810561	Non-participating	31.2	31.1
R-482	544299	4810589	Non-participating	30.0	30.0
R-483	544312	4810623	Non-participating	32.3	32.3
R-484	544387	4810590	Non-participating	32.7	32.6
R-485	544450	4810570	Non-participating	32.4	32.4
R-486	544455	4810621	Non-participating	31.7	31.6
R-487	544498	4810678	Non-participating	35.9	35.9
R-488	544559	4810629	Non-participating	36.9	36.9
R-489	544581	4810543	Non-participating	34.0	34.0
R-490	544315	4810680	Non-participating	32.4	32.4
R-491	544369	4810743	Non-participating	32.7	32.7

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-492	544236	4810662	Non-participating	31.7	31.6
R-493	544227	4810697	Non-participating	31.9	31.9
R-494	544220	4810720	Non-participating	31.8	31.8
R-495	544263	4810744	Non-participating	32.1	32.1
R-496	544208	4810751	Non-participating	31.6	31.6
R-497	544254	4810766	Non-participating	32.1	32.1
R-498	544206	4810777	Non-participating	31.3	31.3
R-499	544245	4810798	Non-participating	32.0	32.0
R-500	544198	4810799	Non-participating	31.1	31.1
R-501	544239	4810819	Non-participating	32.0	32.0
R-502	544190	4810827	Non-participating	30.9	30.9
R-503	544230	4810845	Non-participating	31.9	31.9
R-504	544178	4810852	Non-participating	31.1	31.1
R-505	544226	4810880	Non-participating	31.9	31.9
R-506	544222	4810898	Non-participating	31.8	31.8
R-507	544169	4810880	Non-participating	31.4	31.3
R-508	544170	4810905	Non-participating	31.4	31.4
R-509	544222	4810932	Non-participating	31.8	31.8
R-510	544222	4810964	Non-participating	31.7	31.7
R-511	544155	4810962	Non-participating	31.4	31.4
R-512	544148	4810991	Non-participating	31.3	31.3
R-513	544203	4810994	Non-participating	31.7	31.7
R-514	544125	4811039	Non-participating	31.1	31.1
R-515	544181	4811032	Non-participating	31.4	31.4
R-516	544173	4811079	Non-participating	31.4	31.4
R-517	544120	4811063	Non-participating	31.2	31.1
R-518	544116	4811090	Non-participating	31.1	31.1
R-519	544109	4811116	Non-participating	30.9	30.9
R-520	544095	4811167	Non-participating	30.6	30.6
R-521	544089	4811199	Non-participating	30.7	30.7
R-522	544085	4811227	Non-participating	30.6	30.6
R-523	544140	4811228	Non-participating	30.8	30.8
R-524	544135	4811258	Non-participating	30.0	29.9
R-525	544127	4811290	Non-participating	29.7	29.6
R-526	544072	4811277	Non-participating	30.4	30.4
R-527	544129	4811314	Non-participating	28.6	28.5
R-528	544069	4811308	Non-participating	30.3	30.2
R-529	544063	4811332	Non-participating	29.9	29.8

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-530	544121	4811343	Non-participating	26.5	26.4
R-531	544054	4811360	Non-participating	29.7	29.6
R-532	544107	4811368	Non-participating	27.9	27.9
R-533	544048	4811386	Non-participating	29.7	29.6
R-534	544035	4811416	Non-participating	29.6	29.6
R-535	544032	4811446	Non-participating	29.8	29.7
R-536	544113	4811393	Non-participating	28.7	28.6
R-537	544110	4811428	Non-participating	29.6	29.5
R-538	544032	4811472	Non-participating	29.9	29.9
R-539	544016	4811499	Non-participating	29.8	29.8
R-540	544114	4811481	Non-participating	30.6	30.6
R-541	544077	4811536	Non-participating	29.8	29.8
R-542	544015	4811535	Non-participating	29.7	29.6
R-543	545296	4810426	Non-participating	42.3	42.3
R-544	545486	4810297	Non-participating	43.9	43.9
R-545	545545	4810224	Non-participating	44.6	44.6
R-546	544122	4811970	Non-participating	29.2	29.1
R-547	544144	4812217	Non-participating	32.0	32.0
R-548	544064	4812162	Non-participating	30.7	30.7
R-549	544415	4811928	Non-participating	31.8	31.8
R-550	544475	4811917	Non-participating	33.7	33.7
R-551	544468	4811881	Non-participating	33.7	33.7
R-552	544405	4811883	Non-participating	33.2	33.2
R-553	544449	4811857	Non-participating	33.5	33.5
R-554	544513	4811836	Non-participating	34.1	34.1
R-555	544471	4811812	Non-participating	33.8	33.8
R-556	544516	4811777	Non-participating	34.2	34.2
R-557	544552	4811758	Non-participating	34.6	34.6
R-558	544468	4811733	Non-participating	34.0	34.0
R-559	544632	4811794	Non-participating	35.0	35.0
R-560	544731	4811777	Non-participating	35.2	35.2
R-561	544745	4811815	Non-participating	34.8	34.8
R-562	544552	4811924	Non-participating	34.1	34.1
R-563	544794	4811921	Non-participating	34.3	34.3
R-564	544600	4812086	Non-participating	31.8	31.8
R-565	544667	4812132	Non-participating	31.9	31.9
R-566	544946	4812255	Non-participating	33.4	33.4
R-567	545011	4812015	Non-participating	34.1	34.1

