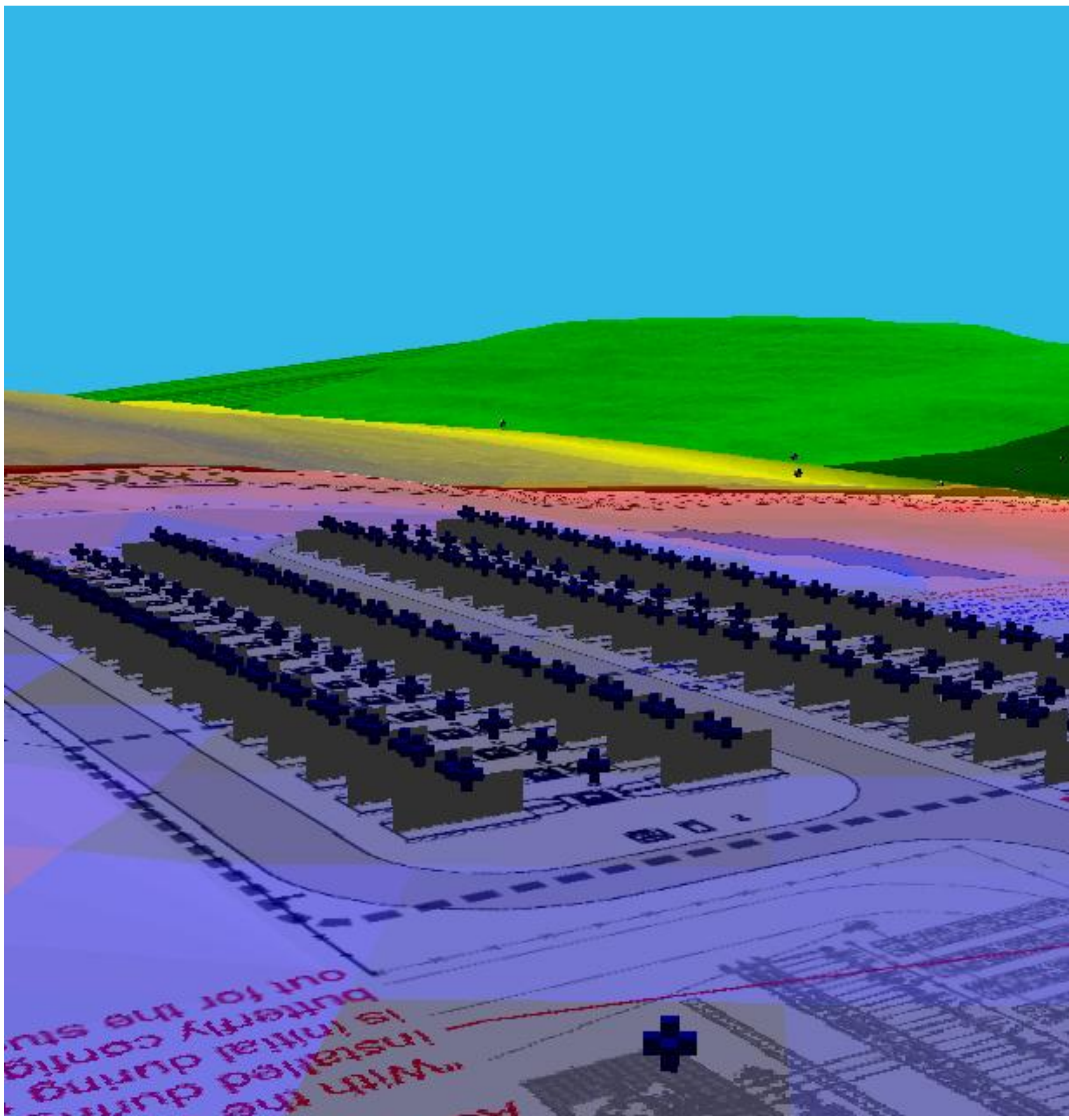
FRASER ENERGY
NOISE IMPACT ASSESSMENT



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Prepared for Fraser Storage, LLC

Report Title:

Fraser Energy Noise Impact Assessment

Report Prepared by:

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1.0 EXECUTIVE SUMMARY

Fraser Storage, LLC is proposing a 125 MW/500 MWh battery energy storage system ("BESS") facility in the Town of Hamden, New York. RSG conducted sound propagation modeling to forecast the Project's operational sound levels.

1. Project noise levels are subject to the Hamden Battery Energy Storage Systems Local Law which limits levels to 60 dBA at any non-participating structure.
2. Sound propagation modeling was conducted in accordance with the ISO 9613-2 standard. Sound levels were assessed at a total of 96 discrete receptors surrounding the Project area. Sound level isolines were generated based on a grid of receptors placed throughout.
3. Model results are provided in Section 4.3. The results show that all surrounding structures are modeled to have Project sound levels at or below the town of Hamden limits.

2.0 INTRODUCTION

Fraser Storage, LLC is proposing a battery energy storage system ("BESS") facility ("Project") rated up to 125 MW/500 MWh in Hamden, New York. To inform the local permitting process, the developer, Fraser Storage, LLC, retained RSG retained to perform a noise assessment of the Project. This report of the assessment includes:

- A Project description;
- Noise limits applicable to the Project;
- Sound monitoring procedures and results;
- Sound propagation modeling procedures and results; and
- Conclusions.

For reference, a primer of acoustical terminology used in this report is in Appendix A.

3.0 PROJECT DESCRIPTION

3.1 PROJECT AREA

The Project will be in Hamden, New York. The BESS yard is 307 meters (1,000 feet) east of Cobbe Cross Road. There is an existing substation in the town of Dehli 700 meters (2,297 feet) northeast of the facility stone limits on Hamden Hill Spur. State Highway 10 and the Delaware River are 2.1 miles (3.3 kilometers) southeast of the facility stone limits; the town of Delhi is 5 miles (8 kilometers) northeast. Figure 1 is a map of the Project area.

The facility area and surrounding areas include a mixture of forestry and farmland with scattered residences. The closest non-participating residence is 604 meters (1,982 feet) east of the facility stone limits on Hamden Hill Spur. There are 96 receptors included in this assessment.

3.2 PROJECT SITE

The Project is a proposed 125 MW/500 MWh BESS facility that will run on a four-hour discharge rate. For each grouping of four BESS containers, one medium voltage transformer will step up the voltage before it connects with the Project substation. The Project substation, located in the northern portion of the Project area, will include a main power transformer to step the voltage up to the grid. The sound sources considered in the Project are the BESS containers, medium voltage transformers, and the substation transformer. The noise emission from any additional auxiliary equipment, including a small transformer, is not expected to cause a notable change in predicted sound levels. This noise assessment includes all equipment that is noted for future augmentation in the site plan. Figure 2 is a map of the Project site layout.

