South Fork Wind Farm - South Fork Export Cable Onshore

Sound Study

PREPARED FOR

SOUTH FORK WIND FARM

Deepwater Wind South Fork, LLC
56 Exchange Terrace, Suite 300
Providence, RI 02903-1772

PREPARED BY

vhb

VHB Engineering, Surveying and Landscape Architecture, P.C.
100 Motor Parkway, Suite 135
Hauppauge, NY 11788
631.787.3400

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Table of Contents

List of Tables

List of Figures

1. Executive Summary

VHB has conducted a sound study of the South Fork Export Cable (SFEC) – Onshore components of the proposed South Fork Wind Farm (SFWF) Project including onshore horizontal directional drilling (HDD) construction of the SFEC to connect to a sea-to-shore transition vault at Beach Lane, construction of the SFEC underground from the sea-to-shore transition vault along public road right-of-ways (ROW) and the Long Island Railroad (LIRR) ROW, and the construction and operation of a new substation at Cove Hollow Road (the "SFEC – Onshore Substation").

Sound has been evaluated according to Article VII, *Siting of Major Utility Transmission Facilities*, of the New York State Public Service Law, U.S. Environmental Protection Agency noise guidelines, the New York State Department of Environmental Conservation (NYSDEC) noise policy, and the Town of East Hampton code's noise chapter.

Existing ambient sound conditions at receptor locations near the proposed substation were measured to be 37 to 42 dBA (Leq) during the night and 46 to 48 dBA (Leq) during the daytime not including contributions from LIRR train operations. Existing ambient sound levels at the sea-to-shore transition vault at Beach Lane were measured to range from 51 to 59 dBA (Leq). Ambient sound levels along the SFEC-Onshore route have been estimated to be 40 dBA (Leq) during the daytime and 35 dBA (Leq) during the evening along local roadways and 60 dBA (Leq) during the day and 55 dBA (Leq) during the evening at receptors along the LIRR right-of-way.

Operation of the proposed SFEC – Onshore Substation would introduce new sources of sound including transformers, oil-cooled reactors, and heating, ventilation, and air-conditioning (HVAC) equipment associated with the control house. To minimize potential noise effects from the substation, low-noise equipment would be used, and a 11.5-foot solid perimeter sound wall would be included. The transformers would generate energy-average sound levels of 62 dBA at a distance of 2 meters from the exterior walls of the transformer which will be 20 dB below the standard National Electrical Manufacturers Association (NEMA) ratings for 108 MVA/650 kV transformers. Each oil-cooled reactor would generate energy-average sound levels of 57 dBA at a distance of 1 foot from the exterior walls of the reactor which will be 20 dB below the NEMA ratings for 35 MVAr transformers. The control house would generate sound from two exterior condenser units that generate a sound level of approximately 50 dBA at 50 feet. As the substation design advances, specific transformers, reactors, and HVAC equipment will be identified that have "guaranteed" sound levels meeting the assumptions used in this analysis and the facility will be designed to result in sound levels consistent with those presented in this study.

Sound from the substation would be 37 dBA (Leq) at the closest receptor property line location at 24 Horseshoe Drive and 35 dBA (Leq) or lower at all other receptor locations. Pure tone conditions are not predicted from the substation. Therefore, the substation sound would be below the U.S. EPA and Town of East Hampton noise criteria.

Operation of the substation would increase future noise levels 2.6 dBA at the closest receptor location and 2 dBA or less at all other receptor locations. Future increases in sound of less than 3 dBA is typically below the threshold of perception. Per the NYSDEC noise criteria, there would be a minimal effect in future noise conditions and there is no need for mitigation.

Construction noise from HDD operations would be 48 dBA (Leq[8h]) or lower at residential buildings near the Beach Lane sea-to-shore transition vault site and between 50 and 55 dBA (Leq[8h]) at yard areas near the road. Construction during HDD operations already implements several sound attenuating features such as using a quieter model HDD and a 14-foot perimeter sound wall to attenuate sound from propagating to nearby residences. HDD operational noise would generally be below existing ambient sound levels and below all applicable construction noise criteria, so mitigation or additional best management practices (BMPs) to further attenuate construction noise are not warranted. Continuous HDD operations are typically needed to minimize potential soil settlement and equipment failures. Therefore, HDD operations would occur during the nighttime period and would conflict with the Town of East Hampton noise code. Deepwater Wind South Fork, LLC (i.e., the Applicant) may need to seek a variance from the Town for nighttime construction. Based on the fact that HDD construction sound would be below existing ambient sound levels and would be planned outside the summer months, there would be minimal effects from continuous HDD construction.

Site preparation for HDD operations, including sheet piling, will last approximately two days, and the highest noise levels at nearby residential buildings would be 76 dBA (Leq[8h]) or lower. HDD site preparation noise would be up to 87 dBA (Leq[8h]) at the closest locations on residential properties in yard areas near the road. HDD site preparation construction activities would occur during the daytime period (7:00 AM to 8:30 PM) and would comply with the Town of East Hampton noise code. However, since HDD site preparation noise levels would exceed the NYSDEC noise guidelines, BMPs need to be considered.