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-568	545054	4811986	Non-participating	34.5	34.5
R-569	544978	4811900	Non-participating	34.7	34.7
R-570	545610	4811866	Non-participating	42.3	42.3
R-571	545594	4811995	Non-participating	38.0	38.0
R-572	545105	4812780	Non-participating	31.8	31.8
R-573	544714	4812823	Non-participating	30.5	30.5
R-574	544782	4812778	Non-participating	30.9	30.9
R-575	544833	4812785	Non-participating	31.1	31.1
R-576	544917	4812786	Non-participating	31.2	31.2
R-577	544732	4812713	Non-participating	31.0	31.0
R-578	544673	4812715	Non-participating	31.2	31.2
R-579	544598	4812697	Non-participating	31.0	31.0
R-580	544533	4812705	Non-participating	30.7	30.7
R-581	544500	4812780	Non-participating	29.9	29.9
R-582	544631	4812790	Non-participating	30.3	30.3
R-583	544451	4812718	Non-participating	30.6	30.6
R-584	544334	4812645	Non-participating	30.5	30.5
R-585	544405	4812604	Non-participating	30.5	30.5
R-586	545530	4812979	Non-participating	31.0	31.0
R-587	545616	4812997	Non-participating	32.5	32.5
R-588	545615	4813132	Non-participating	30.3	30.3
R-589	545682	4813391	Non-participating	28.9	28.9
R-590	545500	4812532	Non-participating	36.0	36.0
R-591	545592	4812584	Non-participating	35.9	35.9
R-592	545473	4812291	Non-participating	34.8	34.8
R-593	545720	4812418	Non-participating	37.4	37.4
R-594	546329	4812580	Non-participating	36.9	36.6
R-595	546206	4813382	Non-participating	29.5	29.5
R-596	546210	4813472	Non-participating	29.0	29.0
R-597	546658	4813237	Non-participating	30.3	30.3
R-598	546709	4813118	Non-participating	30.9	30.9
R-599	546863	4813114	Non-participating	30.9	30.9
R-600	546885	4813050	Non-participating	31.2	31.2
R-601	546690	4812754	Non-participating	33.7	33.7
R-602	546812	4812857	Non-participating	32.5	32.5
R-603	546798	4812725	Non-participating	34.4	34.4
R-604	546794	4812563	Non-participating	35.9	35.6
R-605	546794	4812525	Non-participating	37.4	37.0

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-606	546798	4812429	Non-participating	38.2	37.9
R-607	546805	4812313	Non-participating	39.6	39.4
R-608	546802	4812253	Non-participating	40.3	40.1
R-609	546798	4812176	Non-participating	41.2	41.0
R-610	546716	4812067	Non-participating	42.9	42.8
R-611	546927	4812038	Non-participating	41.9	41.7
R-612	546991	4812029	Non-participating	41.4	41.3
R-613	547044	4812030	Non-participating	41.1	41.1
R-614	547083	4812030	Non-participating	40.8	40.8
R-615	547119	4812035	Non-participating	40.5	40.5
R-616	547067	4811960	Non-participating	41.5	41.5
R-617	547112	4811953	Non-participating	41.2	41.2
R-618	547186	4811960	Non-participating	40.6	40.6
R-619	547326	4812030	Non-participating	39.1	39.1
R-620	547416	4812029	Non-participating	38.6	38.6
R-621	547432	4811961	Non-participating	38.9	38.9
R-622	547135	4812180	Non-participating	39.3	39.3
R-623	547136	4812220	Non-participating	38.9	38.9
R-624	547112	4812375	Non-participating	37.8	37.8
R-625	547120	4812575	Non-participating	33.8	33.8
R-626	547120	4812624	Non-participating	33.5	33.5
R-627	547118	4812773	Non-participating	32.5	32.5
R-628	547193	4812815	Non-participating	32.1	32.1
R-629	547108	4812815	Non-participating	32.3	32.3
R-630	547047	4812934	Non-participating	31.7	31.7
R-631	547078	4813166	Non-participating	30.3	30.3
R-632	547216	4813165	Non-participating	30.2	30.2
R-633	547110	4813226	Non-participating	30.0	30.0
R-634	547117	4813413	Non-participating	31.0	31.0
R-635	547035	4813487	Non-participating	30.9	30.9
R-636	547381	4813410	Non-participating	30.0	30.0
R-637	547474	4813262	Non-participating	31.3	31.3
R-638	547874	4813057	Non-participating	31.6	31.6
R-639	548045	4812800	Non-participating	31.9	31.9
R-640	547904	4812625	Non-participating	31.4	31.4
R-641	547940	4812438	Non-participating	33.1	33.1
R-642	548007	4812256	Non-participating	34.4	34.4
R-643	548071	4812331	Non-participating	33.7	33.7