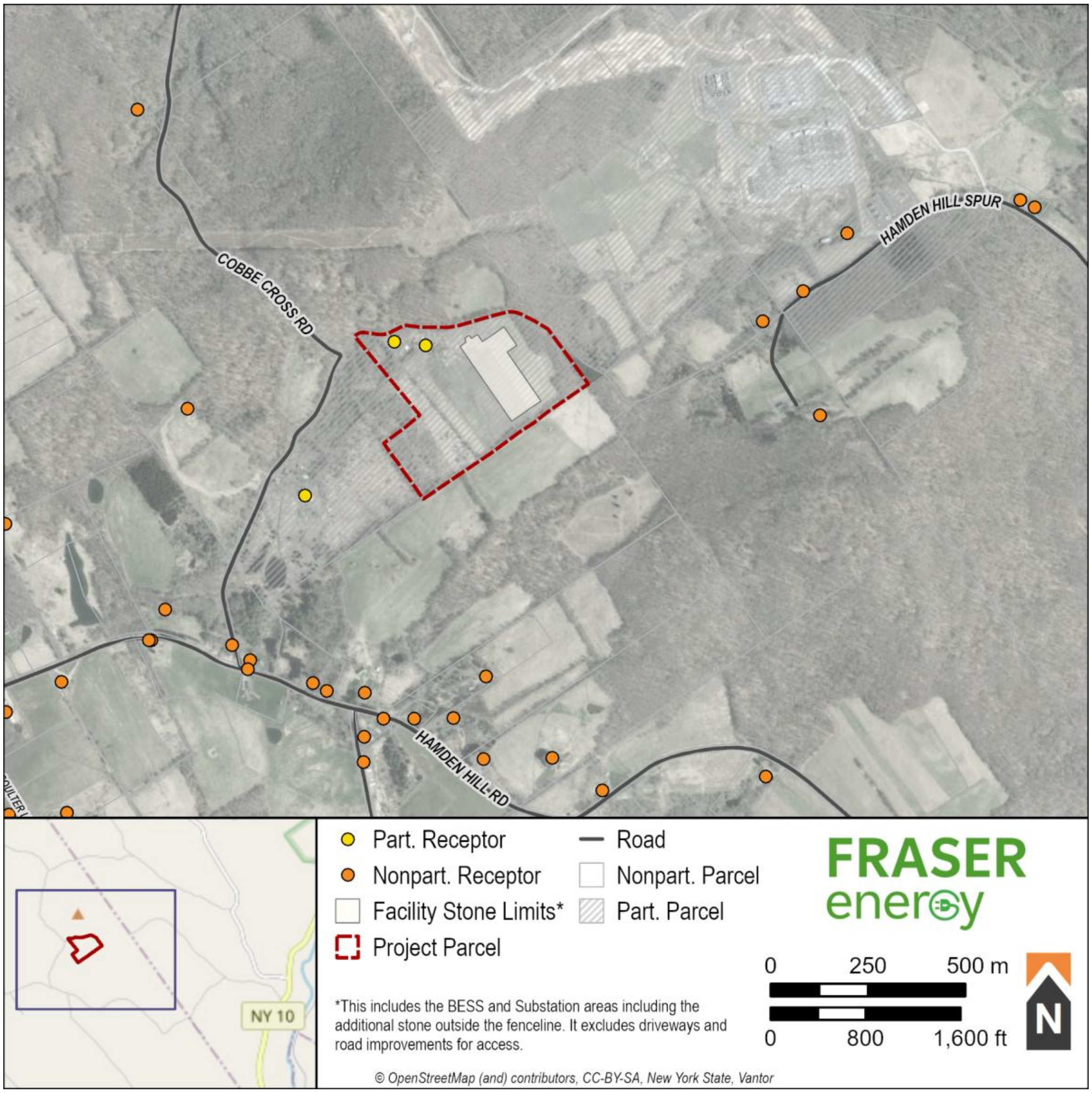

FIGURE 1: PROJECT AREA MAP

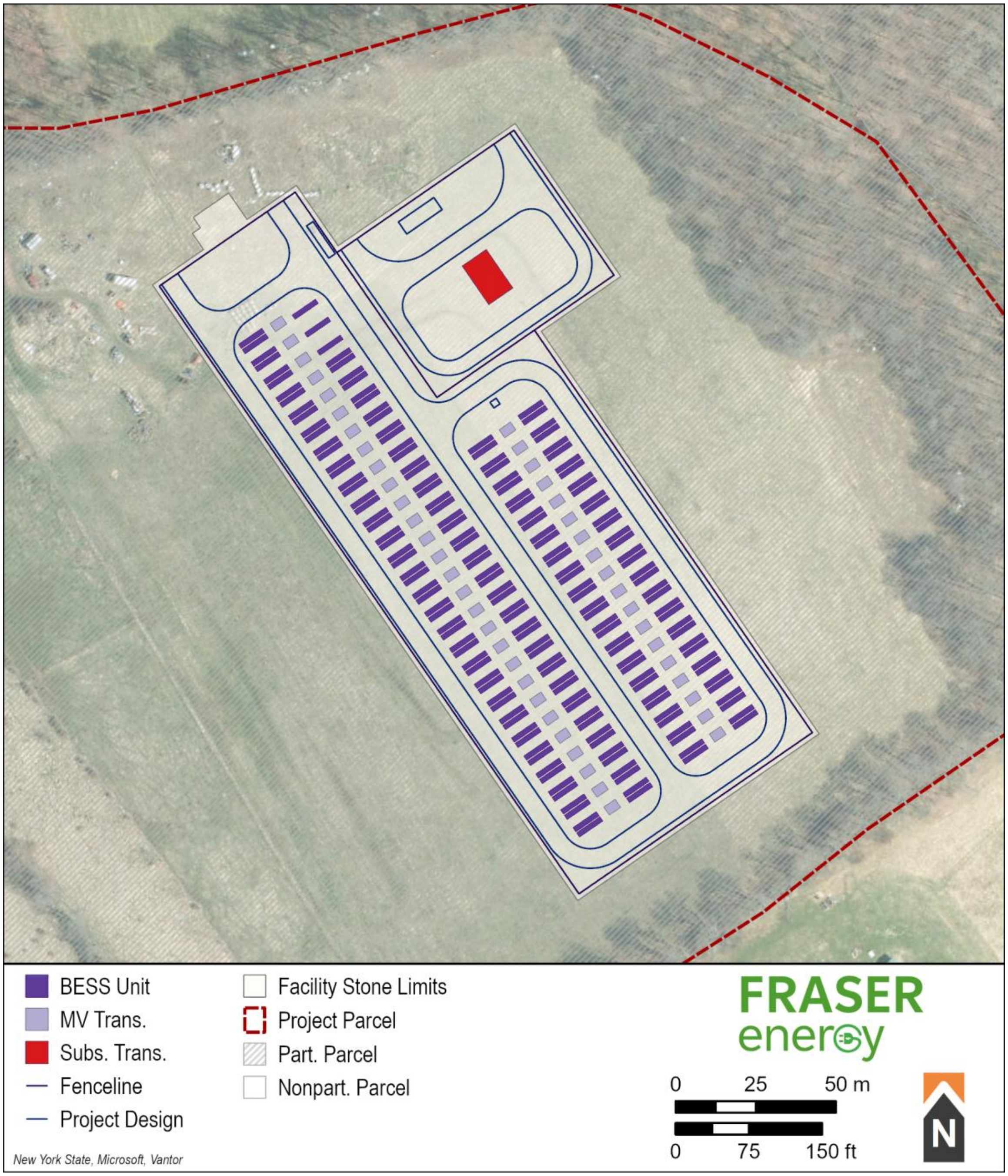

FIGURE 2: SITE MAP

3.3 APPLICABLE NOISE LIMITS

The one-hour average sound levels from the Project are limited to 60 dBA at non-participating structures based on regulations from the Town of Hamden.

Town of Hamden

Hamden regulates noise emissions from Battery Energy Storage Systems under the Town of Hamden Battery Energy Storage Systems Local Law. The law regulates sound levels from Projects greater than 600 kW ("Tier 2") in Section 3.05. Requirements for Tier 2 Battery Energy Storage Systems Application. Part E Noise.

> *"Noise. The one (1) hour average noise generated from the BESS, components, and associated ancillary equipment shall not exceed a noise level of (60) dBA as measured at the outside wall of any non-participating residence or Occupied Community Building. Applicants may submit equipment and component manufacturer noise ratings to demonstrate compliance. The Applicant may be required to provide Operating Sound pressure Level measurements from a reasonable number of sampled locations at the perimeter of the BESS to demonstrate compliance with this standard."*

4.0 SOUND PROPAGATION MODELING

4.1 MODELING PROCEDURES

Modeling for the Project was in accordance with the standard ISO 9613-2, "Acoustics – Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation." The ISO standard states:

> *This part of ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level … under meteorological conditions favorable to propagation from sources of known sound emissions. These conditions are for downwind propagation … or, equivalently, propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs at night.*

The model considers source sound power levels, surface reflection and absorption, atmospheric absorption, geometric divergence, meteorological conditions, walls, barriers, berms, and terrain. ISO 9613-2 assumes downwind sound propagation between every source and every receptor, consequently, all wind directions, including the prevailing wind directions, are considered. The site and surrounding area were modeled in CadnaA, a widely accepted acoustical propagation modeling tool from Datakustik GmbH.

Nearby structures were taken from NYS GIS Data and modeled as discrete points with a height of 4 meters, the average height of a two-story window. In addition, a grid of discrete receiver points with 20-meter by 20-meter spacing was calculated at a 1.5-meter height to produce the sound contour lines provided in Figure 3.

The surrounding Project area is modeled as soft ground (G=1). The area within the Facility Stone Limits is modeled as mixed ground (G=0.6), and access roads and equipment pads are modeled as hard ground (G=0). The model assumes an ambient temperature of 10° Celsius and 70% relative humidity.

Model results represent conservative estimations of sound levels at maximum expected sound emissions from the Project. Spectral sound power levels were assigned to all sources. Appendix B includes a summary of the sound sources and the model parameters.

4.2 SOUND SOURCES

The primary sound sources of the Project include 181 BESS containers, 46 medium voltage transformers, and one high-voltage substation transformer that is assumed to be operating in the oil natural air forced (ONAF) condition. Table 1 provides a summary of the proposed sound-producing equipment. The tonal penalties are not applied to the stated sound powers.

TABLE 1: PROJECT EQUIPMENT SUMMARY

TYPE	QTY.	SOUND POWER		TONAL PENALTY
		dBA	dBZ	
BESS Container	181	93	95	5 dB
Medium Voltage Transformer	46	81	86	5 dB
Substation Transformer (ONAF)	1	108	113	5 dB

BESS Container

The Project utilizes 181 Tesla Megapack 2XL BESS units, each running at a 4-hour discharge rate. Manufacturer test reports provide sound levels around the container and spectra for a series of fan speeds incrementing by 10%. Based on the noise test report for 100% fan speed, the BESS containers are modeled as a point source with a sound power level of 93 dBA. The provided spectra indicate tonal prominence at the 400 Hz 1/3 octave band. As the BESS containers are to be faced back-to-back, a reflective surface is placed between the BESS units to simulate the directivity caused by the adjacent container.

Medium Voltage Transformer

There is a total of 46 4.8 MVA medium voltage transformers ("MVTs") planned for the Project. The MVTs do not include fan cooling but include natural air cooling. Based on the product information, the MVT cooling is K-class fluid Natural Air Natural (KNAN), and Oil Natural Air Natural (ONAN) cooling may be allowed as necessary. Acoustically, these modes are equivalent and do not change the acoustic profile of the equipment. Based on the MVT power and voltage output, the NEMA TR-1 sound level rating is 65 dBA. The sound power level, calculated based on its spatial dimensions, is 81 dBA.

