Noise Assessment

6/29/2026

Harmony BESS

Geronimo Power

Paxwood Acoustics

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1.0 Introduction

Geronimo Power ("Geronimo") is planning to develop a 200 MW battery energy storage system ("BESS") facility with a 4-hour duration (800 MWh) located in Cass County, North Dakota ("Project"). Paxwood Acoustics was retained by Geronimo to conduct a noise assessment of the Project.

Based on the information provided in this report, the Project is expected to produce sound levels that are 40 dBA or less at the nearest residences. While there is not a specific state noise standard for BESS, the projected sound levels are below the applicable limits for wind power projects (North Dakota Administrative Code 69-06-08). See Section 3.2 for more information on noise standards.

This report includes:

- A description of the Project,
- Sound propagation modeling methods and results,
- Evaluation of the Project to noise standards, and
- Conclusions.

In addition, an introduction to acoustics is provided in Appendix A and model input data is in Appendix B.

2.0 Project Description

The proposed Project is a 200 MW BESS facility that would be located in Cass County, North Dakota. The Project would be located approximately 2.75 miles west-southwest of Prosper and 3.25 miles north of Mapleton, near an existing substation on 32nd Street SE.

The primary equipment associated with BESS that has the potential to produce sound are the cooling fans on the energy storage units and medium voltage transformers. The Project will be located on the west side of 32nd Street SE, east of the existing substation. The Project plans to install 314 Tesla Megapack XL units in groups of four. In the first year of operation, the Project will include 264 units, with augmentation over time to reach 314 units.

The Project area is composed primarily of agricultural land use with some rural residences located approximately 5,000 feet away. A map of the proposed Project showing the BESS and surrounding area is provided in Figure 1.

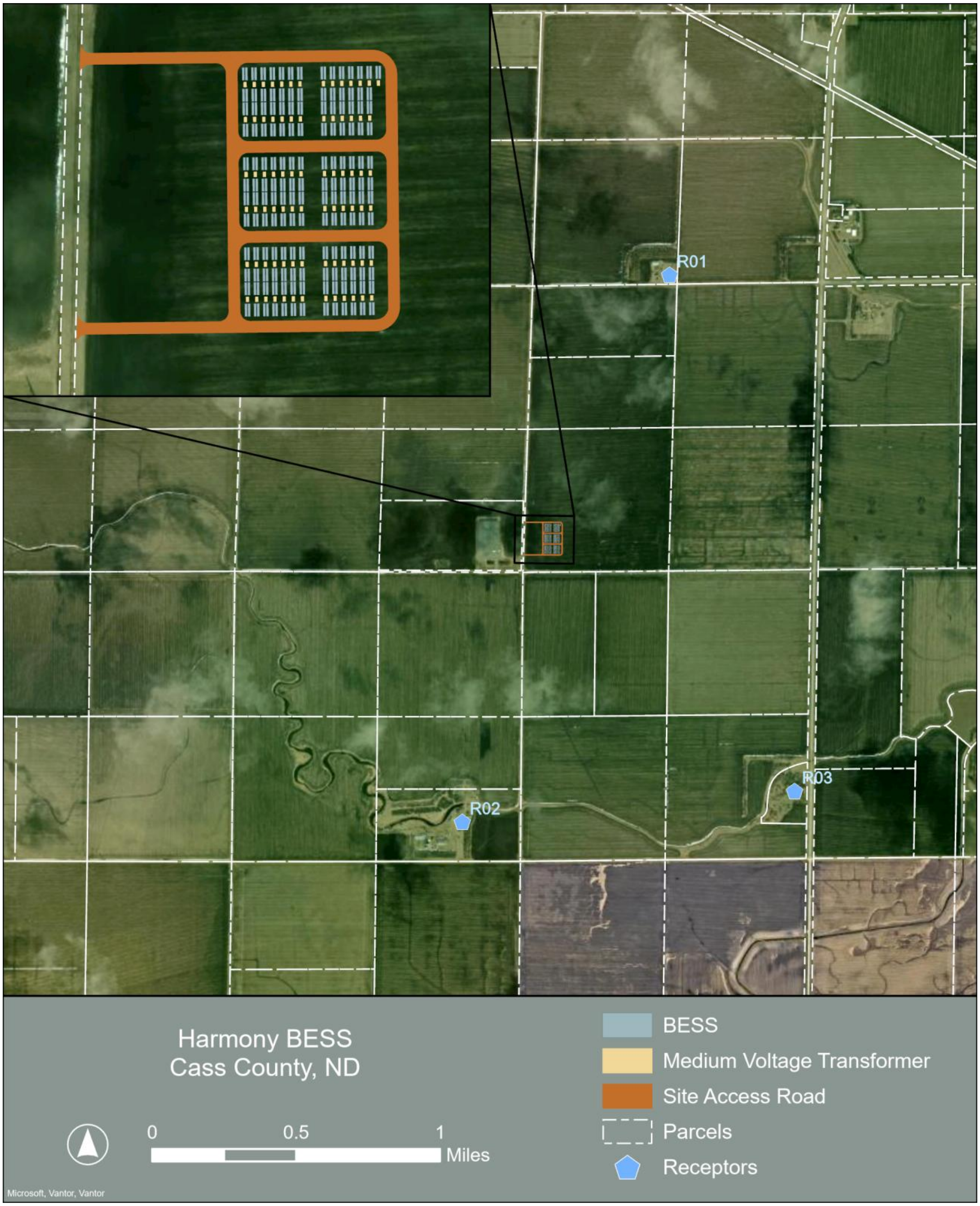

Figure 1: Map of the Project and Surrounding Area

3.0 Noise Standards

3.1 Local Standards

There are no quantitative noise regulations for Cass County, North Dakota that apply to the proposed BESS.