During HDD site preparation, the 14-foot perimeter sound wall may not yet be installed as it may conflict with the equipment setup during site preparation. The sound wall may not be tall enough to attenuate sound during the start of sheet piling equipment. Since HDD site preparation would exceed NYSDEC construction noise guidelines, BMPs will be implemented such as: notifying nearby residences of the days and times that sheet piling will occur; installing the perimeter sound wall prior to sheet pile driving, if construction logistics allow; and using quieter methods (i.e. push in piling) to install sheet piling as geological conditions allow.

Construction of the SFEC – Onshore Substation would be 58 dBA (Leq[8h]) at the nearest property line at 24 Horseshoe Drive. Since substation construction would occur during the daytime, it would meet all applicable construction noise criteria and BMPs to reduce noise are not warranted.

Construction of the underground SFEC - Onshore cable within public road ROWs or LIRR ROW would generate noise of approximately 65 dBA (Leq[8h]) at a distance of 200 feet which is the NYSDEC noise guideline limit for construction activities. Therefore, construction noise would approach or exceed 65 dBA (Leq[8h]) at most first-row receptors immediately adjacent to the road or railroad ROWs and BMPs to minimize construction noise are warranted. The applicant will use BMPs to minimize construction noise such as replacing back-up alarms with strobes, assuring that equipment is functioning properly and is equipped with mufflers, locating especially noisy equipment as far from sensitive locations as possible, using quieter construction equipment, using path noise controls such as portable enclosures, limiting the period of time when construction occurs, and maintaining strong communication with the public about the time and nature of construction activities.

2. Introduction

This Sound Study Technical Report ("report") includes an overview of the SFWF Project (the "Project" or the "proposed Project") and the components that are the subject of the sound study, background information on sound level concepts, applicable federal, state, and local regulations, and ordinances and standards related to noise. This report also presents the existing ambient sound conditions in the study area, which is described below, including the results of ambient sound monitoring, the methodology for predicting sound from the construction and operation of the proposed Project, an assessment of the potential effects of sound due to the Project, and recommended mitigation measures and BMPs to minimize potential effects.

2.1 Project Overview

VHB has conducted a sound study of the South Fork Export Cable (SFEC) – Onshore components of the proposed SFWF Project.

The overall SFWF Project includes up to 15 offshore wind turbine generators, inter-array cables, and an offshore substation in federal waters approximately 19 miles southeast of Block Island, Rhode Island and approximately 35 miles east of Montauk Point, New York. The SFEC, a component of the SFWF Project, includes a submarine export cable that would connect the wind turbine generators, through federal waters in the Outer Continental Shelf and state territorial waters in New York (i.e., the SFEC–Offshore), to an onshore substation, which would connect to the existing Long Island Power Authority (LIPA) 69 kilovolt (kV) East Hampton Substation bus into the mainline grid.

The SFEC – Onshore components of the overall Project, which are the subject of this sound study, include onshore horizontal directional drilling (HDD) construction of the SFEC to connect to a sea-to-shore transition vault at Beach Lane, construction of the SFEC underground from the sea-to-shore transition vault along public road right-of-ways (ROW) and the Long Island Railroad (LIRR) ROW, and the construction and operation of a new substation at Cove Hollow Road (the "SFEC – Onshore Substation"), where the SFEC would interconnect with the LIPA system, in the Town of East Hampton on Long Island, Suffolk County, New York.

3. Sound Level Concepts

Sound is the rapid fluctuations of air pressure above and below ambient pressure levels. Noise is defined as unwanted or excessive sound. Sound becomes unwanted when it interferes with normal activities such as sleep, work, communication, or recreation. How people perceive sound depends on several measurable physical characteristics, including:

Sound Level - Sound level is based on the amplitude change in pressure and is related to the loudness or intensity. Human hearing covers a wide range of changes in sound pressure amplitude. Therefore, sound levels are most often measured on a logarithmic scale of decibels (dB) relative to 20 micro-pascals. The dB scale compresses the audible range of acoustic pressure levels, which can vary from the threshold of hearing (0 dB) to the threshold of pain (120 dB). Because sound levels are measured in dB, the addition of two sound levels is not linear. For example, adding two equal sound levels results in a 3 dB increase in the overall level. Research indicates the general relationships between sound level and human perception are as follows:

- A 3-dB increase is a doubling of acoustic energy and is approximately the smallest difference in sound level that can be perceived in most environments.
- A 10-dB increase is a tenfold increase in acoustic energy and is generally perceived as a doubling in loudness to the average person.

Frequency - Sounds are comprised of acoustic energy distributed over a range of frequencies. Acoustic frequencies, commonly referred to as tone or pitch, are typically measured in Hertz (Hz). Human hearing generally ranges from 20 to 20,000 Hz; however, the human ear does not perceive sound levels from each frequency as equally loud. To compensate for this phenomenon in perception, a frequency filter known as A-weighting is commonly used to evaluate environmental noise levels, and sound levels are denoted as “dBA.”

- Sound levels reported in octave or one-third-octave frequency bands are often used to describe the frequency content of different sounds. Some sources of sound can generate “pure tones,” which is when there is a concentration of sound within a narrow frequency range such as a whistle. Humans can hear pure tones very well, and such conditions can be a cause of increased annoyance.