Substation Transformer

A 115 kV / 143 MVA high-voltage transformer is to be located in the Project substation to step the voltage to match the grid. The transformer has the ability to operate in two different modes: with and without fan cooling (ONAF and ONAN, respectively). The maximum sound level rating according to the NEMA TR-1 standard is 83 dBA in the ONAF mode and 80 dBA in the ONAN mode. To assess maximum expected levels, the transformer was modeled assuming ONAF operation. Given its predicted spatial dimensions, the modeled transformer sound power is 108 dBA in the ONAF mode.

Tonality

Power equipment is often tonal at integer multiples of the line frequency (60 Hz). The BESS units are expected to have a tonal prominence in the 400 Hz 1/3 octave band, as indicated in the manufacturer test report. Transformers are usually tonal in the 125 Hz, 250 Hz, 315 Hz, 500 Hz, or 630 Hz 1/3 octave bands; therefore, the MVTs and the substation high-voltage transformer are assumed to be tonal at the source in both the ONAN and ONAF cooling modes for the purposes of this assessment. Per the ANSI S12.9 Part 4 standard, a 5 dB tonal penalty is added to the sound power of sources that indicate tonal prominence. The addition of a 5 dB tonal penalty to the sound emissions of all Project equipment is a conservative and protective assumption because tonal prominences can be masked by attenuation over propagation distance and broadband background sound.

4.3 SOUND MODELING RESULTS

Sound propagation modeling results are displayed in Figure 3. With the BESS containers at 100% fan speed, the highest modeled one-hour equivalent sound level at a non-participating structure is 48 dBA at a residence to the west of the facility stone limits along Cobbe Cross Road. Sound propagation isolines in bold increments of 5 dBA are provided. The sound level limit for non-participating structures, 60 dBA, is shown in a dashed orange line. One-decibel increments are shown in a dashed gray line.

Appendix C includes a table of all modeled receptor locations and results.

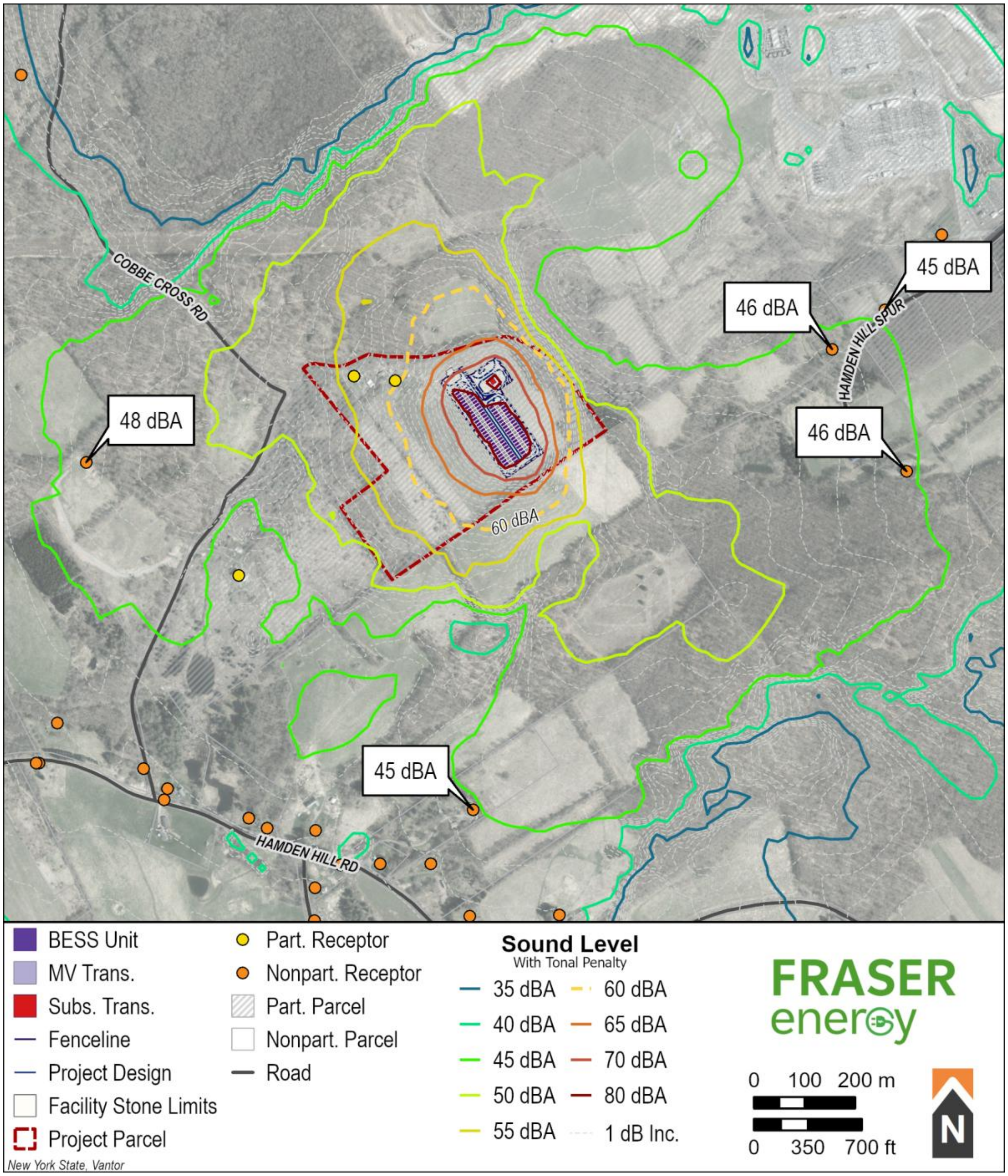

FIGURE 3: SOUND PROPAGATION MODELING RESULTS

5.0 CONCLUSION

The Project is subject to the town of Hamden Battery Energy Storage Systems Local Law which limits Project one-hour equivalent sound levels to 60 dBA at non-participating structures.

With the Project designs outlined in this noise assessment, all non-participating structures are below the town of Hamden regulations.

APPENDIX A. ACOUSTICS PRIMER

Expressing Sound Levels in Decibels

The varying air pressure that constitutes sound can be characterized in many different ways. The human ear is the basis for the metrics that are used in acoustics. Normal human hearing is sensitive to sound fluctuations over an enormous range of pressures, from about 20 micropascals (the "threshold of audibility") to about 20 pascals (the "threshold of pain").[1] This factor of one million in sound pressure difference is challenging to convey in engineering units. Instead, sound pressure is converted to sound "levels" in units of "decibels" (dB, named after Alexander Graham Bell). Once a measured sound is converted to dB, it is denoted as a level with the letter "L".

The conversion from sound pressure in pascals to sound level in dB is a four-step process. First, the sound wave's measured amplitude is squared, and the mean is taken. Second, a ratio is taken between the mean square sound pressure and the square of the threshold of audibility (20 micropascals). Third, using the logarithm function, the ratio is converted to factors of 10. The final result is multiplied by 10 to give the decibel level. By this decibel scale, sound levels range from 0 dB at the threshold of audibility to 120 dB at the threshold of pain.

Typical sound sources, and their sound pressure levels, are listed on the scale in Figure 4.

Human Response to Sound Levels: Apparent Loudness

For every 20 dB increase in sound level, the sound pressure increases by a *factor* of 10; the sound *level* range from 0 dB to 120 dB covers 6 factors of 10, or one million, in sound *pressure*. However, for an increase of 10 dB in sound *level* as measured by a meter, humans perceive an approximate doubling of apparent loudness: to the human ear, a sound level of 70 dB sounds about "twice as loud" as a sound level of 60 dB. Smaller changes in sound level, less than 3 dB up or down, are generally not perceptible.

[1] The pascal is a measure of pressure in the metric system. In Imperial units, they are themselves very small: one pascal is only 145 millionths of a pound per square inch (psi). The sound pressure at the threshold of audibility is only 3 one-billionths of one psi: at the threshold of pain, it is about 3 one-thousandths of one psi.