Receptor ID	X [m]	Y [m]	Status	Operational - Project Sound w/o Sound Barrier [dB(A)]	Operational - Project Sound w/ Sound Barrier [dB(A)]
R-644	548014	4812026	Non-participating	35.3	35.3
R-645	547940	4812064	Non-participating	35.4	35.4
R-646	547543	4812051	Non-participating	37.9	37.9
R-647	547859	4811944	Non-participating	36.5	36.5
R-648	547944	4811945	Non-participating	36.0	36.0
R-649	547950	4811874	Non-participating	36.4	36.4
R-650	547953	4811808	Non-participating	37.6	37.6
R-651	548009	4811768	Non-participating	37.6	37.6
R-652	548202	4811948	Non-participating	34.7	34.7
R-653	548411	4811933	Non-participating	33.9	33.9
R-654	548402	4812007	Non-participating	33.6	33.6
R-655	548744	4812214	Non-participating	31.7	31.7
R-656	548809	4812098	Non-participating	31.9	31.9
R-657	548952	4811998	Non-participating	32.3	32.3
R-658	548901	4811923	Non-participating	32.7	32.7
R-659	548829	4811926	Non-participating	32.9	32.9
R-660	548756	4811686	Non-participating	33.8	33.8
R-661	548757	4811589	Non-participating	34.0	34.0
R-662	548582	4811533	Non-participating	35.8	35.7
R-663	548733	4811413	Non-participating	36.5	35.2
R-664	548826	4811373	Non-participating	37.2	35.5
R-665	548761	4811251	Non-participating	38.4	37.0
R-666	548038	4810827	Non-participating	44.5	44.0
R-667	548039	4810941	Non-participating	44.2	43.6
R-668	548040	4811061	Non-participating	43.7	43.2
R-669	548038	4811141	Non-participating	43.2	42.8
R-670	548040	4811237	Non-participating	41.6	41.6
R-671	548018	4811521	Non-participating	39.1	39.1
R-672	547948	4811485	Non-participating	40.2	40.2
R-673	547720	4811562	Non-participating	40.6	40.6
R-674	547800	4811726	Non-participating	38.8	38.8
R-675	545257	4808058	Non-participating	37.4	37.4

Pre-construction Sound Monitoring Plan

ReGenerate
RENEWABLE ENERGY CONSULTING

Pre-Construction Sound Monitoring Plan

PROJECT: LAKESIDE SOLAR/BESS (MI)

DATE: AUGUST 7, 2025

REGENERATE CONSULTING
3413 NEST AVE.
SHELDON, IA 51201
TEL: (712) 577-1825
E-MAIL: CHRIS@REGENERATECONSULTING.COM
WEB: WWW.REGENERATECONSULTING.COM

Contents

Revision History

Issue	Date	Revision Purpose
1	04-Aug-25	Original
2	07-Aug-25	Minor Report Edits

1. Executive Summary

This report provides a summary of the planned monitoring of pre-construction sound at the Lakeside Solar and BESS Project (Project) developed on behalf ofLakeside Solar, LLC. Details include the purpose and guidelines of the relevant protocol as well as details on the equipment, siting and data collection.

The plan is based primarily upon the guidelines of the Michigan Public Service Commission (MPSC or Commission) Application Filing Instructions and Procedures. [1] This is in conjunction with ReGenerate's experience as an independent engineering consulting agency.