A variety of sound level descriptors can be used for environmental noise analyses. These descriptors relate to the way sound varies in level over time. The following is a list of common sound level descriptors:

Energy-Average Sound Level (Leq) - Leq is a single value, which represents the same acoustic energy as the fluctuating levels that exists over a given period of time. The Leq takes into account how loud noise events are during the period, how long they last, and how many times they occur. Leq is commonly used to describe environmental noise and relates well to human annoyance. An Leq over an 8-hour period is commonly used to evaluate construction noise and is denoted Leq[8hr].

Day-night Average Sound Level (Ldn) - Ldn is similar to the Leq in that it is a single value, which represents the same acoustic energy as the fluctuating levels, that exists over a 24-hour period. The Ldn takes into account how loud sound events are, how long they last, how many times they occur over a 24-hour period, and whether they occur during the day (7:00 AM to 10:00 PM) or night (10:00 PM to 7:00 AM). Sound that occurs during the night is given a 10-dB penalty to account for the increased human sensitivity to noise at night. If sound levels are constant over a 24-hour period, the Ldn level is 6.4 dB greater than the Leq level due to the 10-dB nighttime penalty.

Statistical Sound Levels – Sound level metrics, such as L01, L10, L50 or L90, represent the levels that are exceeded for a particular percentage of time over a given period. For example, L10 is the level that is exceeded for 10 percent of the time. Therefore, it represents the higher end of the range of sound levels. The L90, on the other hand, is the level that is exceeded 90 percent of the time, and therefore, is representative of the background sound level.

Maximum Sound Level (Lmax) – Many sources of sound, including mobile sources and stationary sources, change over time. Stationary sources associated with energy facilities can often generate different sound levels depending on the operational condition of the equipment. It is common to describe sound in terms of the maximum (Lmax) sound level emissions. Table 1 presents a list of the maximum sound levels of common outdoor and indoor sources.

Table 1: Maximum Sound Levels of Common Outdoor and Indoor Sources

Outdoor Source	Sound Level (dBA)	Indoor Source
	110	Rock Band at 5 m
Jet Over Flight at 300 m	**105**	
	100	Inside New York Subway Train
Gas Lawn Mower at 1 m	**95**	
	90	Food Blender at 1 m
Diesel Truck at 15 m	**85**	
Noisy Urban Area—Daytime	**80**	Garbage Disposal at 1 m
	75	Shouting at 1 m
Gas Lawn Mower at 30 m	**70**	Vacuum Cleaner at 3 m
Suburban Commercial Area	**65**	Normal Speech at 1 m
	60	
Quiet Urban Area—Daytime	**55**	Quiet Conversation at 1 m
	50	Dishwasher Next Room
Quiet Urban Area—Nighttime	**45**	
	40	Empty Theater or Library
Quiet Suburb—Nighttime	**35**	
	30	Quiet Bedroom at Night
Quiet Rural Area—Nighttime	**25**	Empty Concert Hall
Rustling Leaves	**20**	
	15	Broadcast and Recording Studios
	10	
	5	
Reference Pressure Level	**0**	Threshold of Hearing

Source: Highway Noise Fundamentals. Federal Highway Administration, September 1980.

4. Regulatory Context

This section describes the federal, state, and local noise policies and ordinances applicable to the proposed Project. Table 2 summarizes the jurisdiction, agency, standard, and operational and construction noise limits.

Table 2: Summary of Applicable Noise Standards

Jurisdiction	Agency	Standard	Operational Noise Limit (dBA)	Construction Noise Limit (dBA)
Federal	EPA	*Information on the Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* [a]	55 dBA (Ldn) 48.6 dBA (Continuous Leq)	N/A
New York State	NYSDEC	*Assessing and Mitigating Noise Impacts* [b]	Ambient + 6 dBA (Leq)	65 dBA (Leq) or Ambient + 10 dBA if greater than 65 dBA (Leq)
Town of East Hampton		Chapter 185: Noise Town Code	65 dBA (Leq) 7 AM – 7 PM 50 dBA (Leq) 7 PM – 7 AM with Octave Band Limits	No sound limit 7 AM – 8:30 PM 50 dBA (Leq) 8:30 PM – 7 AM

Sources:
[a] U.S. Environmental Protection Agency (EPA), 1974
[b] New York State Department of Environmental Conservation (NYSDEC), 2001

4.1 Article VII Noise Requirements

Article VII, *Siting of Major Utility Transmission Facilities*, of the New York State Public Service Law (16 NYCRR Subpart 86.5 [b][8] "Exhibit 4: Environmental Impact") requires that an applicant make a statement as to "what, if any, plans have been made to locate and design appurtenant structures to minimize the environmental impact of the structures (including visual and noise disturbance) . . ."

4.2 Federal Noise Guideline

The Noise Control Act of 1972 authorized federal agencies to adequately control noise that may endanger the health and welfare of the nation's population. In 1974, the U.S. EPA conducted a study on noise impacts relative to public health and safety (EPA, 1974). This EPA study provides guidance on the potential effects of noise that can be considered by federal, state, and local agencies; however, it does not constitute a standard or regulation.

As shown in Table 3, the EPA study concluded that a day-night average sound level of 55 dBA (Ldn) or less for outdoor residential areas, or 55 dBA (Leq[24]) or less for outdoor areas where people spend limited amounts of time, such as schools and playgrounds, would protect public health and welfare in regard to potential interference with outdoor activity and annoyance. The study also concluded that a sound level of 45 dBA (Ldn) or (Leq[24]) or less for indoor residential uses and schools, respectively, would protect public health and welfare in regard to potential interference and annoyance. Since most buildings with windows closed provide 20 dB or more, and buildings with windows open provide 10 dB of outdoor-to-indoor sound attenuation, the exterior criteria are more stringent, and noise from the proposed Project will be evaluated according to the outdoor criteria.