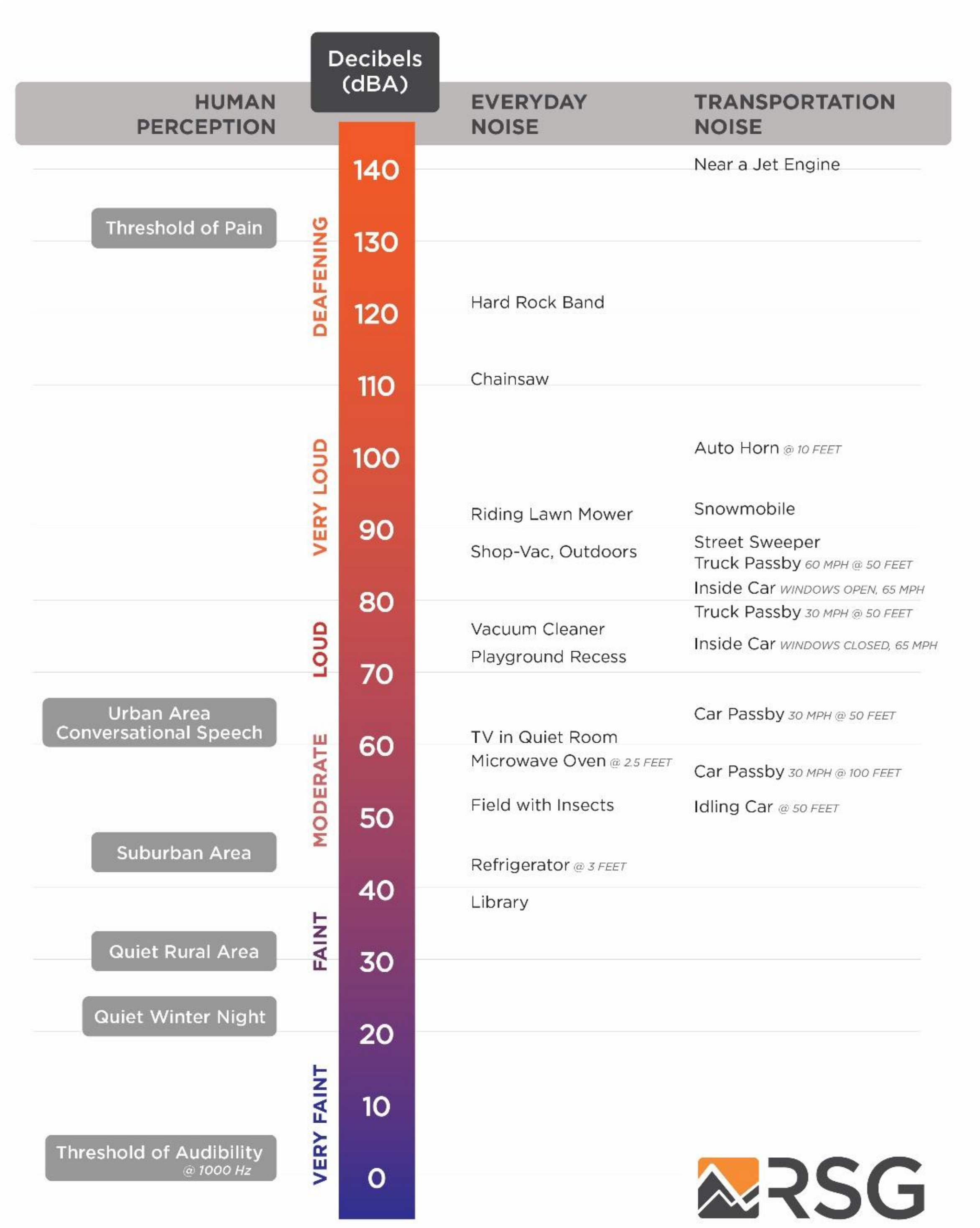

FIGURE 4: A SCALE OF SOUND PRESSURE LEVELS FOR TYPICAL SOUND SOURCES

Frequency Spectrum of Sound

The "frequency" of a sound is the rate at which it fluctuates in time, expressed in Hertz (Hz), or cycles per second. Very few sounds occur at only one frequency: most sound contains energy at many different frequencies, and it can be broken down into different frequency divisions, or bands. These bands are similar to musical pitches, from low tones to high tones. The most common division is the standard octave band. An octave is the range of frequencies whose upper frequency limit is twice its lower frequency limit, exactly like an octave in music. An octave band is identified by its center frequency: each successive band's center frequency is twice as high (one octave) as the previous band. For example, the 500 Hz octave band includes all sound whose frequencies range between 354 Hz (Hertz, or cycles per second) and 707 Hz. The next band is centered at 1,000 Hz with a range between 707 Hz and 1,414 Hz. The range of human hearing is divided into 10 standard octave bands: 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1,000 Hz, 2,000 Hz, 4,000 Hz, 8,000 Hz, and 16,000 Hz. For analyses that require finer frequency detail, each octave-band can be subdivided. A commonly used subdivision creates three smaller bands within each octave band, or so-called 1/3-octave bands.

The Spectrogram

One method of viewing the spectral sound level is to look at a spectrogram of the sound. As shown in Figure 5, the spectrogram shows the level, frequency spectra, and time in one graph. That is, the horizontal axis represents time, the vertical axis is frequency, and the intensity of the color is proportional to the intensity of the sound.

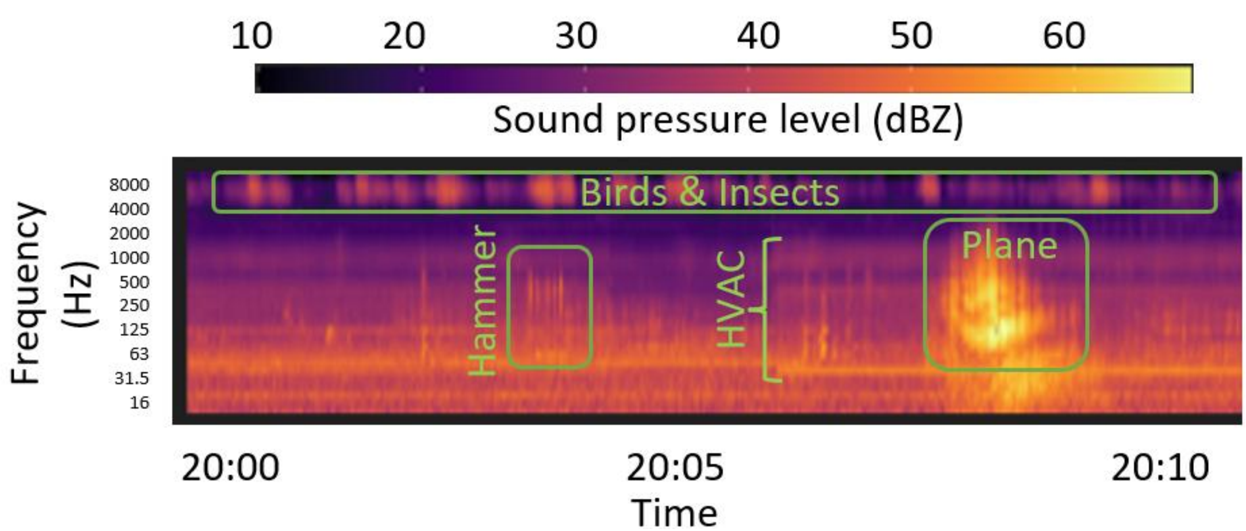

FIGURE 5: AN EXAMPLE OF A SOUND SPECTROGRAM WITH ANNOTATIONS

The spectrogram is useful for identifying the sources of sound. For example, birds show short bursts of high frequency sound, while airplanes are mostly low frequency sound and show slow rise and fall times. In the example above, we can see several of these events.

Human Response to Frequency: Weighting of Sound Levels

The human ear is not equally sensitive to sounds of all frequencies. Sounds at some frequencies seem louder than others, despite having the same decibel level as measured by a sound level meter. In particular, human hearing is much more sensitive to medium pitches (from about 500 Hz to about 4,000 Hz) than to very low or very high pitches. For example, a tone measuring 80 dB at 500 Hz (a medium pitch) sounds quite a bit louder than a tone measuring 80 dB at 60 Hz (a very low pitch). The frequency response of normal human hearing ranges from 20 Hz to 20,000 Hz. Below 20 Hz, sound pressure fluctuations are not “heard”, but sometimes can be “felt”. This is known as “infrasound”. Likewise, above 20,000 Hz, sound can no longer be heard by humans; this is known as “ultrasound”. As humans age, they tend to lose the ability to hear higher frequencies first; many adults do not hear very well above about 16,000 Hz. Most natural and man-made sound occurs in the range from about 40 Hz to about 4,000 Hz. Some insects and birdsongs reach about 8,000 Hz.

To adjust measured sound pressure levels so that they mimic human hearing response, sound level meters apply filters, known as “frequency weightings”, to the signals. There are several defined weighting scales, including “A”, “B”, “C”, “D”, “G”, and “Z”. The most common weighting scale used in environmental noise analysis and regulation is A-weighting. This weighting represents the sensitivity of the human ear to sounds of low to moderate level. It attenuates sounds with frequencies below 1000 Hz and above 4000 Hz; it amplifies very slightly sounds between 1000 Hz and 4000 Hz, where the human ear is particularly sensitive. The C-weighting scale is sometimes used to describe louder sounds. The B- and D- scales are seldom used. All of these frequency weighting scales are normalized to the average human hearing response at 1000 Hz: at this frequency, the filters neither attenuate nor amplify. When a reported sound level has been filtered using a frequency weighting, the letter is appended to “dB”. For example, sound with A-weighting is usually denoted “dBA”. When no filtering is applied, the level is denoted “dB” or “dBZ”. The letter is also appended as a subscript to the level indicator “L”, for example “L_A” for A-weighted levels.

A relatively new standard weighting is the ANS weight. ANS stands for A-weighted, natural sounds. The ANS weight is the same as the A-weighting, but it filters out all sound above the 1,000 Hz octave band. Thus, it removes the impact of many high frequency biogenic sounds such as insects, birds, and amphibians. The ANS weighting is often used to eliminate the effects of seasonality of sound, as there are fewer insects and birds during the winter than the summer.