Primary highlights of the protocol include:

- Timing: Monitoring shall be conducted prior to construction of the Project in order to provide a baseline of ambient, or background, sound at the site to aid in post-construction sound verification.
- Monitoring Locations: Monitoring locations will include the two highest non-participating receptors in modeled sound and up to three additional receptors based on population density and/or areas of highest concern for sound. Criteria for selection of monitoring locations as well as preliminary locations chosen as an example is provided in Section 4 of this document.
- Equipment Setup: Sound level meters meeting the ANSI/IEC Class 1 performance requirements and logging 1/3 octave band equivalent sound pressure levels shall be used in conjunction with a windscreen, anemometer and recorder. Equipment will be as specified by the MPSC and is consistent with industry best practices in ReGenerate's experience.
- Data Collection: Data to be collected in 1-second intervals and averaged into 10-minute periods for reporting. Data collection is to be completed over a period of approximately 7 to 10 days at a minimum.
- Data Analysis: Data to be filtered for erroneous values based upon guidelines of the MPSC and industry best practices. Ambient, or background, noise levels for the project to be determined either through pre-construction noise monitoring or other agreed upon means.
- Reporting: Reporting will be completed per MPSC guidelines. This includes but is not limited to narrative description of the soundscape, summary of overall day and night A-weighted sound level (L_{eq}, L_{10}, L_{50} and L_{90}), overall A-weighted time history sound levels, ANS weighted results for the above should substantive biogenetic sound be found and comparison of modeled sound levels to existing background sound.

2. Purpose

Pre-construction sound monitoring of the facility will be conducted to provide an understanding of potential noise impacts on the existing soundscape prior to operation of the Project. Sound monitoring

will generally follow the guidelines as defined in MCL 460.1226 and requirements of ANSI S12.9 Part 3 as per the guidelines. [2,3].

3. Equipment

Sound level meters used for measurement shall meet the ANSI/IEC Class 1 performance requirements (i.e., IEC 61672-1 and ANSI S1.4) and log 1/3 octave band equivalent sound pressure levels. The microphone shall be protected by a 7-inch diameter or equivalent hydrophobic windscreen. Sound level meters will be coupled with continuous audio recordings in an effort to aid in sound source identification and soundscape characterization.

Each sound level meter shall be field calibrated with an acoustical calibrator meeting the requirements of IEC 60942 Class 1 immediately before and after each monitoring period. Any calibration drift above 0.5 dB will be noted and addressed with respect to ANSI S12.18. Each sound level meter will have been calibrated within two years and calibrator within one year of the completion of monitoring by a National Institute of Standards and Technology traceable facility.

Anemometers will be located adjacent to the monitoring station at microphone height to measure wind speed. Additional meteorological data would be obtained from nearby National Weather Service station and/or facility logging systems.

An example setup from a previous project is shown in the figure below.

Figure 1: Example Setup of Noise Monitoring Equipment

4. Siting

Monitors will be sited at representative locations for the two non-participating dwellings with the highest modeled sound level. Up to three additional sound monitoring locations will be chosen that could be representative of areas with high population density and/or nearest to areas of highest concern for sound.

Sound level meter microphones will be placed outside, approximately 1.2 m to 1.5 m above the ground. The microphone will not be placed such that any structure blocks the line of sight between the microphone and otherwise visible facility components and not placed within dense vegetation or near contributing sources of transient of consistent sound, Generally, the measurements will be done in such a way that they are representative of the soundscapes at the monitoring location. A location on the nearest vertical surface of the residence may be utilized or, more likely, a location in the free-field at least 25 feet from any building façade or other large reflective objects. This will be dependent on preferences of the landowner. If a free-field location is chosen, then 6 dB will be added to the results to account for the pressure doubling at the wall of the dwelling.

If site access is denied by a landowner of a monitoring location to measure near or on the dwelling, the sound monitor may be sited at the closest property line at the same or similar modeled sound isoline as the dwelling. If a location with a similar sound level cannot be obtained, then an additional sound level correction shall be extrapolated to the dwelling through use of sound propagation modeling.

Preliminary monitoring locations have been developed by ReGenerate based on sound modeling. These locations are considered representative of the two highest non-participating receptors and three alternative locations that could be representative of areas with high population density and/or nearest to areas of highest concern for sound. Note that these locations represent reasonable locations, but will not be finalized until the project is in operation and permission from landowners has been secured.