The EPA noise guidelines are based on the evaluation of pervasive long-term noise, and therefore, are applied to future operational noise conditions and are not typically applied to short-term construction-period activities.

Table 3: EPA Noise Levels Identified to Protect Public Health and Welfare

Effect	Level	Area
Outdoor Activity Interference	L_{DN} [55 dBA]	Outdoors in residential areas and farms, other outdoor areas where people spend widely varying amounts of time, and other places in which quiet is a basis for use
	L_{EQ}(24) [55 dBA]	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, parks, etc.
Indoor Activity Interference and Annoyance	L_{DN} [45 dBA]	Indoor residential areas
	L_{EQ}(24) [45 dBA]	Other areas with human activities, such as schools

Source: EPA, 1974

4.3 New York State Department of Conservation Noise Policy

The NYDEC program policy provides guidance on the methods to assess potential noise impact and avoid or reduce adverse impacts (NYSDEC, 2001). The NYSDEC policy addresses noise assessments and mitigation for both construction and operation of a proposed Project.

As shown in Table 4, the NYSDEC policy includes guidelines for assessing noise impacts and mitigation. If a project would increase noise by three dB or less, there would be a minimal effect in future noise conditions and there is no need for mitigation. Changes in noise less than three dB are typically considered to be imperceptible in most environments. If a project would increase ambient noise levels by 3 to 6 dBA, there is potential for adverse noise impact for the most sensitive receptors, and there may be a need for mitigation. For increases in noise of 6 to 10 dBA, there is a greater potential for impact, and mitigation is generally needed. For increases in ambient noise of 10 dBA or more, mitigation is warranted where reasonable.

When a noise study indicates that the proposed action may result in significant impact, the NYSDEC requires the applicant to implement reasonable and necessary measures to mitigate or eliminate the adverse effects. If a significant adverse impact is identified, in addition to physical mitigation measures, such as reducing sound at the source or installing noise barriers, an applicant should also consider BMPs to reduce noise by means of modifying noise-generating equipment, limiting the time of noisy operations, or relocating noise sources farther away from receptors.

Since construction activities are short-term in relation to operational noise, separate thresholds are generally used to assess construction noise. According to the NYSDEC policy, a proposed action should generally not raise ambient sound levels above 65 dBA in non-industrial settings or above 79 dBA in industrial environments. Therefore, given the temporary nature of construction noise, an increase in ambient noise of 10 dBA or more that would increase levels above 65 dBA is considered a reasonable construction noise threshold. Beyond these levels, it is recommended that BMPs be used to minimize the effects of construction noise.

Table 4: NYSDEC Guidelines for Assessing Operational Noise Impact and Mitigation

Sound Level Increase (dBA)	Impact Determination	Need for Mitigation
0–3	No impact	None
3–6	Potential adverse impact for the most sensitive receptors	Mitigation may be needed for the most sensitive receptors
6–10	Potential adverse impact depending on existing sound level and character of land use	Mitigation is generally needed for most residential receptors
10 or more	Adverse impact	Mitigation is warranted where reasonable

Source: NYSDEC, 2001.

4.4 Local Noise Code

The Town of East Hampton code’s noise chapter prohibits the operation of any source of noise that permits the condition of noise pollution, whereby noise pollution is defined as noise that is necessary to cause temporary or permanent hearing loss, be injurious to public health, cause a nuisance, or exceed noise limits, as summarized in Table 5. This local noise code applies to long-term operational and short-term construction-period activities. Construction noise is exempt from the noise level limits between 7:00 AM and 8:30 PM on any day. The ordinance prohibits the SFEC - Onshore Substation from generating an overall level of 65 dBA between the hours of 7:00 AM and 7:00 PM when measured on the property line of a residential district and 70 dBA when measured in a commercial or industrial district. During the nighttime hours of 7:00 PM to 7:00 AM, the SFEC - Onshore Substation and construction noise is limited to 50 dBA for residential districts and 55 dBA for commercial or industrial districts.

Table 5: Town of East Hampton Town Code Noise Chapter

Receiving Property Category	Daytime Noise Limit (dBA) (7 AM –7 PM)	Nighttime Noise Limit (dBA) (7 PM – 7 AM)
Residential	65	50
Commercial	70	55
Industrial	70	55

Source: Town of East Hampton code noise chapter, adopted June 7, 1985

The Town of East Hampton noise code also includes octave-band limits which limit noise in different frequency bands (i.e., high-pitched or low-pitched sounds). These octave band limits are presented in Table 6. It should be noted that these octave band limits are inconsistent with the associated overall A-weighted limits. For example, the maximum overall A-weighted sound level that could be generated based on octave band limits is 58.3 dBA for daytime sound at residential receptors, which is substantially lower than the overall sound level limit of 65 dBA.