Time Response of Sound Level Meters

Because sound levels can vary greatly from one moment to the next, the time over which sound is measured can influence the value of the levels reported. Often, sound is measured in real time, as it fluctuates. In this case, acousticians apply a so-called "time response" to the sound level meter, and this time response is often part of regulations for measuring sound. If the sound level is varying slowly, over a few seconds, "Slow" time response is applied, with a time constant of one second. If the sound level is varying quickly (for example, if brief events are mixed into the overall sound), "Fast" time response can be applied, with a time constant of one-eighth of a second.[2] The time response setting for a sound level measurement is indicated with the subscript "S" for Slow and "F" for Fast: L_S or L_F. A sound level meter set to Fast time response will indicate higher sound levels than one set to Slow time response when brief events are mixed into the overall sound, because it can respond more quickly.

In some cases, the maximum sound level that can be generated by a source is of concern. Likewise, the minimum sound level occurring during a monitoring period may be required. To measure these, the sound level meter can be set to capture and hold the highest and lowest levels measured during a given monitoring period. This is represented by the subscript "max", denoted as "L_{max}". One can define a "max" level with Fast response L_{Fmax} (1/8-second time constant), Slow time response L_{Smax} (1-second time constant), or Continuous Equivalent level over a specified time period $L_{eq.max}$.

Accounting for Changes in Sound Over Time

A sound level meter's time response settings are useful for continuous monitoring. However, they are less useful in summarizing sound levels over longer periods. To do so, acousticians apply simple statistics to the measured sound levels, resulting in a set of defined types of sound level related to averages over time. An example is shown in Figure 6. The sound level at each instant of time is the grey trace going from left to right. Over the total time it was measured (1 hour in the figure), the sound energy spends certain fractions of time near various levels, ranging from the minimum (about 27 dB in the figure) to the maximum (about 65 dB in the figure). The simplest descriptor is the average sound level, known as the Equivalent Continuous Sound Level. Statistical levels are used to determine for what percentage of time the sound is louder than any given level. These levels are described in the following sections.

Equivalent Continuous Sound Level - L_{eq}

One straightforward, common way of describing sound levels is in terms of the Continuous Equivalent Sound Level, or L_{eq}. The L_{eq} is the average sound pressure level over a defined period of time, such as one hour or one day. L_{eq} is the most commonly used descriptor in noise

[2] There is a third-time response defined by standards, the "Impulse" response. This response was defined to enable use of older, analog meters when measuring very brief sounds; it is no longer in common use.

standards and regulations. L_{eq} is representative of the overall sound to which a person is exposed. Because of the logarithmic calculation of decibels, L_{eq} tends to favor higher sound levels: loud and infrequent sources have a larger impact on the resulting average sound level than quieter but more frequent sounds. For example, in Figure 6, even though the sound levels spends most of the time near about 34 dBA, the L_{eq} is 41 dBA, having been “inflated” by the maximum level of 65 dBA and other occasional spikes over the course of the hour.

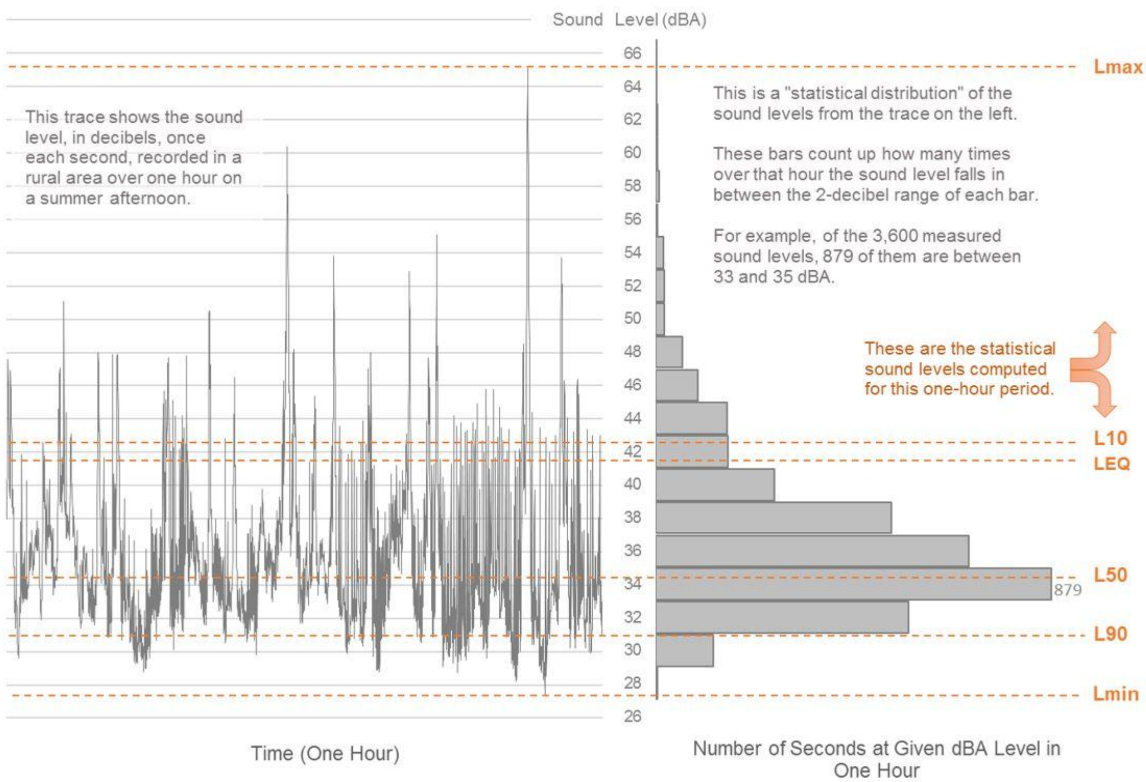

FIGURE 6: EXAMPLE OF DESCRIPTIVE TERMS OF SOUND MEASUREMENT OVER TIME

Percentile Sound Levels – L_n

Percentile sound levels describe the statistical distribution of sound levels over time. “L_N” is the level above which the sound spends “N” percent of the time. For example, L_{90} (sometimes called the “residual base level”) is the sound level exceeded 90% of the time: the sound is louder than L_{90} most of the time. L_{10} is the sound level that is exceeded only 10% of the time. L_{50} (the “median level”) is exceeded 50% of the time: half of the time the sound is louder than L_{50}, and half the time it is quieter than L_{50}. Note that L_{50} (median) and L_{eq} (mean) are not always the same, for reasons described in the previous section.

L_{90} is the sound that persists for longer periods, and below which the overall sound level seldom falls. It tends to filter out other short-term environmental sounds that aren't part of the source being investigated. L_{10} represents the higher, but less frequent, sound levels. These could include such events as barking dogs, vehicles driving by and aircraft flying overhead, gusts of wind, and work operations. L_{90} represents the background sound that is present when these event sounds are excluded.

Note that if one sound source is very constant and dominates the soundscape in an area, all of the descriptive sound levels mentioned here tend toward the same value. It is when the sound is varying widely from one moment to the next that the statistical descriptors are useful.

Sound Levels from Multiple Sources: Adding Decibels

Because of the way that sound levels in decibels are calculated, the sounds from more than one source do not add arithmetically. Instead, two sound sources that are the same decibel level increase the total sound level by 3 dB. For example, suppose the sound from an industrial blower registers 80 dB at a distance of 2 meters (6.6 feet). If a second industrial blower is operated next to the first one, the sound level from both machines will be 83 dB, not 160 dB. Adding two more blowers (a total of four) raises the sound level another 3 dB to 86 dB. Finally, adding four more blowers (a total of eight) raises the sound level to 89 dB. It would take eight total blowers, running together, for a person to judge the sound as having "doubled in loudness".

Recall from the explanation of sound levels that a difference of 10 decibels is a factor of 20 in sound pressure and a factor of 10 in sound power. (The difference between sound pressure and sound power is described in the next Section.) If two sources of sound differ individually by 10 decibels, the louder of the two generates *ten times* more sound. This means that the loudest source(s) in any situation always dominates the total sound level. Looking again at the industrial blower running at 80 decibels, if a small ventilator fan whose level alone is 70 decibels were operated next to the industrial blower, the total sound level increases by only 0.4 decibels, to 80.4 decibels. The small fan is only 10% as loud as the industrial blower, so the larger blower completely dominates the total sound level.

The Difference Between Sound Pressure and Sound Power

The human ear and microphones respond to variations in sound *pressure*. However, in characterizing the sound emitted by a specific source, it is proper to refer to sound *power*. While sound pressure induced by a source can vary with distance and conditions, the power is the same for the source under all conditions, regardless of the surroundings or the distance to the nearest listener. In this way, sound power levels are used to characterize noise sources because they act like a "fingerprint" of the source. An analogy can be made to light bulbs. The bulb emits a constant amount of light under all conditions, but its perceived brightness diminishes as one moves away from it.

Both sound power and sound pressure levels are described in terms of decibels, but they are not the same thing. Decibels of sound pressure are related to 20 micropascals, as explained at the beginning of this primer. Sound power is a measure of the acoustic power emitted or radiated by a source; its decibels are relative to one picowatt.