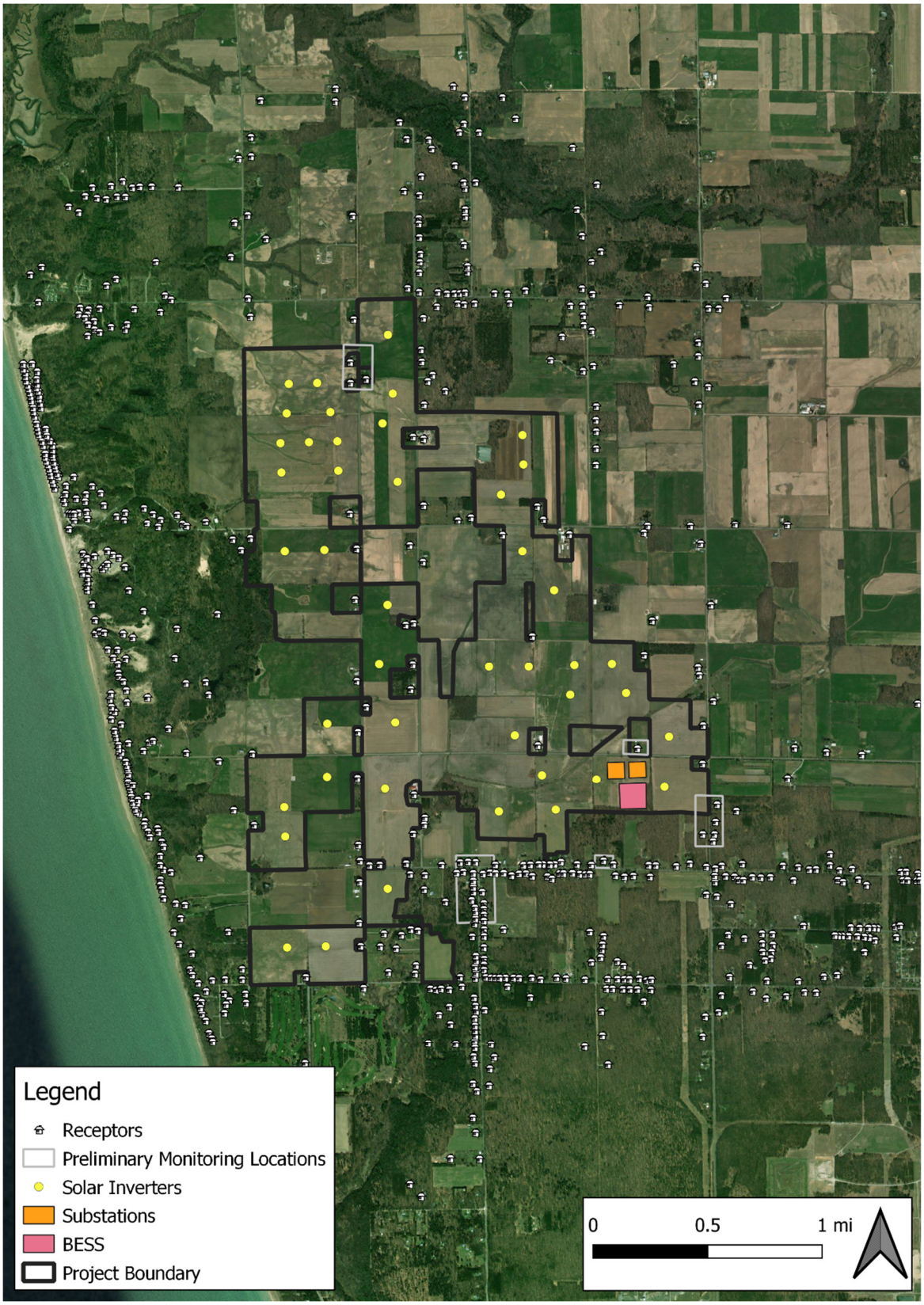

Figure 2: Preliminary Monitoring Location Areas

The one-hour equivalent average (L_{1h}) is the target sound level metric and averaging time for assessment of noise compliance. Sound levels will be logged at a finer interval than one-hour to provide the fidelity to enable source characterization through 1/3 octave band spectrograms and the calculation of statistical sound levels over the course of an hour, i.e. 10th percentile (L_{10}), median (L_{50}), and lower 10th percentile (L_{90}) sound levels. To this end, 1/3 octave band data will be logged at least once per minute with a one-second measurement interval preferred.

5. Data Processing and Analysis

Sound level data from each monitor will be averaged into 10-minute periods and summarized over the entire monitoring period.

Data Exclusions

Data is to be excluded under the following conditions :

- Wind gust speeds above 5 m/s (11 mph),
- Temperatures below -10° C (14° F) (outside the specification of the sound level meters),
- Precipitation in the form of rain, sleet, or ice,
- Thunder,
- Humidity outside the specifications of the sound level meter,
- Anomalous sounds that were out of character for the area being monitored,
- Seasonal sound sources such as harvesting equipment, lawn mowers, and snow removal equipment, and
- Equipment interactions by field staff during microphone calibration and maintenance.

If more than half of a one-hour aggregation period is not acoustically valid the entire one-hour period will be excluded from the analysis.

Precipitation events are to be obtained from nearby publicly available data and corroborated through both analysis of sound level spectrograms and from audio recordings.