3.2 State Regulations

There are no quantitative noise regulations for the State of North Dakota that apply to the proposed BESS. However, North Dokata has state noise limits for wind energy projects that are identified in ND Administrative Code 69-06-08 under Criterion 4 which states that,

> *A wind energy conversion facility site must not include a geographic area where, due to operation of the facility, the sound levels within one hundred feet of an inhabited residence or a community building will exceed forty-five dBA. The sound level avoidance criteria may be waived in writing by the owner of the occupied residence or the community building.*

This sets a limit of 45 dBA within 100 feet of a residence or community building unless there is a waiver. While the proposed BESS project is not subject to this criteria, the same sound level limit is used in this assessment to evaluate if the Project would result in undue sound conditions at nearby residences or community buildings.

4.0 Sound Propagation Modeling

4.1 Modeling Procedure & Settings

Sound propagation modeling was completed using the modeling software CadnaA made by DataKustik GmbH. CadnaA implements the international sound propagation standard, ISO 9613-2 "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation." Both CadnaA and the ISO 9613-2 standard are used by noise control professionals across the United States and are regularly relied upon by local and state jurisdictions. The model takes into account source sound emissions, topography, receptor locations, and several other factors. It conservatively calculates sound levels for meteorological conditions that are favorable for sound propagation, assuming that all receptors are downwind of the sound sources.

For this assessment, USGS terrain data was used for the Project to create the three-dimensional topography throughout the surrounding area. Other site features, including the proposed locations of equipment, the receptor locations, and Project boundaries, were provided by the Applicant. Model settings and input data are provided in Appendix B.

4.2 Modeled Sound Sources

The model included sound emissions from medium voltage transformers, and BESS units. The Project has plans for future augmentation that would increase the number of BESS units and medium voltage transformers at the site. The two scenarios modeled were first year of operation with 264 BESS units and 66 medium voltage transformers and the last year of augmentation with 314 BESS units and 79 medium voltage transformers.

Battery Energy Storage System Units

The model included sound emissions from Tesla Megapack XL BESS units. The Project assumed fan type (FN) 03 and thermal configuration (TC) 2 which has a specified sound pressure level of 66.3 dBA at 10 meters. Modeled sound power levels for the BESS units are provided in Appendix B.

Medium Voltage Transformers

Each group of 4 BESS units have one medium voltage transformer ("MVT") (4400 kVA, 200 kV BIL) associated with them. The specified sound pressure level of each MVT is 65 dBA at 0.3 meters KNAN[1]. Modeled sound power levels for the MVTs are provided in Appendix B.

Modeled sound power levels for the BESS units and medium voltage transformers are provided in Appendix B.

4.3 Model Results

Model results for the first year of operation and end of augmentation scenarios were calculated throughout the Project area at a grid of receptors. Based on the grid of receptors, sound level iso-lines were generated throughout the area so that the projected sound levels can be shown. Additionally, discrete receptors were placed within 100 feet of the nearest inhabited residences at a height of 5 feet (1.5 meters) above the ground. The scenario specific results are presented below.

First Year Operation

The first year operation model included 264 BESS units and 66 medium voltage transformers. The model results for this scenario are presented in Figure 2 and the highest results within 100 feet of the nearest residences are presented in

Table 1. As shown in

Table 1, the first year operation sound levels at nearby residences would range from approximately 37 dBA to 40 dBA with all equipment operating simultaneously.

End of Augmentation Operation

The final augmentation model included 314 BESS units and 79 medium voltage transformers. The model results for this scenario are presented in Figure 3 and the highest results within 100 feet of the nearest residences are presented in

Table 1. As shown in

Table 1, the end of augmentation operation sound levels at nearby residences would range from approximately 38 dBA to 40 dBA with all equipment operating simultaneously. This represents potential increase of 1 dBA compared to the first year of operation.

[1] ONAN: Oil Natural Air Natural

Table 1: Receptor Sound Levels Results

Receptor ID	Receptor Address	Overall Level (dBA)	
		First Year Operation	End of Augmentation
01	16247 31 St SE	40	40
02	16179 33 St SE	39	40
03	3280 163 Ave SE	37	38

Figure 2: Map of Modeled Sound Pressure Levels, First Year Operation

Figure 3: Map of Modeled Sound Pressure Levels, End of Augmentation Operation

5.0 Conclusions

Paxwood Acoustics conducted a noise assessment of the proposed Harmony BESS Project, a 200 MW battery energy storage system located in Cass County, North Dakota. This noise assessment included identification of noise emitting equipment, a discussion of noise limits, and sound propagation modeling.

The primary sound producing equipment for the Project includes Tesla Megapack XL units and medium voltage transformers.

There are no quantitative local or state noise regulations that apply directly to the proposed BESS, therefore, this assessment used the ND Administrative Code 69-06-08 Criterion 4, which applies to wind energy facilities to evaluate potential impact. The criterion establishes a limiting value of 45 dBA within 100 feet of an inhabited residence or community building as the benchmark to evaluate whether the Project would result in undue sound conditions at nearby residences.

As discussed in Section 4.3, the highest projected sound level at a nearby residence for both the first year of operation and end of augmentation scenarios would be 40 dBA, occurring north of the Project at 16247 31st St SE. This is below the 45 dBA criteria being used to evaluate the Project.