Table 6: Town of East Hampton Overall and Octave Band Noise Limits

Location	Measurement Period	Overall (Leq, dBA)	Octave-Band Sound Pressure Level (Leq, dB)								
			31.5	63	125	250	500	1000	2000	4000	8000
Residential Receptor	Day 7 AM – 7 PM	**65**	78	73	67	60	55	51	46	43	40
Residential Receptor	Night 7 PM – 7 AM	**50**	75	70	64	57	52	49	43	40	37
Commercial Receptor	Day 7 AM – 7 PM	**70**	85	80	74	67	62	58	53	50	47
Commercial Receptor	Night 7 PM – 7 AM	**55**	78	73	67	60	55	51	46	43	40

Source: Town of East Hampton, NY.

5. Methodology

The methodology used to assess potential effects of sound from the construction and operation of the SFEC – Onshore includes identifying noise-sensitive receptors in the study area, characterizing the existing ambient sound environment with measurements and modeling, predicting future sound emissions from the construction and operation of the proposed Project, assessing potential impact, and evaluating the need for mitigation or BMPs.

Existing conditions have been measured at the SFEC – Onshore Substation and the proposed landing site at Beach Lane to evaluate operational, daytime construction, and nighttime construction noise. Ambient sound levels have been estimated along the SFEC-Onshore route since only daytime construction noise has been evaluated. The daytime construction noise assessment does not depend on existing noise conditions unless ambient levels exceed 65 dBA (Leq). Therefore, estimating ambient sound levels based on population density and proximity to transportation sources along the SFEC – Onshore route provide a sufficient level of detail.

5.1 Ambient Sound Measurement Methodology

An important aspect to assessing the potential effects of introducing new long-term operational sources of sound is to understand the existing ambient sound environment and to characterize the existing conditions. As described in Section 4.3, the NYSDEC noise limits are directly related to existing conditions, so it is necessary to characterize existing noise level conditions in the study area. Although federal, and local noise limits are based on absolute thresholds and are not based on existing noise conditions, existing noise conditions may affect the context of how these limits apply to the proposed Project. The U.S. EPA and local ordinances do not have specific requirements for conducting ambient sound levels measurements. The NYSDEC identifies the following factors that should be considered when conducting ambient measurements:

- determining the fluctuation in sound levels by reporting sound level percentile results,
- expressing the overall sound environment by reporting the equivalent sound level (Leq),
- reporting maximum and minimum sound levels,
- determining the frequency content, and whether there are impulsive patterns or tonal conditions present,
- reporting the date, time and duration of sound measurements,
- the receptor locations where noise will be assessed,
- distances from the sources of sound to the receptor,
- presence of intervening terrain or structures,

- time of day,
- time of year, and
- atmospheric conditions such as wind direction and speed, temperature gradient, and relative humidity.
- Although not identified in the NYSDEC policy, another important factor is the potential presence of insect noise at night, such as crickets. At certain times of the year in certain locations insect noise at night can cause seasonally high ambient sound levels that may not be representative of the quietest ambient conditions.

VHB followed best practices when conducting ambient sound measurements in the study area around the proposed SFEC – Onshore Substation and the proposed landing site at Beach Lane.

- Measurements were conducted using sound level meters certified to have Type I accuracy according to the ANSI S1.4 "Specifications for Sound Level Meters." Larson Davis model 831 and model LxT sound level meters were utilized. The sound level meters were calibrated in the field prior to and after the measurements and by a laboratory traceable to the National Institute of Standards and Technology within one year of the field measurements.
- Measurement data collected included overall A-weighted sound levels and one-third-octave band sound levels, which provide information on the frequency content (i.e. low or high-pitched) character of sound. Data collection included one-second time histories of all sound level metrics and hourly interval summaries of the minimum, maximum, percentile values (L01, L10, L33, L50, L90, and L99), and the energy-average sound level (Leq).
- Atmospheric observations of wind speed, wind direction, air temperature, precipitation, barometric pressure and sky conditions were made in the field and from a nearby weather station (data accessible online).
- During attended measurements, observations were made of the predominant sources of sound. For long-term unattended measurements, audio recordings and/or sound level time histories were reviewed to understand the character of different sources of sound. The noise data was evaluated to determine whether there was significant insect noise present. This was done based on knowledge of the potential presence of insects, by listening to audio recordings and by analyzing the frequency content to identify high-frequency tonal conditions, which are indicative of insect noise. No significant insect noise was identified in any of the measurements.
- Measurement equipment was located in areas that are representative of the ambient conditions at noise-sensitive receptor locations. The most significant ambient sources in the study areas include transportation sources, existing stationary facilities at Cove Hollow Road and natural sounds such as wind through the trees, wind through the grass, and ocean waves at Beach Lane.
- An important aspect to the noise assessment according to NYSDEC policy is to evaluate noise from the proposed Project at different times of day including the daytime and nighttime periods when ambient sound levels are generally quieter.

Ambient sound measurements were conducted for long-term (24-hour) durations and short-term (20-minute) durations during late-night periods. Twenty minutes is a typical duration for short-term measurements when there are relatively constant noise sources such as roadway noise or existing energy facilities. The late-night period for measurements was between 12:00 AM and 5:00 AM when ambient conditions are typically quietest.

5.2 Ambient Sound Level Estimates (SFEC – Onshore Route)

Existing sources of sound along the SFEC – Onshore Route include natural ambient sources such as wind through the trees, local traffic on the roadways and train operations on the LIRR tracks. Ambient sound levels have been estimated, rather than measured, along the route since operational and nighttime construction noise evaluations are not needed and the daytime construction noise assessment only depends on existing conditions if the existing noise levels exceed 65 dBA (Leq), per NYSDEC criteria.