Biogenic Sound

Sound level data containing notable biogenic sound will be treated carefully and noted in the narrative description of the monitoring site and results. Some equipment may contribute sound at frequencies above the 1 kHz octave band. Therefore, additional care should be taken when monitoring the sound of these facilities, including scheduling post-construction monitoring during periods where insects and other biogenic sounds are less prominent, such as late fall through early spring.

If needed, seasonal biogenic sounds could be excluded using the ANSI S12.100 "ANS" frequency-weighting network.

6. References

[1] Michigan Public Service Commission. (10 Oct 2024). MPSC Certificate for Solar Energy, Wind Energy, and Energy Storage Facilities: Application Filing Instructions and Procedures.

[2] Michigan Legislature. (Retrieved Jul 2025). MCL - Section 460.1226: CLEAN AND RENEWABLE ENERGY AND ENERGY WASTE REDUCTION ACT (EXCERPT). Retrieved from https://www.legislature.mi.gov/Laws/MCL?objectName=mcl-460-1226.

[3] American National Standards Institute. ANSI/ASA S12.9-2013 Part 3: Quantities and Procedures for Description and Measurement of Environmental Sound – Part 3: Short-term Measurements with an Observer Present Retrieved from https://www.seia.org/research-resources/major-solar-projects-list.

Post-construction Sound Monitoring Plan

ReGenerate
RENEWABLE ENERGY CONSULTING

Post-Construction Sound Monitoring Plan

PROJECT: LAKESIDE SOLAR/BESS (MI)

DATE: AUGUST 7, 2025

REGENERATE CONSULTING
3413 NEST AVE.
SHELDON, IA 51201
TEL: (712) 577-1825
E-MAIL: CHRIS@REGENERATECONSULTING.COM
WEB: WWW.REGENERATECONSULTING.COM

Contents

Revision History

Issue	Date	Revision Purpose
1	04-Aug-25	Original
2	07-Aug-25	Minor Report Edits

1. Executive Summary

This report provides a summary of the planned monitoring of post-construction sound at the Lakeside Solar and BESS Project (Project) developed on behalf ofLakeside Solar, LLC. Details include the purpose and guidelines of the relevant protocol as well as details on the equipment, siting and data collection.

The plan is based primarily upon the guidelines of the Michigan Public Service Commission (MPSC or Commission) Application Filing Instructions and Procedures. [1] This is in conjunction with ReGenerate's experience as an independent engineering consulting agency.

Primary highlights of the protocol include:

- Timing: Monitoring shall be conducted within the first year after the facility has completed constructed, unless otherwise directed by the Commission.
- Monitoring Locations: Monitoring locations will include the two highest non-participating receptors in modeled sound and up to three additional receptors based on noise complaints received. Criteria for selection of monitoring locations as well as preliminary locations chosen as an example is provided in Section 5 of this document.
- Equipment Setup: Sound level meters meeting the ANSI/IEC Class 1 performance requirements and logging 1/3 octave band equivalent sound pressure levels shall be used in conjunction with a windscreen, anemometer and recorder. Equipment will be as specified by the MPSC and is consistent with industry best practices in ReGenerate's experience.
- Data Collection: Data to be collected in 1-second intervals and averaged into 10-minute periods for reporting. Data collection is to be completed over a period of approximately 7 to 10 days at a minimum.
- Data Analysis: Data to be filtered for erroneous values based upon guidelines of the MPSC and industry best practices. Ambient, or background, noise levels for the project to be determined either through pre-construction noise monitoring or other agreed upon means.
- Reporting: Reporting will be completed per MPSC guidelines.

2. Purpose

Post-construction sound monitoring of the facility will be conducted to assess whether sound levels from the as-built facility meet the noise limits as defined in MCL 460.1226. [2] Sound monitoring will generally follow the requirements of ANSI S12.9 Part 3 as per the guidelines. [3] Post-construction sound monitoring shall be conducted within the first year after the facility has completed constructed, unless otherwise directed by the Commission.

3. Monitoring Guidelines

The noise limit for energy facilities, as defined in MCL 460.1226, is 55 dBA L_{1h} referring specifically to facility-produced sound. To ensure that facility operation is assessed in a variety of conditions, including those associated with maximum sound emissions from the facility, unattended long-term monitoring (at least 7 to 10 days) should be completed.

In order to isolate facility produced sound, total sound measured will subtract out ambient background noise determined either through pre-construction noise monitoring or other agreed upon means.

4. Equipment

Sound level meters used for measurement shall meet the ANSI/IEC Class 1 performance requirements (i.e., IEC 61672-1 and ANSI S1.4) and log 1/3 octave band equivalent sound pressure levels. The microphone shall be protected by a 7-inch diameter or equivalent hydrophobic windscreen. Sound level meters will be coupled with continuous audio recordings in an effort to aid in sound source identification and soundscape characterization.