Appendix A: Introduction to Acoustics

Sound, Sources, and Perception

Sound in air is caused by fluctuations in air pressure which can be due to a variety of sources. The sources of sound can generally be grouped into three major categories: anthropogenic, biogenic, and geophonic. Anthropogenic sounds are human caused sounds such as voices, instruments, vehicles, and mechanical and electrical equipment. Biogenic sounds are those that are caused by organisms such as animal calls or animal interaction with the environment. And lastly geophonic sounds are those caused by the environment itself such as waves hitting a shoreline or wind interacting with plants or other objects.

There are three primary characteristics of sound that affect human perception: frequency which may also be referred to as pitch or tone, amplitude which relates to perceived loudness or volume, and temporal fluctuations, which is to say that sound can change with time.

Frequency

Humans can hear sound over a range of frequencies typically from 20 Hz to 20,000 Hz. While not strictly defined, this range can be divided into three subranges which are described as low frequency (20 Hz to around 250 Hz), mid frequency (around 250 Hz to around 4,000 Hz), and high frequency (around 4,000 Hz to 20,000 Hz). The mid frequency range is where most human speech occurs. More defined ranges of frequency are divided into octave bands (31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, and 16 kHz), or even further into 1/3 octave bands which are three smaller bands within each octave band. Sound below 20 Hz is referred to infrasound and is not typically audible to the human ear. Sound above 20,000 Hz is referred to as ultrasound and is also not audible to the human ear.

Most sounds are broadband in nature and contain energy at a range of frequencies. If however, a sound contains notably more energy at a specific frequency compared to the adjacent frequencies, then the sound can be perceived as a tone, such as a note in music.

Amplitude

Humans can hear sound over a wide range of pressures, from approximately 20 micropascals to over 20 million micropascals. Sound can occur outside of this range, but below 20 micropascals is typically inaudible to humans and above 20 million micropascal can cause pain. In acoustics, this wide range of audible sound pressures is compressed using a logarithmic scale to create a range of sound pressure levels from 0 dB (20 micropascals) to 120 dB (20 million micropascals). It is in this logarithmic scale, denoted as decibel or dB, that acousticians and environmental regulations quantify the amplitude of sound.

Temporal Changes

Both frequency and amplitude can change with time. A sound may be constant in both frequency and level, but this is fairly uncommon. If one considers the fluctuation in sounds from people having conversations, birds chirping, or vehicles passing by, it becomes apparent how much sound can change from one instance to the next. It is for this reason that acousticians use a variety of metrics to define and describe sound. These metrics are discussed further below.

Weighting Networks, Sound Pressure Level, and Metrics

Weighting Networks

Humans are most sensitive to sound between 500 Hz and 5 kHz. Our sensitivity with sound decreases below 500 Hz and above 5 kHz. In order to account for this varying sensitivity, the A-weighting network or filter was developed to mimic the sensitivity of the human ear and how we perceive loudness. A-weighting discounts sound in varying degrees by frequency below 500 Hz and above 5,000 Hz. Between 1,000 Hz and 4,000 Hz, the A-weighting network amplifies sound slightly to account for the increased sensitivity of the human ear in that range. Since the A-weighting network accounts for human sensitivity at difference frequencies, it is widely used in environmental acoustics and most environmental regulations. When a sound level is A-weighted, an “A” is typically added to the end of the abbreviation for decibel: dBA.

There are other weighting networks with different purposes, such as C, G, or Z, but A-weighting is most used in environmental acoustics. If a sound is not weighted or sometimes referred to as unweighted, it is considered Z-weighted or dBZ.

Sound Pressure Level

As was discussed previously, in acoustics, the amplitude of sound is often referred to in terms of sound pressure level. Representative sound pressure levels of some common sound sources and environments are shown in Figure 4. The sound levels presented in Figure 4 are meant to be illustrative, so any specific source or environment may be similar to or fall outside of the ranges shown in the graphic.