Existing ambient sound levels along the SFEC – Onshore Route have been estimated based on the methodology described in the Federal Transit Administration guidance manual[1] which is based on population density and the proximity of receptor locations to transportation sources such as major roads and railroads. For receptors adjacent to roadways on the SFEC – Onshore Route, existing sound levels are estimated to be 40 dBA (Leq) during the daytime and 35 dBA (Leq) during the evening based on a population density of approximately 285 people per square mile. The closest receptors along the LIRR tracks on the SFEC – Onshore Route are approximately 150 to 250 feet from the tracks. Ambient sound levels are estimated to be 60 dBA (Leq) during the day and 55 dBA (Leq) during the evening based on a proximity to the track.

Since existing ambient sound levels along the SFEC – Onshore Route are estimated to be below 65 dBA (Leq), the NYSDEC daytime construction noise limit is 65 dBA (Leq).

5.3 Sound Prediction Modeling Methodology

This section presents the methodology for modeling sound from the construction and operation of the proposed Project. There is no permanent noise-generating equipment associated with the SFEC-Onshore route and landing site, so operational noise has not been evaluated with these components. The assumptions used to

[1] Federal Transit Administration, "Noise and Vibration Impact Assessment" Guidance Manual, Report No. FTA-VA-90-1003-06, May, 2006.

predict sound are presented including the type, size, and sound emissions of construction and substation equipment.

5.3.1 Substation Operations

The proposed SFEC – Onshore Substation would introduce new sources of sound including transformers, oil-cooled reactors, and heating, ventilation, and air-conditioning (HVAC) equipment associated with the control house. Specifically, the SFEC - Onshore Substation is assumed to include the following sound-generating equipment:

- (2) HV / MV substation transformers rated for 650 kV Basic Insulation Level (BIL) and 108 Mega-Volt-Amperes (MVA).
- (2) Oil-cooled reactors rated for 35 Mega-Volt-Amperes-Reactive (MVAr).
- (1) Control house with exterior HVAC equipment.

At this phase of the SFEC - Onshore Substation design, specific manufacturers and models of equipment have not been finalized. NEMA has reference data available on sound emissions for different sizes of transformers and reactors[2], although these sound levels are typically higher than actual equipment emissions. Actual equipment sound emissions are typically based on measurements conducted in accordance with standard procedures such as the IEEE "Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers."[3] Actual sound emissions based on measurements are then documented in manufacturer specifications and are commonly procured assuming the noise will meet "guaranteed levels."

To minimize potential noise effects from the SFEC – Onshore Substation, low-noise equipment would be used, and a 11.5-foot solid perimeter sound wall would be included. Sound from the SFEC – Onshore Substation has been evaluated based on the following assumptions:

- The transformers would generate energy-average sound levels of 62 dBA at a distance of 2 meters from the exterior walls of the transformer. This sound rating is based on the NEMA methodology for determining sound emissions from transformers that have air-forced cooling (fans). These sound emissions are 20 dB below the standard NEMA ratings for 108 MVA/650 kV transformers. Ultra-low noise transformers have been shown to achieve sound emissions that are 20 dB below the NEMA standard rating.

[2] National Electrical Manufacturers Association Standard Publication No. TR-1-2013, "Transformers, Step Voltage Regulators and Reactors", (2014).

[3] IEEE Standard C57.12.90-1999 "Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers", 1999.

- Each oil-cooled reactor would generate energy-average sound levels of 57 dBA at a distance of 1 foot from the exterior walls of the reactor. This sound rating is based on the NEMA methodology for rating sound emissions from reactors that do not have air-forced cooling (fans). These sound emissions are 20 dB below the NEMA ratings for 35 MVAr transformers.
- The control house would generate sound from two exterior condenser units that generate a sound level of approximately 50 dBA at 50 feet. This is based on typical climate control equipment used for such facilities.[4]
- An 11.5-foot perimeter wall made of a solid material (i.e. concrete or metal) would be installed around the SFEC – Onshore Substation site.
- The frequency content of sound including octave band sound levels between 31.5 and 8000 Hz has been included in the modeling of transformers and reactors. The frequency content has been based on research that relates overall sound levels to octave band levels.[5,6]

Operational sound from the SFEC – Onshore Substation has been predicted using Cadna-A sound prediction software. Cadna-A is an internationally-accepted sound prediction program that implements the International Standards Organization 9613-2 sound propagation standard. This model takes into account the sound emissions of equipment, the ground cover, terrain, and intervening objects such as buildings.

5.3.2 Construction (Landing Site, SFEC – Onshore Route, and SFEC – Onshore Substation)

Construction activities would introduce temporary noise sources associated with the different phases of construction. The following summarizes the different phases of construction:

- The sea-to-shore transition site work area would accommodate an HDD rig, mud pump, crane, generator, backhoe, and other equipment to facilitate the construction of the Project. Depending on site-specific conditions and other external factors, the HDD installation activities are expected to take 10 to 12 weeks and would occur 24 hours per day. HDD activities would be completed outside the summer season. Construction at the transition site would also include site preparation, including excavation for the vault, and support of the excavation sidewalls, if necessary.,

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[4] BARD Sound Level Specification for WA48, WA60, WA70 / W48A-W70A & WH48, WH60/W48H, W60H Equipment.