Each sound level meter shall be field calibrated with an acoustical calibrator meeting the requirements of IEC 60942 Class 1 immediately before and after each monitoring period. Any calibration drift above 0.5 dB will be noted and addressed with respect to ANSI S12.18. Each sound level meter will have been calibrated within two years and calibrator within one year of the completion of monitoring by a National Institute of Standards and Technology traceable facility.

Anemometers will be located adjacent to the monitoring station at microphone height to measure wind speed. Additional meteorological data would be obtained from nearby National Weather Service station and/or facility logging systems.

An example setup from a previous project is shown in the figure below.

Figure 1: Example Setup of Noise Monitoring Equipment

5. Siting

Monitors will be sited at representative locations for the two non-participating dwellings with the highest modeled sound level. Up to three additional sound monitoring locations will be chosen with an emphasis on additional monitoring for residences with formal noise complaints regarding facility operation. If more than three locations received complaints, then three will be selected based on the modeled sound levels for each location and how well represented other complaint locations are.

Consideration of monitoring locations will also be based on:

- Type of complaint (outdoor or indoor noise, tones, low frequency noise, amplitude modulation, vibrations, rumbles, rattles, etc., if available).
- Whether the complaint was due to a continuing operational issue or a non-recurring event.
- Whether the modeled free-field sound level is above 44 dBA (or dwelling wall is above 50 dBA).
- Whether the landowner cooperates with the study.

Sound level meter microphones will be placed outside, approximately 1.2 m to 1.5 m above the ground. The microphone will not be placed such that any structure blocks the line of sight between the microphone and otherwise visible facility components and not placed within dense vegetation or near

contributing sources of transient of consistent sound, Generally, the measurements will be done in such a way that they are representative of the soundscapes at the monitoring location. A location on the nearest vertical surface of the residence may be utilized or, more likely, a location in the free-field at least 25 feet from any building façade or other large reflective objects. This will be dependent on preferences of the landowner. If a free-field location is chosen, then 6 dB will be added to the results to account for the pressure doubling at the wall of the dwelling.

If site access is denied by a landowner of a monitoring location to measure near or on the dwelling, the sound monitor may be sited at the closest property line at the same or similar modeled sound isoline as the dwelling. If a location with a similar sound level cannot be obtained, then an additional sound level correction shall be extrapolated to the dwelling through use of sound propagation modeling.

Preliminary monitoring locations have been developed by ReGenerate based on sound modeling. These locations are considered representative of the two highest non-participating receptors and three alternative locations that could be representative of areas with high population density and/or nearest to areas of highest concern for sound. Note that these locations represent reasonable locations, but will not be finalized until the project is in operation and permission from landowners has been secured.