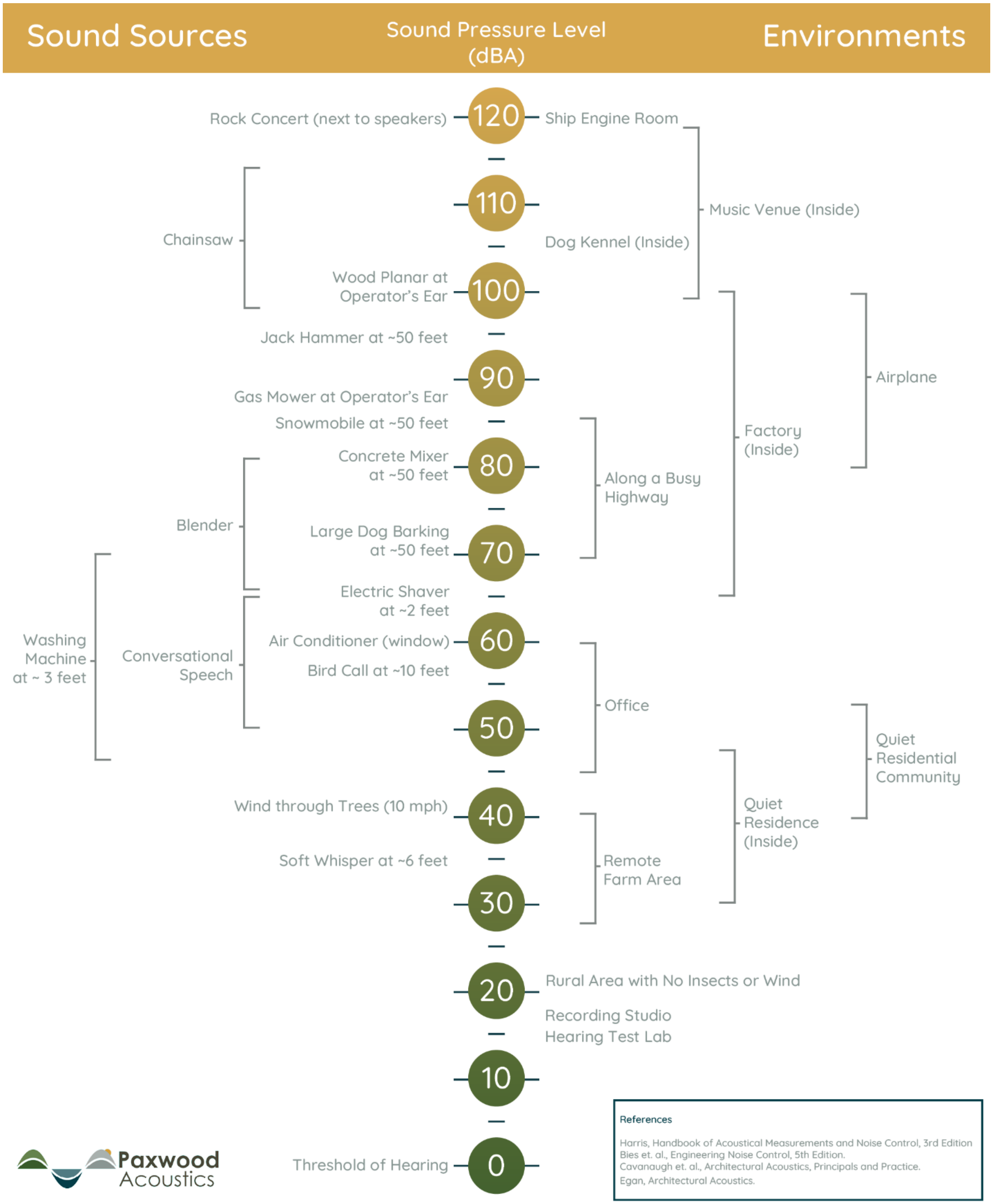

Figure 4: Representative Sound Pressure Levels (dBA) of Common Sound Sources & Environments

Since sound is a logarithmic function, one cannot use regular arithmetic operations to add and subtract sound levels. So, for example, conversational speech typically occurs at a level between 55 dBA and 65 dBA. If one person is speaking at a level of 60 dBA and another person is also speaking at a level of 60 dBA, the total sound level is not 120 dBA. (And a good thing too, otherwise, two people talking at the same time would quickly approach the threshold of pain, 120 dBA.) Instead, two voices at the same level only causes an increase of 3 dB, so 60 dBA plus 60 dBA equals 63 dBA.

In terms of perception of sound level there are two helpful rules of thumb to be aware of: 1) A change in broadband sound level of 10 dB is perceived as a halving or doubling of loudness, depending on if the amplitude of the sound decreased or increased, and 2) Changes in sound level of less than 3 dB are generally considered not perceptible.

Sound Level Metrics

With sound levels in an environment continuously changing, different sound level metrics are used to describe the sound level versus time. Some common sound level metrics are briefly described below:

- Equivalent Continuous Sound Level (L_{eq}): The L_{eq} is the level of the average sound pressure over a specified period of time. It takes into account quieter, long-term sound levels along with louder, short-duration sound levels to provide an overall sound level for a given time period. The louder sound levels, even with a short-duration, can have a strong influence on the L_{eq}. The L_{eq} is often used in environmental acoustics to convey an average representation of the acoustical environment, even though it is influenced more strongly by higher sound levels that occur over the specified interval. An L_{eq} may be as short as 1-second or up to an hour or more depending on the purpose of the quantification.
- Statistical Sound Levels (L_n): Statistical sound levels or percentile sound levels describe the level that is exceeded for a specified percentage of time. The L_{10}, for example, is the level that is exceeded 10% of the time. The L_{50}, is the median sound level: half the time the sound level is above the L_{50} and half the time the sound level is below the L_{50}. And the L_{90} is the sound level that is exceeded 90% of the time.
- Maximum Sound Level (L_{max}): The phrase “maximum sound level” may be used to describe the maximum L_{eq} or L_n over a given time period, but it can also be used to describe the sound level over a very short-duration typically using either a 1-second time constant which is referred to as slow-response, or a 125-millisecond time constant which is referred to as a fast-response. If the L_{max} metric is being used, it is good practice to note which time constant is being applied by adding the

notation S or F to the abbreviation: L_{Smax} or L_{Fmax}. The most appropriate time constant to use depends on the specific context of the quantification.

- Day-Night Level (L_{dn}): The L_{dn} is similar to the L_{eq} except that it is specifically applied over an entire day or 24-hour period with a 10 dB penalty applied to sound levels between 10 PM and 7 AM to account for greater sensitivity at night.

Appendix B: Model Settings & Input

Table 2: Sound Propagation Model Settings

Model Parameter	**Setting**
Ground Attenuation	ISO 9613-2 spectral ground attenuation with a ground factor of 0.0 at the BESS yard and 1.0 elsewhere.
Topography	USGS terrain.
Foliage Attenuation	No attenuation due to forest was taken into account in the model.
Atmospheric Attenuation	Based on 70% relative humidity and 10° C.
Search Radius	1.25 miles (2,000 meters)
Receptor Grid	50 feet by 50 feet (15 meters by 15 meters) over the entire Project area at a height of 5 feet (1.5 meters) above grade.