[5] Ver, I., G. Anderson, and M. Myles, "Characterization of Transformer Noise Emissions," BBN Report No. 3305 (2 Vols.), submitted to ESEERCO (July 1977).

[6] Stevens, R. and C. Hung, "Toward a Realistic Estimate of Octave band Sound Levels for Electric Transformers", Canadian Acoustics, Vol. 38, No. 1 (2010).

The equipment included in the HDD site preparation activities include an excavator or crane utilizing a vibratory or impact hammer. The loudest phase of construction at the transition site will be HDD site preparation activities associated with sheet piling which is expected to last approximately two days to install and remove.

- The SFEC – Onshore cable route begins at the sea-to-shore transition vault and would run to the SFEC – Onshore Substation at Cove Hollow Road. A duct bank would be located underground along public road ROWs and the LIRR ROW and would not include any overhead lines before arriving at the SFEC – Onshore Substation. Wherever possible, the SFEC - Onshore route would be located within the existing paved section of the road ROW. Underground cable construction typically includes concrete saws, jackhammers, or hoe rams to remove existing pavement and small backhoes, trenchers, and dump trucks to install the cable and replace the paved surface. SFEC - Onshore cable installation is expected to take approximately nine to 12 months and would occur during daytime hours.
- Construction of the SFEC – Onshore Substation would take approximately six to nine months and would occur during daytime hours. Substation construction would include the following activities:
    - Site preparation, excavation, and grading (this is typically the loudest phase of substation construction);
    - Construction of foundations for the control building, transformer, reactors, and switchgear;
    - Construction of electrical grounding, duct banks, and underground conduits;
    - Installation of appropriate drainage systems and station service including electrical and water; and
    - Installation of all above ground structures including transformer, switchgear, and cable systems.

Construction noise has been modeled using standard methods for energy and transmission line projects in a manner that is consistent with federal guidelines. The construction noise model accounts for the types of construction equipment, the number of each type of equipment, the amount of time they typically operate during a work period (usage factor), and the distance between receptor locations and the equipment. For typical daytime construction activities, construction noise is evaluated according to the 8-hour energy-average Leq(8h). For construction activities that may occur continuously, such as HDD, construction noise is evaluated according to the 24-hour energy-average Leq(24h).

Table 7 presents the reference sound emissions of the equipment used during each phase of construction. Noise emissions of construction equipment is based on reference data from the Federal Highway Administration's (FHWA) Roadway Construction Noise Model (RCNM) and other project-specific equipment specifications. RCNM includes a database of sound emissions for commonly used construction equipment such as dump trucks, backhoes, concrete saws, air compressors, and portable generators.

The reference sound emissions for the HDD rig is based on typical equipment such as the Vermeer D330 x 500 which is powered by a C15 diesel engine which is within a sound attenuation enclosure.

For stationary construction, including site preparation for HDD operations, HDD operations, and construction at the SFEC – Onshore Substation, Cadna-A has been used to predict sound at nearby receptor locations. The model includes specific locations of the equipment, heights of the construction noise sources, terrain, and location and height of intervening objects such as sound walls surrounding the HDD site. The model provides construction sound level contours from the sites.

For construction of the SFEC - Onshore, which moves linearly along public road ROWs and the LIRR ROW, the FHWA RCNM model is used to predict construction noise levels. The model provides sound level versus distance results, which are then applied along the route.

Table 7: Construction Equipment Noise Emissions

Construction Activity	Construction Equipment	Sound Level at 50 feet (dBA)	Utilization Factor
SFEC - Onshore Construction in Roadway or Railway	Dump Truck [A]	**76**	**40%**
	Backhoe [A]	**78**	**40%**
	Jackhammer, Hoe Ram or Concrete Saw [A]	**90**	**20%**
	Generator (75 kW)[B]	**56**	**40%**
SFEC – Onshore Substation Construction	Crane [A]	**76**	**10%**
	Backhoe [A]	**78**	**40%**
	Dump Truck [A]	**76**	**40%**
HDD On-Shore Site Preparation	Impact Pile Driving [A]	**101**	**20%**
	Excavator [A]	**81**	**40%**
	Crane [A]	**76**	**10%**
HDD On-Shore Entry/Exit Site	HDD Rig [C]	**70**	**100%**
	Mud pump [D]	**67**	**50%**
	Crane [A]	**76**	**10%**
	Generator (75 kW) [B]	**56**	**40%**
	Backhoe [A]	**78**	**40%**

A: Source: RCNM, 2011.
B: Source: WhisperWatt.Ultra Silent 75 kW Generator.
C: Source: Vermeer, Caterpillar.
D: Source: eNoise Control Case Study (Sound Power Level, 98 dBA).

6. Existing Conditions

The sound study area extends from the preferred landing site at Beach Lane along the SFEC - Onshore route to the SFEC – Onshore Substation at Cove Hollow Road. Noise-sensitive receptors throughout the study area include single-family residences on Beach Lane, Wainscott Main Street, Sayre's Path, Wainscott Stone Road, Wainscott Northwest Road, and adjacent to the LIRR ROW. The Child Development Center of the Hamptons school is also approximately 200 feet from the LIRR ROW.

6.1 Ambient Sound Measurement Results

The following presents the results of ambient sound measurements conducted at the proposed Beach Lane landing site and the SFEC – Onshore Substation in the Town of East Hampton.