Sound Propagation Outdoors

As a listener moves away from a source of sound, the sound level decreases due to “geometrical divergence”: the sound waves spread outward like ripples in a pond and lose energy. For a sound source that is compact in size, the received sound level diminishes or attenuates by 6 dB for every doubling of distance: a sound whose level is measured as 70 dBA at 100 feet from a source will have a measured level of 64 dBA at 200 feet from the source and 58 dBA at 400 feet. Other factors, such as walls, berms, buildings, terrain, atmospheric absorption, and intervening vegetation will also further reduce the sound level reaching the listener.

The type of ground over which sound is propagating can have a strong influence on sound levels. Harder ground, pavement, and open water are very reflective, while soft ground, snow cover, or grass is more absorptive. In general, sounds of higher frequency will attenuate more over a given distance than sounds of lower frequency: the “boom” of thunder can be heard much further away than the initial “crack”.

Atmospheric and meteorological conditions can enhance or attenuate sound from a source in the direction of the listener. Wind blowing from the source toward the listener tends to enhance sound levels; wind blowing away from the listener toward the source tends to attenuate sound levels. Normal temperature profiles (typical of a sunny day, where the air is warmer near the ground and gets colder with increasing altitude) tend to attenuate sound levels; inverted profiles (typical of nighttime and some overcast conditions) tend to enhance sound levels.

APPENDIX B. MODEL INPUT DATA

TABLE 2: MODEL PARAMETER SETTINGS

MODEL PARAMETER	SETTING
Atmospheric Absorption	Based on 10°C and 70% RH
Foliage	No Foliage Attenuation
Ground Absorption	ISO 9613-2 spectral; G=0 for equipment pads and access roads; G=0.6 for BESS and substation area; and G=1 elsewhere
Receptor Height	1.5 meters for sound level isolines, 4 meters for discrete homes
Search Radius	5,000 meters from each source

TABLE 3: MODELED SOUND POWER SPECTRA, dBZ UNLESS OTHERWISE NOTED

SOURCE	OCTAVE BAND CENTER FREQUENCY (HZ)									OVERALL SOUND POWER LEVEL		REFERENCE
	31.5	63	125	250	500	1000	2000	4000	8000	dBA	dBZ	
BESS Container	Confidential									93	95	Megapack Test Report 100% 4-hr config FN03
Medium Voltage Transformer	72	72	80	75	83	73	65	56	51	81	86	NEMA TR-1, RSG Library
Substation Transformer (ONAF)	111	104	113	109	109	97	91	88	82	108	117	NEMA TR-1, RSG Library

TABLE 4: SOURCE LOCATIONS

SOURCE ID	EQUIPMENT TYPE	SOUND POWER (dBA)	HEIGHT (m)	COORDINATES (NAD83 UTM18N)		
				X (m)	Y (m)	Z (m)
BESS 01	BESS	93	3.3	499341	4677645	666
BESS 02	BESS	93	3.3	499342	4677643	666
BESS 03	BESS	93	3.3	499358	4677654	666
BESS 04	BESS	93	3.3	499345	4677639	666
BESS 05	BESS	93	3.3	499346	4677637	666
BESS 06	BESS	93	3.3	499362	4677648	666
BESS 07	BESS	93	3.3	499349	4677633	666
BESS 08	BESS	93	3.3	499350	4677632	666

SOURCE ID	EQUIPMENT TYPE	SOUND POWER (dBA)	HEIGHT (m)	COORDINATES (NAD83 UTM18N)		
				X (m)	Y (m)	Z (m)
BESS 09	BESS	93	3.3	499366	4677643	666
BESS 10	BESS	93	3.3	499353	4677628	666
BESS 11	BESS	93	3.3	499354	4677626	666
BESS 12	BESS	93	3.3	499368	4677639	666
BESS 13	BESS	93	3.3	499369	4677637	666
BESS 14	BESS	93	3.3	499357	4677622	666
BESS 15	BESS	93	3.3	499358	4677621	666
BESS 16	BESS	93	3.3	499372	4677633	666
BESS 17	BESS	93	3.3	499373	4677631	666
BESS 18	BESS	93	3.3	499361	4677617	666
BESS 19	BESS	93	3.3	499362	4677615	666
BESS 20	BESS	93	3.3	499376	4677628	666
BESS 21	BESS	93	3.3	499377	4677626	666
BESS 22	BESS	93	3.3	499364	4677611	666
BESS 23	BESS	93	3.3	499366	4677610	666
BESS 24	BESS	93	3.3	499380	4677622	666
BESS 25	BESS	93	3.3	499381	4677620	666
BESS 26	BESS	93	3.3	499368	4677606	666
BESS 27	BESS	93	3.3	499369	4677604	666
BESS 28	BESS	93	3.3	499384	4677616	666
BESS 29	BESS	93	3.3	499385	4677615	666
BESS 30	BESS	93	3.3	499372	4677600	666
BESS 31	BESS	93	3.3	499373	4677598	666
BESS 32	BESS	93	3.3	499388	4677611	666
BESS 33	BESS	93	3.3	499389	4677609	666
BESS 34	BESS	93	3.3	499376	4677594	666
BESS 35	BESS	93	3.3	499377	4677593	666
BESS 36	BESS	93	3.3	499392	4677605	666
BESS 37	BESS	93	3.3	499393	4677604	666
BESS 38	BESS	93	3.3	499380	4677589	666
BESS 39	BESS	93	3.3	499381	4677587	666
BESS 40	BESS	93	3.3	499395	4677600	666
BESS 41	BESS	93	3.3	499397	4677598	666
BESS 42	BESS	93	3.3	499384	4677583	666
BESS 43	BESS	93	3.3	499385	4677582	666
BESS 44	BESS	93	3.3	499399	4677594	666
BESS 45	BESS	93	3.3	499400	4677592	666

SOURCE ID	EQUIPMENT TYPE	SOUND POWER (dBA)	HEIGHT (m)	COORDINATES (NAD83 UTM18N)		
				X (m)	Y (m)	Z (m)
BESS 46	BESS	93	3.3	499387	4677578	666
BESS 47	BESS	93	3.3	499389	4677576	666
BESS 48	BESS	93	3.3	499403	4677589	666
BESS 49	BESS	93	3.3	499404	4677587	666
BESS 50	BESS	93	3.3	499391	4677572	666
BESS 51	BESS	93	3.3	499393	4677571	666
BESS 52	BESS	93	3.3	499407	4677583	666
BESS 53	BESS	93	3.3	499408	4677581	666
BESS 54	BESS	93	3.3	499395	4677567	666
BESS 55	BESS	93	3.3	499396	4677565	666
BESS 56	BESS	93	3.3	499411	4677577	666
BESS 57	BESS	93	3.3	499412	4677576	666
BESS 58	BESS	93	3.3	499399	4677561	666
BESS 59	BESS	93	3.3	499400	4677559	666
BESS 60	BESS	93	3.3	499415	4677572	666
BESS 61	BESS	93	3.3	499416	4677570	666
BESS 62	BESS	93	3.3	499403	4677555	666
BESS 63	BESS	93	3.3	499404	4677554	666
BESS 64	BESS	93	3.3	499418	4677566	666
BESS 65	BESS	93	3.3	499420	4677565	666
BESS 66	BESS	93	3.3	499407	4677550	666
BESS 67	BESS	93	3.3	499408	4677548	666
BESS 68	BESS	93	3.3	499422	4677561	666
BESS 69	BESS	93	3.3	499424	4677559	666
BESS 70	BESS	93	3.3	499411	4677544	666
BESS 71	BESS	93	3.3	499412	4677543	666
BESS 72	BESS	93	3.3	499426	4677555	666
BESS 73	BESS	93	3.3	499427	4677553	666
BESS 74	BESS	93	3.3	499415	4677539	666
BESS 75	BESS	93	3.3	499416	4677537	666
BESS 76	BESS	93	3.3	499430	4677550	666
BESS 77	BESS	93	3.3	499431	4677548	666
BESS 78	BESS	93	3.3	499418	4677533	666
BESS 79	BESS	93	3.3	499420	4677531	666
BESS 80	BESS	93	3.3	499434	4677544	666
BESS 81	BESS	93	3.3	499435	4677542	666
BESS 82	BESS	93	3.3	499422	4677528	666