Table 3: Modeled Point Source

Source	**Sound Power Level (dBA)**	**Relative Height (m)**	**Coordinates (NAD83 Z14N)**		**Elevation (m)**
			X (m)	**Y (m)**	
BESS	97	2.78	646719	5201589	280
BESS	97	2.78	646721	5201589	280
BESS	97	2.78	646725	5201590	280
BESS	97	2.78	646727	5201590	280
BESS	97	2.78	646731	5201590	281
BESS	97	2.78	646733	5201590	281
BESS	97	2.78	646738	5201590	281
BESS	97	2.78	646740	5201590	281
BESS	97	2.78	646744	5201590	281
BESS	97	2.78	646746	5201590	281
BESS	97	2.78	646750	5201590	281
BESS	97	2.78	646752	5201590	281
BESS	97	2.78	646756	5201590	280
BESS	97	2.78	646758	5201590	280
BESS	97	2.78	646772	5201591	280
BESS	97	2.78	646774	5201591	280
BESS	97	2.78	646778	5201591	280
BESS	97	2.78	646780	5201591	280
BESS	97	2.78	646784	5201591	280
BESS	97	2.78	646787	5201591	280
BESS	97	2.78	646791	5201591	280
BESS	97	2.78	646793	5201591	280

Source	Sound Power Level (dBA)	Relative Height (m)	Coordinates (NAD83 Z14N)		Elevation (m)
			X (m)	Y (m)	
BESS	97	2.78	646797	5201591	280
BESS	97	2.78	646799	5201591	280
BESS	97	2.78	646803	5201591	280
BESS	97	2.78	646805	5201592	280
BESS	97	2.78	646809	5201592	280
BESS	97	2.78	646811	5201592	280
BESS	97	2.78	646719	5201575	280
BESS	97	2.78	646721	5201575	280
BESS	97	2.78	646725	5201575	280
BESS	97	2.78	646728	5201575	280
BESS	97	2.78	646732	5201575	281
BESS	97	2.78	646734	5201575	281
BESS	97	2.78	646738	5201575	281
BESS	97	2.78	646740	5201575	281
BESS	97	2.78	646744	5201576	281
BESS	97	2.78	646746	5201576	281
BESS	97	2.78	646750	5201576	281
BESS	97	2.78	646752	5201576	281
BESS	97	2.78	646756	5201576	280
BESS	97	2.78	646759	5201576	280
BESS	97	2.78	646772	5201576	280
BESS	97	2.78	646775	5201576	280
BESS	97	2.78	646779	5201576	280
BESS	97	2.78	646781	5201576	280
BESS	97	2.78	646785	5201577	280
BESS	97	2.78	646787	5201577	280
BESS	97	2.78	646791	5201577	280
BESS	97	2.78	646793	5201577	280
BESS	97	2.78	646797	5201577	280
BESS	97	2.78	646799	5201577	280
BESS	97	2.78	646803	5201577	280
BESS	97	2.78	646806	5201577	280
BESS	97	2.78	646719	5201566	280
BESS	97	2.78	646722	5201566	280
BESS	97	2.78	646726	5201566	280
BESS	97	2.78	646728	5201566	280
BESS	97	2.78	646732	5201566	281
BESS	97	2.78	646734	5201566	281

Source	Sound Power Level (dBA)	Relative Height (m)	Coordinates (NAD83 Z14N)		Elevation (m)
			X (m)	Y (m)	
BESS	97	2.78	646738	5201566	281
BESS	97	2.78	646740	5201566	281
BESS	97	2.78	646744	5201566	281
BESS	97	2.78	646746	5201566	281
BESS	97	2.78	646751	5201567	281
BESS	97	2.78	646753	5201567	281
BESS	97	2.78	646757	5201567	280
BESS	97	2.78	646759	5201567	280
BESS	97	2.78	646773	5201567	280
BESS	97	2.78	646775	5201567	280
BESS	97	2.78	646779	5201567	280
BESS	97	2.78	646781	5201567	280
BESS	97	2.78	646785	5201567	280
BESS	97	2.78	646787	5201567	280
BESS	97	2.78	646791	5201568	280
BESS	97	2.78	646793	5201568	280
BESS	97	2.78	646797	5201568	280
BESS	97	2.78	646800	5201568	280
BESS	97	2.78	646804	5201568	280
BESS	97	2.78	646806	5201568	280
BESS	97	2.78	646720	5201551	280
BESS	97	2.78	646722	5201551	280
BESS	97	2.78	646726	5201551	280
BESS	97	2.78	646728	5201551	280
BESS	97	2.78	646732	5201552	281
BESS	97	2.78	646734	5201552	281
BESS	97	2.78	646738	5201552	281
BESS	97	2.78	646741	5201552	281
BESS	97	2.78	646745	5201552	281
BESS	97	2.78	646747	5201552	281
BESS	97	2.78	646751	5201552	281
BESS	97	2.78	646753	5201552	281
BESS	97	2.78	646757	5201552	280
BESS	97	2.78	646759	5201552	280
BESS	97	2.78	646773	5201553	280
BESS	97	2.78	646775	5201553	280
BESS	97	2.78	646779	5201553	280
BESS	97	2.78	646781	5201553	280