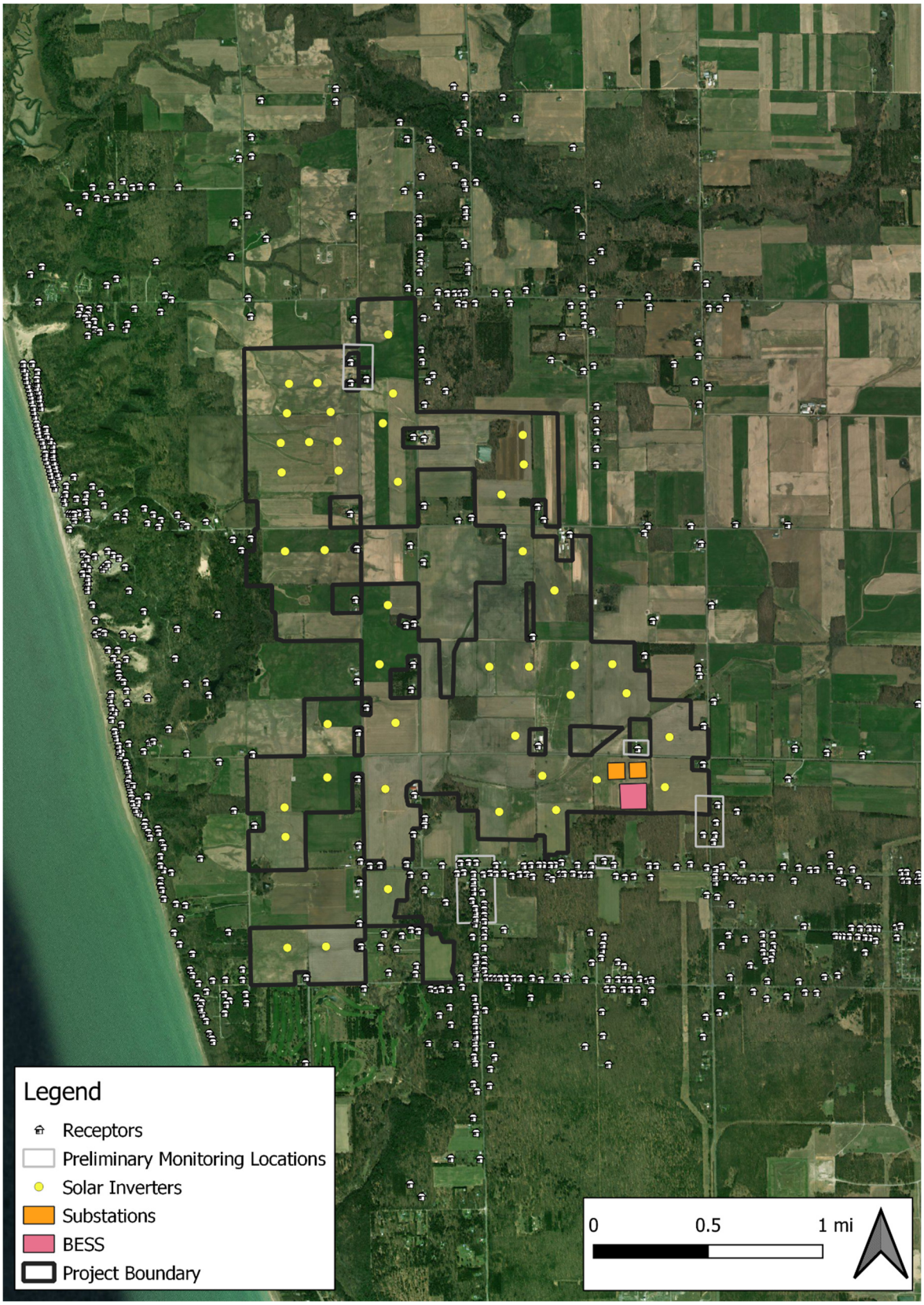

Figure 2: Preliminary Monitoring Location Areas

The one-hour equivalent average (L_{1h}) is the target sound level metric and averaging time for assessment of noise compliance. Sound levels will be logged at a finer interval than one-hour to provide the fidelity to enable source characterization through 1/3 octave band spectrograms and the calculation of statistical sound levels over the course of an hour, i.e. 10th percentile (L_{10}), median (L_{50}), and lower 10th percentile (L_{90}) sound levels. To this end, 1/3 octave band data will be logged at least once per minute with a one-second measurement interval preferred. Project operation logs (SCADA) and sound levels will be collected to categorize operational states of the facility during the time of the measurements.

6. Data Processing and Analysis

Sound level data from each monitor will be averaged into 10-minute periods and summarized over the entire monitoring period.

Data Exclusions

Data is to be excluded under the following conditions :

- Wind gust speeds above 5 m/s (11 mph),
- Temperatures below -10° C (14° F) (outside the specification of the sound level meters),
- Precipitation in the form of rain, sleet, or ice,
- Thunder,
- Humidity outside the specifications of the sound level meter,
- Anomalous sounds that were out of character for the area being monitored,
- Seasonal sound sources such as harvesting equipment, lawn mowers, and snow removal equipment, and
- Equipment interactions by field staff during microphone calibration and maintenance.

If more than half of a one-hour aggregation period is not acoustically valid the entire one-hour period will be excluded from the analysis.

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If needed, seasonal biogenic sounds could be excluded using the ANSI S12.100 "ANS" frequency-weighting network.

Tonality

Prominent discrete tones are to be assessed by comparing the total sound level in a given 1/3 octave band to the adjacent 1/3 octave bands for each minute. The difference between the 1/3 octave band sound level is compared to the arithmetic average of the sound levels in the adjacent 1/3 octave bands. If the difference is greater than the values listed below, a prominent discrete tone is present.

- 15 dB at low frequencies (25 Hz to 125 Hz).
- 8 dB at middle-frequency bands (160 to 400 Hz).
- 5 dB at high-frequency bands (500 to 10,000 Hz).

Any one-minute period with prominent discrete tones shall have a tonal penalty of 5 dB applied to the data if the tone is audible.

7. References

[1] Michigan Public Service Commission. (10 Oct 2024). MPSC Certificate for Solar Energy, Wind Energy, and Energy Storage Facilities: Application Filing Instructions and Procedures.

[2] Michigan Legislature. (Retrieved Jul 2025). MCL - Section 460.1226: CLEAN AND RENEWABLE ENERGY AND ENERGY WASTE REDUCTION ACT (EXCERPT). Retrieved from https://www.legislature.mi.gov/Laws/MCL?objectName=mcl-460-1226.

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