SOURCE ID	EQUIPMENT TYPE	SOUND POWER (dBA)	HEIGHT (m)	COORDINATES (NAD83 UTM18N)		
				X (m)	Y (m)	Z (m)
BESS 83	BESS	93	3.3	499423	4677526	666
BESS 84	BESS	93	3.3	499438	4677538	666
BESS 85	BESS	93	3.3	499439	4677537	666
BESS 86	BESS	93	3.3	499426	4677522	666
BESS 87	BESS	93	3.3	499427	4677520	666
BESS 88	BESS	93	3.3	499442	4677533	666
BESS 89	BESS	93	3.3	499443	4677531	666
BESS 90	BESS	93	3.3	499430	4677516	666
BESS 91	BESS	93	3.3	499431	4677515	666
BESS 92	BESS	93	3.3	499446	4677527	666
BESS 93	BESS	93	3.3	499447	4677525	666
BESS 94	BESS	93	3.3	499434	4677511	666
BESS 95	BESS	93	3.3	499435	4677509	666
BESS 96	BESS	93	3.3	499449	4677522	666
BESS 97	BESS	93	3.3	499450	4677520	666
BESS 98	BESS	93	3.3	499438	4677505	666
BESS 99	BESS	93	3.3	499439	4677504	666
BESS 100	BESS	93	3.3	499453	4677516	666
BESS 101	BESS	93	3.3	499454	4677514	666
BESS 102	BESS	93	3.3	499442	4677500	666
BESS 103	BESS	93	3.3	499443	4677498	666
BESS 104	BESS	93	3.3	499457	4677510	666
BESS 105	BESS	93	3.3	499458	4677509	666
BESS 106	BESS	93	3.3	499445	4677494	666
BESS 107	BESS	93	3.3	499461	4677505	666
BESS 108	BESS	93	3.3	499462	4677503	666
BESS 109	BESS	93	3.3	499413	4677612	666
BESS 110	BESS	93	3.3	499414	4677610	666
BESS 111	BESS	93	3.3	499416	4677606	666
BESS 112	BESS	93	3.3	499418	4677604	666
BESS 113	BESS	93	3.3	499432	4677617	666
BESS 114	BESS	93	3.3	499433	4677615	666
BESS 115	BESS	93	3.3	499420	4677600	666
BESS 116	BESS	93	3.3	499421	4677599	666
BESS 117	BESS	93	3.3	499436	4677611	666
BESS 118	BESS	93	3.3	499437	4677609	666
BESS 119	BESS	93	3.3	499424	4677595	666

SOURCE ID	EQUIPMENT TYPE	SOUND POWER (dBA)	HEIGHT (m)	COORDINATES (NAD83 UTM18N)		
				X (m)	Y (m)	Z (m)
BESS 120	BESS	93	3.3	499425	4677593	666
BESS 121	BESS	93	3.3	499440	4677606	666
BESS 122	BESS	93	3.3	499441	4677604	666
BESS 123	BESS	93	3.3	499428	4677589	666
BESS 124	BESS	93	3.3	499429	4677588	666
BESS 125	BESS	93	3.3	499444	4677600	666
BESS 126	BESS	93	3.3	499445	4677598	666
BESS 127	BESS	93	3.3	499432	4677584	666
BESS 128	BESS	93	3.3	499433	4677582	666
BESS 129	BESS	93	3.3	499447	4677594	666
BESS 130	BESS	93	3.3	499449	4677593	666
BESS 131	BESS	93	3.3	499436	4677578	666
BESS 132	BESS	93	3.3	499437	4677576	666
BESS 133	BESS	93	3.3	499451	4677589	666
BESS 134	BESS	93	3.3	499452	4677587	666
BESS 135	BESS	93	3.3	499440	4677573	666
BESS 136	BESS	93	3.3	499441	4677571	666
BESS 137	BESS	93	3.3	499455	4677583	666
BESS 138	BESS	93	3.3	499456	4677582	666
BESS 139	BESS	93	3.3	499444	4677567	666
BESS 140	BESS	93	3.3	499445	4677565	666
BESS 141	BESS	93	3.3	499459	4677578	666
BESS 142	BESS	93	3.3	499460	4677576	666
BESS 143	BESS	93	3.3	499447	4677561	666
BESS 144	BESS	93	3.3	499449	4677560	666
BESS 145	BESS	93	3.3	499463	4677572	666
BESS 146	BESS	93	3.3	499464	4677571	666
BESS 147	BESS	93	3.3	499451	4677556	666
BESS 148	BESS	93	3.3	499452	4677554	666
BESS 149	BESS	93	3.3	499467	4677567	666
BESS 150	BESS	93	3.3	499468	4677565	666
BESS 151	BESS	93	3.3	499455	4677550	666
BESS 152	BESS	93	3.3	499456	4677549	666
BESS 153	BESS	93	3.3	499471	4677561	666
BESS 154	BESS	93	3.3	499472	4677559	666
BESS 155	BESS	93	3.3	499459	4677545	666
BESS 156	BESS	93	3.3	499460	4677543	666

SOURCE ID	EQUIPMENT TYPE	SOUND POWER (dBA)	HEIGHT (m)	COORDINATES (NAD83 UTM18N)		
				X (m)	Y (m)	Z (m)
BESS 157	BESS	93	3.3	499474	4677555	666
BESS 158	BESS	93	3.3	499476	4677554	666
BESS 159	BESS	93	3.3	499463	4677539	666
BESS 160	BESS	93	3.3	499464	4677537	666
BESS 161	BESS	93	3.3	499478	4677550	666
BESS 162	BESS	93	3.3	499479	4677548	666
BESS 163	BESS	93	3.3	499467	4677534	666
BESS 164	BESS	93	3.3	499468	4677532	666
BESS 165	BESS	93	3.3	499482	4677544	666
BESS 166	BESS	93	3.3	499483	4677543	666
BESS 167	BESS	93	3.3	499470	4677528	666
BESS 168	BESS	93	3.3	499486	4677539	666
BESS 169	BESS	93	3.3	499487	4677537	666
BESS 170	BESS	93	3.3	499474	4677522	666
BESS 171	BESS	93	3.3	499476	4677521	666
BESS 172	BESS	93	3.3	499490	4677533	666
BESS 173	BESS	93	3.3	499491	4677531	666
BESS 174	BESS	93	3.3	499478	4677517	666
BESS 175	BESS	93	3.3	499479	4677515	666
BESS 176	BESS	93	3.3	499494	4677528	666
BESS 177	BESS	93	3.3	499495	4677526	666
BESS 178	BESS	93	3.3	499428	4677622	666
BESS 179	BESS	93	3.3	499429	4677621	666
BESS 180	BESS	93	3.3	499472	4677526	666
BESS 181	BESS	93	3.3	499446	4677492	666
MVT 01	MVT	81	2.2	499350	4677649	665
MVT 02	MVT	81	2.2	499353	4677644	665
MVT 03	MVT	81	2.2	499357	4677638	665
MVT 04	MVT	81	2.2	499361	4677632	665
MVT 05	MVT	81	2.2	499365	4677627	665
MVT 06	MVT	81	2.2	499369	4677621	665
MVT 07	MVT	81	2.2	499373	4677616	665
MVT 08	MVT	81	2.2	499377	4677610	665
MVT 09	MVT	81	2.2	499381	4677605	665
MVT 10	MVT	81	2.2	499384	4677599	665
MVT 11	MVT	81	2.2	499388	4677593	665
MVT 12	MVT	81	2.2	499392	4677588	665

SOURCE ID	EQUIPMENT TYPE	SOUND POWER (dBA)	HEIGHT (m)	COORDINATES (NAD83 UTM18N)		
				X (m)	Y (m)	Z (m)
MVT 13	MVT	81	2.2	499396	4677582	665
MVT 14	MVT	81	2.2	499400	4677577	665
MVT 15	MVT	81	2.2	499404	4677571	665
MVT 16	MVT	81	2.2	499407	4677566	665
MVT 17	MVT	81	2.2	499411	4677560	665
MVT 18	MVT	81	2.2	499415	4677554	665
MVT 19	MVT	81	2.2	499419	4677549	665
MVT 20	MVT	81	2.2	499423	4677543	665
MVT 21	MVT	81	2.2	499427	4677538	665
MVT 22	MVT	81	2.2	499431	4677532	665
MVT 23	MVT	81	2.2	499435	4677527	665
MVT 24	MVT	81	2.2	499438	4677521	665
MVT 25	MVT	81	2.2	499442	4677515	665
MVT 26	MVT	81	2.2	499446	4677510	665
MVT 27	MVT	81	2.2	499450	4677504	665
MVT 28	MVT	81	2.2	499454	4677499	665
MVT 29	MVT	81	2.2	499421	4677616	665
MVT 30	MVT	81	2.2	499425	4677611	665
MVT 31	MVT	81	2.2	499429	4677605	665
MVT 32	MVT	81	2.2	499433	4677599	665
MVT 33	MVT	81	2.2	499436	4677594	665
MVT 34	MVT	81	2.2	499440	4677588	665
MVT 35	MVT	81	2.2	499444	4677583	665
MVT 36	MVT	81	2.2	499448	4677577	665
MVT 37	MVT	81	2.2	499452	4677571	665
MVT 38	MVT	81	2.2	499456	4677566	665
MVT 39	MVT	81	2.2	499460	4677560	665
MVT 40	MVT	81	2.2	499464	4677555	665
MVT 41	MVT	81	2.2	499467	4677549	665
MVT 42	MVT	81	2.2	499471	4677544	665
MVT 43	MVT	81	2.2	499475	4677538	665
MVT 44	MVT	81	2.2	499479	4677533	665
MVT 45	MVT	81	2.2	499483	4677527	665
MVT 46	MVT	81	2.2	499487	4677521	665
Substation Transformer		108	4.0	499415	4677664	667