Source	Sound Power Level (dBA)	Relative Height (m)	Coordinates (NAD83 Z14N)		Elevation (m)
			X (m)	Y (m)	
BESS	97	2.78	646785	5201553	280
BESS	97	2.78	646787	5201553	280
BESS	97	2.78	646792	5201553	280
BESS	97	2.78	646794	5201553	280
BESS	97	2.78	646798	5201553	280
BESS	97	2.78	646800	5201553	280
BESS	97	2.78	646804	5201553	280
BESS	97	2.78	646806	5201553	280
BESS	97	2.78	646720	5201529	280
BESS	97	2.78	646723	5201529	280
BESS	97	2.78	646727	5201529	280
BESS	97	2.78	646729	5201529	280
BESS	97	2.78	646733	5201529	281
BESS	97	2.78	646735	5201529	281
BESS	97	2.78	646739	5201529	281
BESS	97	2.78	646741	5201529	281
BESS	97	2.78	646745	5201529	281
BESS	97	2.78	646747	5201529	281
BESS	97	2.78	646751	5201529	281
BESS	97	2.78	646754	5201529	281
BESS	97	2.78	646758	5201529	280
BESS	97	2.78	646760	5201529	280
BESS	97	2.78	646774	5201530	280
BESS	97	2.78	646776	5201530	280
BESS	97	2.78	646780	5201530	280
BESS	97	2.78	646782	5201530	280
BESS	97	2.78	646786	5201530	280
BESS	97	2.78	646788	5201530	280
BESS	97	2.78	646792	5201530	280
BESS	97	2.78	646794	5201530	280
BESS	97	2.78	646798	5201530	280
BESS	97	2.78	646800	5201530	280
BESS	97	2.78	646805	5201531	280
BESS	97	2.78	646807	5201531	280
BESS	97	2.78	646721	5201514	280
BESS	97	2.78	646723	5201514	280
BESS	97	2.78	646727	5201514	280
BESS	97	2.78	646729	5201514	280

Source	Sound Power Level (dBA)	Relative Height (m)	Coordinates (NAD83 Z14N)		Elevation (m)
			X (m)	Y (m)	
BESS	97	2.78	646733	5201514	281
BESS	97	2.78	646735	5201514	281
BESS	97	2.78	646739	5201515	281
BESS	97	2.78	646741	5201515	281
BESS	97	2.78	646746	5201515	281
BESS	97	2.78	646748	5201515	281
BESS	97	2.78	646752	5201515	281
BESS	97	2.78	646754	5201515	281
BESS	97	2.78	646758	5201515	280
BESS	97	2.78	646760	5201515	280
BESS	97	2.78	646721	5201505	280
BESS	97	2.78	646723	5201505	280
BESS	97	2.78	646727	5201505	280
BESS	97	2.78	646729	5201505	280
BESS	97	2.78	646733	5201505	281
BESS	97	2.78	646736	5201505	281
BESS	97	2.78	646740	5201505	281
BESS	97	2.78	646742	5201505	281
BESS	97	2.78	646746	5201505	281
BESS	97	2.78	646748	5201505	281
BESS	97	2.78	646752	5201506	281
BESS	97	2.78	646754	5201506	281
BESS	97	2.78	646758	5201506	280
BESS	97	2.78	646760	5201506	280
BESS	97	2.78	646774	5201515	280
BESS	97	2.78	646776	5201515	280
BESS	97	2.78	646780	5201516	280
BESS	97	2.78	646782	5201516	280
BESS	97	2.78	646786	5201516	280
BESS	97	2.78	646788	5201516	280
BESS	97	2.78	646793	5201516	280
BESS	97	2.78	646795	5201516	280
BESS	97	2.78	646774	5201506	280
BESS	97	2.78	646776	5201506	280
BESS	97	2.78	646780	5201506	280
BESS	97	2.78	646782	5201506	280
BESS	97	2.78	646787	5201506	280
BESS	97	2.78	646789	5201506	280

Source	Sound Power Level (dBA)	Relative Height (m)	Coordinates (NAD83 Z14N)		Elevation (m)
			X (m)	Y (m)	
BESS	97	2.78	646793	5201507	280
BESS	97	2.78	646795	5201507	280
BESS	97	2.78	646799	5201516	280
BESS	97	2.78	646801	5201516	280
BESS	97	2.78	646805	5201516	280
BESS	97	2.78	646807	5201516	280
BESS	97	2.78	646799	5201507	280
BESS	97	2.78	646801	5201507	280
BESS	97	2.78	646805	5201507	280
BESS	97	2.78	646807	5201507	280
BESS	97	2.78	646721	5201490	280
BESS	97	2.78	646723	5201490	280
BESS	97	2.78	646728	5201491	280
BESS	97	2.78	646730	5201491	280
BESS	97	2.78	646734	5201491	281
BESS	97	2.78	646736	5201491	281
BESS	97	2.78	646740	5201491	281
BESS	97	2.78	646742	5201491	281
BESS	97	2.78	646746	5201491	281
BESS	97	2.78	646748	5201491	281
BESS	97	2.78	646752	5201491	281
BESS	97	2.78	646754	5201491	281
BESS	97	2.78	646759	5201491	280
BESS	97	2.78	646761	5201491	280
BESS	97	2.78	646774	5201492	280
BESS	97	2.78	646777	5201492	280
BESS	97	2.78	646781	5201492	280
BESS	97	2.78	646783	5201492	280
BESS	97	2.78	646787	5201492	280
BESS	97	2.78	646789	5201492	280
BESS	97	2.78	646793	5201492	280
BESS	97	2.78	646795	5201492	280
BESS	97	2.78	646799	5201492	280
BESS	97	2.78	646801	5201492	280
BESS	97	2.78	646806	5201492	280
BESS	97	2.78	646808	5201492	280
BESS	97	2.78	646722	5201468	280
BESS	97	2.78	646724	5201468	280