APPENDIX C. RESULTS AT DISCRETE RECEPTORS

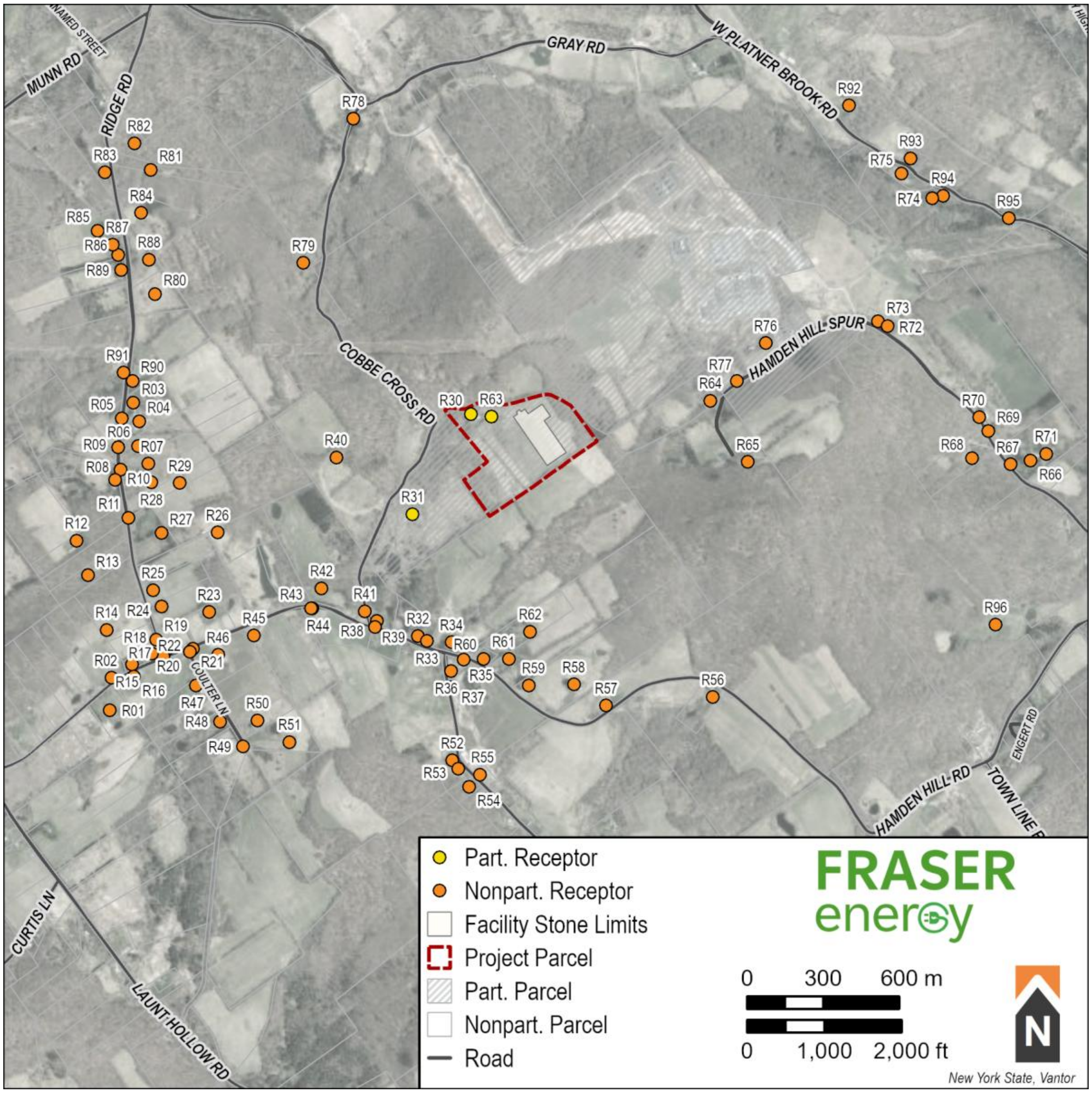

FIGURE 7: MAP OF MODELED RECEPTORS

TABLE 5: DISCRETE RECEPTOR RESULTS

RECEIVER ID	STATUS	SOUND LEVEL (dBA)	RELATIVE HEIGHT (m)	COORDINATES (UTM NAD ZONE 18N)		
				X (m)	Y (m)	Z (m)
R63	Participating	61	4	499223	4677664	661
R30	Participating	58	4	499142	4677673	659
R64	Non-Participating	46	4	500087	4677726	598
R40	Non-Participating	48	4	498612	4677502	647
R77	Non-Participating	45	4	500191	4677804	591
R65	Non-Participating	46	4	500234	4677484	640
R62	Non-Participating	45	4	499376	4676815	605
R76	Non-Participating	43	4	500303	4677951	564
R34	Non-Participating	44	4	499066	4676774	583
R31	Participating	45	4	498913	4677279	598
R61	Non-Participating	43	4	499293	4676708	588
R26	Non-Participating	41	4	498144	4677206	657
R32	Non-Participating	44	4	498933	4676799	584
R33	Non-Participating	44	4	498969	4676778	584
R35	Non-Participating	43	4	499114	4676706	575
R60	Non-Participating	43	4	499193	4676708	578
R39	Non-Participating	43	4	498772	4676857	589
R41	Non-Participating	43	4	498726	4676896	590
R58	Non-Participating	43	4	499548	4676607	614
R59	Non-Participating	43	4	499370	4676604	594
R38	Non-Participating	43	4	498766	4676834	591
R36	Non-Participating	42	4	499065	4676660	570
R42	Non-Participating	44	4	498554	4676987	615
R37	Non-Participating	42	4	499063	4676596	565
R44	Non-Participating	44	4	498519	4676908	621
R43	Non-Participating	44	4	498513	4676908	621
R25	Non-Participating	40	4	497890	4676979	652
R45	Non-Participating	42	4	498289	4676801	636
R23	Non-Participating	42	4	498111	4676892	642
R24	Non-Participating	40	4	497924	4676914	651
R56	Non-Participating	38	4	500095	4676558	616
R14	Non-Participating	39	4	497708	4676822	661
R52	Non-Participating	39	4	499069	4676308	557
R53	Non-Participating	39	4	499092	4676276	557
R55	Non-Participating	39	4	499178	4676252	552
R46	Non-Participating	41	4	498146	4676725	636
R29	Non-Participating	38	4	497996	4677400	641

R51	Non-Participating	39	4	498429	4676381	640
R19	Non-Participating	40	4	497902	4676784	642
R22	Non-Participating	40	4	498047	4676748	635
R54	Non-Participating	39	4	499136	4676205	557
R20	Non-Participating	40	4	497947	4676748	639
R17	Non-Participating	40	4	497931	4676718	637
R28	Non-Participating	37	4	497884	4677403	631
R18	Non-Participating	39	4	497885	4676729	639
R50	Non-Participating	38	4	498303	4676466	633
R27	Non-Participating	37	4	497923	4677204	643
R07	Non-Participating	37	4	497872	4677477	628
R79	Non-Participating	38	4	498483	4678268	610
R06	Non-Participating	36	4	497831	4677546	624
R21	Non-Participating	38	4	498035	4676736	633
R80	Non-Participating	37	4	497899	4678145	644
R04	Non-Participating	36	4	497835	4677644	620
R15	Non-Participating	39	4	497806	4676686	639
R08	Non-Participating	36	4	497763	4677454	616
R11	Non-Participating	37	4	497794	4677265	628
R88	Non-Participating	36	4	497875	4678281	653
R05	Non-Participating	35	4	497767	4677656	613
R73	Non-Participating	34	4	500747	4678037	537
R16	Non-Participating	38	4	497815	4676638	634
R02	Non-Participating	38	4	497726	4676633	640
R10	Non-Participating	36	4	497742	4677413	616
R09	Non-Participating	35	4	497752	4677542	612
R47	Non-Participating	37	4	498060	4676603	625
R03	Non-Participating	35	4	497813	4677717	617
R90	Non-Participating	35	4	497810	4677803	617
R48	Non-Participating	36	4	498155	4676461	621
R49	Non-Participating	36	4	498245	4676362	626
R91	Non-Participating	35	4	497773	4677837	612
R89	Non-Participating	36	4	497765	4678239	645
R84	Non-Participating	36	4	497843	4678465	656
R86	Non-Participating	36	4	497753	4678299	648
R87	Non-Participating	35	4	497731	4678341	646
R13	Non-Participating	35	4	497633	4677037	636
R12	Non-Participating	35	4	497588	4677174	617
R85	Non-Participating	35	4	497673	4678395	645
R81	Non-Participating	35	4	497881	4678635	663

R01	Non-Participating	37	4	497721	4676505	628
R68	Non-Participating	32	4	501117	4677499	531
R67	Non-Participating	32	4	501269	4677474	514
R66	Non-Participating	32	4	501348	4677489	510
R71	Non-Participating	31	4	501409	4677517	506
R72	Non-Participating	32	4	500784	4678018	536
R92	Non-Participating	31	4	500633	4678887	501
R57	Non-Participating	32	4	499676	4676524	592
R82	Non-Participating	32	4	497817	4678740	647
R83	Non-Participating	32	4	497701	4678625	638
R96	Non-Participating	28	4	501210	4676844	549
R69	Non-Participating	25	4	501182	4677606	516
R93	Non-Participating	28	4	500875	4678680	485
R70	Non-Participating	22	4	501144	4677660	518
R78	Non-Participating	26	4	498680	4678836	553
R94	Non-Participating	25	4	501002	4678533	471
R74	Non-Participating	25	4	500959	4678522	477
R95	Non-Participating	23	4	501261	4678444	463
R75	Non-Participating	24	4	500838	4678620	476