Source	Sound Power Level (dBA)	Relative Height (m)	Coordinates (NAD83 Z14N)		Elevation (m)
			X (m)	Y (m)	
BESS	97	2.78	646728	5201468	280
BESS	97	2.78	646730	5201468	280
BESS	97	2.78	646734	5201468	280
BESS	97	2.78	646736	5201468	280
BESS	97	2.78	646741	5201468	280
BESS	97	2.78	646743	5201468	281
BESS	97	2.78	646747	5201468	281
BESS	97	2.78	646749	5201468	281
BESS	97	2.78	646753	5201468	281
BESS	97	2.78	646755	5201468	281
BESS	97	2.78	646759	5201469	280
BESS	97	2.78	646761	5201469	280
BESS	97	2.78	646775	5201469	280
BESS	97	2.78	646777	5201469	280
BESS	97	2.78	646781	5201469	280
BESS	97	2.78	646783	5201469	280
BESS	97	2.78	646787	5201469	280
BESS	97	2.78	646790	5201469	280
BESS	97	2.78	646794	5201469	280
BESS	97	2.78	646796	5201469	280
BESS	97	2.78	646800	5201470	280
BESS	97	2.78	646802	5201470	280
BESS	97	2.78	646806	5201470	280
BESS	97	2.78	646808	5201470	280
BESS	97	2.78	646722	5201453	280
BESS	97	2.78	646724	5201453	280
BESS	97	2.78	646728	5201453	280
BESS	97	2.78	646731	5201453	280
BESS	97	2.78	646722	5201444	280
BESS	97	2.78	646725	5201444	280
BESS	97	2.78	646729	5201444	280
BESS	97	2.78	646731	5201444	280
BESS	97	2.78	646735	5201453	280
BESS	97	2.78	646737	5201453	280
BESS	97	2.78	646735	5201444	280
BESS	97	2.78	646737	5201444	280
BESS	97	2.78	646741	5201454	280
BESS	97	2.78	646743	5201454	281

Source	Sound Power Level (dBA)	Relative Height (m)	Coordinates (NAD83 Z14N)		Elevation (m)
			X (m)	Y (m)	
BESS	97	2.78	646741	5201444	280
BESS	97	2.78	646743	5201444	281
BESS	97	2.78	646747	5201454	281
BESS	97	2.78	646749	5201454	281
BESS	97	2.78	646747	5201445	281
BESS	97	2.78	646749	5201445	281
BESS	97	2.78	646753	5201454	281
BESS	97	2.78	646755	5201454	281
BESS	97	2.78	646754	5201445	281
BESS	97	2.78	646756	5201445	281
BESS	97	2.78	646759	5201454	280
BESS	97	2.78	646762	5201454	280
BESS	97	2.78	646760	5201445	280
BESS	97	2.78	646762	5201445	280
BESS	97	2.78	646775	5201454	280
BESS	97	2.78	646777	5201454	280
BESS	97	2.78	646776	5201445	280
BESS	97	2.78	646778	5201445	280
BESS	97	2.78	646782	5201455	280
BESS	97	2.78	646784	5201455	280
BESS	97	2.78	646782	5201445	280
BESS	97	2.78	646784	5201445	280
BESS	97	2.78	646788	5201455	280
BESS	97	2.78	646790	5201455	280
BESS	97	2.78	646788	5201446	280
BESS	97	2.78	646790	5201446	280
BESS	97	2.78	646794	5201455	280
BESS	97	2.78	646796	5201455	280
BESS	97	2.78	646794	5201446	280
BESS	97	2.78	646796	5201446	280
BESS	97	2.78	646800	5201455	280
BESS	97	2.78	646802	5201455	280
BESS	97	2.78	646800	5201446	280
BESS	97	2.78	646803	5201446	280
BESS	97	2.78	646806	5201455	280
BESS	97	2.78	646809	5201455	280
BESS	97	2.78	646807	5201446	280
BESS	97	2.78	646809	5201446	280

Source	Sound Power Level (dBA)	Relative Height (m)	Coordinates (NAD83 Z14N)		Elevation (m)
			X (m)	Y (m)	
BESS	97	2.78	646723	5201429	280
BESS	97	2.78	646725	5201430	280
BESS	97	2.78	646729	5201430	280
BESS	97	2.78	646731	5201430	280
BESS	97	2.78	646735	5201430	280
BESS	97	2.78	646737	5201430	280
BESS	97	2.78	646741	5201430	280
BESS	97	2.78	646744	5201430	281
BESS	97	2.78	646748	5201430	281
BESS	97	2.78	646750	5201430	281
BESS	97	2.78	646754	5201430	281
BESS	97	2.78	646756	5201430	281
BESS	97	2.78	646760	5201430	280
BESS	97	2.78	646762	5201430	280
BESS	97	2.78	646776	5201431	280
BESS	97	2.78	646778	5201431	280
BESS	97	2.78	646782	5201431	280
BESS	97	2.78	646784	5201431	280
BESS	97	2.78	646788	5201431	280
BESS	97	2.78	646790	5201431	280
BESS	97	2.78	646795	5201431	280
BESS	97	2.78	646797	5201431	280
BESS	97	2.78	646801	5201431	280
BESS	97	2.78	646803	5201431	280
BESS	97	2.78	646807	5201432	280
BESS	97	2.78	646809	5201432	280
MVT	81	1.83	646720	5201582	280
MVT	81	1.83	646726	5201582	280
MVT	81	1.83	646733	5201583	280
MVT	81	1.83	646739	5201583	280
MVT	81	1.83	646745	5201583	280
MVT	81	1.83	646751	5201583	280
MVT	81	1.83	646757	5201583	280
MVT	81	1.83	646773	5201584	279
MVT	81	1.83	646780	5201584	279
MVT	81	1.83	646786	5201584	279
MVT	81	1.83	646792	5201584	279
MVT	81	1.83	646798	5201584	279

Source	Sound Power Level (dBA)	Relative Height (m)	Coordinates (NAD83 Z14N)		Elevation (m)
			X (m)	Y (m)	
MVT	81	1.83	646804	5201584	279
MVT	81	1.83	646811	5201584	279
MVT	81	1.83	646721	5201559	280
MVT	81	1.83	646727	5201559	280
MVT	81	1.83	646733	5201559	280
MVT	81	1.83	646739	5201559	280
MVT	81	1.83	646746	5201559	280
MVT	81	1.83	646752	5201559	280
MVT	81	1.83	646758	5201559	280
MVT	81	1.83	646774	5201560	279
MVT	81	1.83	646780	5201560	279
MVT	81	1.83	646786	5201560	279
MVT	81	1.83	646793	5201560	279
MVT	81	1.83	646799	5201560	279
MVT	81	1.83	646805	5201561	279
MVT	81	1.83	646722	5201521	280
MVT	81	1.83	646728	5201521	280
MVT	81	1.83	646734	5201522	280
MVT	81	1.83	646740	5201522	280
MVT	81	1.83	646747	5201522	280
MVT	81	1.83	646753	5201522	280
MVT	81	1.83	646759	5201522	280
MVT	81	1.83	646775	5201523	279
MVT	81	1.83	646781	5201523	279
MVT	81	1.83	646787	5201523	279
MVT	81	1.83	646793	5201523	279
MVT	81	1.83	646800	5201523	279
MVT	81	1.83	646806	5201523	279
MVT	81	1.83	646722	5201498	280
MVT	81	1.83	646728	5201498	280
MVT	81	1.83	646735	5201498	280
MVT	81	1.83	646741	5201498	280
MVT	81	1.83	646747	5201498	280
MVT	81	1.83	646753	5201498	280
MVT	81	1.83	646760	5201499	280
MVT	81	1.83	646775	5201499	279
MVT	81	1.83	646782	5201499	279
MVT	81	1.83	646788	5201499	279

Source	Sound Power Level (dBA)	Relative Height (m)	Coordinates (NAD83 Z14N)		Elevation (m)
			X (m)	Y (m)	
MVT	81	1.83	646794	5201499	279
MVT	81	1.83	646800	5201500	279
MVT	81	1.83	646806	5201500	279
MVT	81	1.83	646723	5201460	280
MVT	81	1.83	646729	5201461	280
MVT	81	1.83	646736	5201461	280
MVT	81	1.83	646742	5201461	280
MVT	81	1.83	646748	5201461	280
MVT	81	1.83	646754	5201461	280
MVT	81	1.83	646760	5201461	280
MVT	81	1.83	646776	5201462	279
MVT	81	1.83	646783	5201462	279
MVT	81	1.83	646789	5201462	279
MVT	81	1.83	646795	5201462	279
MVT	81	1.83	646801	5201462	279
MVT	81	1.83	646807	5201462	279
MVT	81	1.83	646724	5201437	280
MVT	81	1.83	646730	5201437	280
MVT	81	1.83	646736	5201437	280
MVT	81	1.83	646742	5201437	280
MVT	81	1.83	646749	5201437	280
MVT	81	1.83	646755	5201437	280
MVT	81	1.83	646761	5201438	280
MVT	81	1.83	646777	5201438	279
MVT	81	1.83	646783	5201438	279
MVT	81	1.83	646789	5201438	279
MVT	81	1.83	646796	5201438	279
MVT	81	1.83	646802	5201439	279
MVT	81	1.83	646808	5201439	279

Table 4: Modeled Sound Power Level (dBZ) by Octave Band Frequency[2]

Source	Full Octave Band Center Frequency (Hz)									Overall Sound Power Level	
	31.5	63	125	250	500	1000	2000	4000	8000	dBA	dBZ
Medium Voltage Transformer KNAN	57	57	79	81	83	69	59	47	41	81	87
BESS Unit[3]					97					97	101

Table 5: Coordinates of Modeled Discrete Receptors

Receptor ID	Relative Height (m)	Coordinates (NAD83 Z14N)		Elevation (m)
		X (m)	Y (m)	
01	1.5	647383	5203004	279
02	1.5	646305	5199918	279
03	1.5	648157	5200138	278

[2] Spectral levels for the transformers were derived from the *Handbook of Acoustical Measurements and Noise Control, Third Edition*, Cyril M. Harris (ed.), 1998. Spectral levels for the inverters were based on data from the manufacturer.
[3] Spectral levels were not available from the manufacturer for the BESS unit, so the overall sound level for the BESS was modeled using the ISO 9613-2 methodology for attenuation of 500 Hz.