6.1.1 SFEC – Onshore Substation

As shown in Figure 1, long-term (24-hour) ambient measurements were conducted at two locations (LT-1 and LT-2) from December 11 to 12, 2017 and short-term (20-minute) late-night ambient measurements were conducted at five locations (ST-1 to ST-5) on February 1, 2018.

Ambient noise measurements were conducted with Larson Davis Model LxT and 831 sound level meters, which meet ANSI Type 1 accuracy. The sound level meters were calibrated in the field before and after the measurements and by a laboratory traceable to the National Institute of Standards and Technology. The microphones were located at a height of 5 feet above ground in areas representative of nearby sensitive receptors. The data collected included overall A-weighted and octave-band sound levels every second. The data were analyzed to identify LIRR train events and to exclude these transient events from the sound level results. This is a conservative approach to evaluating ambient sound conditions and the potential for construction or operational noise to affect receptors.

Overall daytime (7:00 AM to 10:00 PM) and nighttime (10:00 PM to 7:00 AM) energy-average Leq and statistical sound levels were determined at the long-term measurement locations. The short-term measurements were all conducted during the late-night period (approximately 1:00 to 3:00 AM) when ambient conditions are typically quietest and did not include train events.

Weather Conditions

The atmospheric conditions during the noise measurements were suitable for collecting data without substantial influence from weather conditions. On December 11 and 12, 2017, the air temperature ranged from 24 to 39 degrees Fahrenheit, relative humidity was 67 percent, there was no precipitation, and wind speeds were nominally 5 to 7 miles per hour (mph) from the west. On February 1, 2018, the air temperature was approximately 34 degrees Fahrenheit, relative humidity was 79 percent, there was no precipitation, and wind speeds were nominally 9 mph from the southwest.

Ambient Noise Measurement Results

Table 8 presents the overall A-weighted (dBA) and un-weighted (dB) octave-band energy-average sound levels (Leq). For the long-term noise measurements, train events were identified from the sound level time histories and periodic audio recordings and were excluded from the measurement results to present the typical ambient noise environment when train events do not occur. Existing nighttime ambient sound levels range from 37.3 to 42.2 dBA (Leq). Daytime ambient sound levels range from 45.8 to 47.5 dBA (Leq). Additional noise measurement results including statistical sound level results are presented in the Appendix.

Table 8: Ambient Sound Measurement Results at SFEC – Onshore Substation

Location	Measurement Period	Overall[1] (Leq, dBA)	Octave-Band Sound Pressure Level (Leq, dB)[1]								
			31.5	63	125	250	500	1000	2000	4000	8000
LT-1: Near 24 Horseshoe Drive	Night (10PM – 7AM)	**37.5**	39.5	46.6	43.3	40.4	36.0	31.2	22.1	19.3	16.7
	Day (7AM – 10PM)	**45.8**	56.6	53.6	46.2	46.0	43.6	41.2	35.5	32.0	27.4
LT-2: Near Cove Hollow Road	Night (10PM – 7AM)	**37.3**	39.5	45.9	43.0	39.1	36.2	31.3	22.7	20.3	19.1
	Day (7AM – 10PM)	**47.5**	55.2	54.5	48.2	45.2	44.5	43.3	39.4	34.6	29.4
ST-1: Surrey Court (Cul-de-sac)	1:10 – 1:30 AM	**42.2**	58.9	53.1	44.2	42.1	39.3	36.1	33.8	30.8	26.6
ST-2: 5 Hardscrabble Court	1:40 – 2:00 AM	**39.8**	52.1	48.3	40.2	39.9	36.7	34.4	30.9	28.9	25.1
ST-3: Substation Road	2:10 – 2:30 AM	**39.0**	49.2	45.6	40.3	38.3	36.3	32.8	30.3	29.6	26.0
ST-4: Cove Hollow Road and Buell Lane	2:35 – 2:55 AM	**38.9**	49.1	44.2	39.4	37.1	35.3	33.5	30.3	29.0	25.7
ST-5: Near 19 Horseshoe Drive	3:10 – 3:30 AM	**38.5**	53.2	46.1	39.6	40.5	36.6	31.5	27.6	25.2	20.1

Note 1: Ambient noise measurement results exclude LIRR train operations.

Noise measurements at LT-1 and LT-2 conducted from December 11-12, 2017.

Noise measurements at ST-2 to ST-5 conducted on February 1, 2018.

Source, VHB, 2017 and 2018.

6.1.2 Beach Lane Landing Site

As shown in Figure 2, short-term (20-minute) ambient measurements were conducted at two locations (ST-1 & ST-2), on January 31, 2018 to February 1, 2018. The measurements were conducted during the morning (8:00 to 9:00 AM), evening (5:00 to 6:00 PM), and nighttime (12:00 to 1:00 AM). Ambient noise measurements were conducted with Larson Davis Model LxT and 831 sound level meters, which meet ANSI Type 1 accuracy. The sound level meters were calibrated in the field before and after the measurements and by a laboratory traceable to the National Institute of Standards and Technology. The microphones were located at a height of 5 feet above ground in areas representative of nearby sensitive receptors. The data collected included overall A-weighted and octave-band sound levels every second.

Weather Conditions

The atmospheric conditions during the noise measurements were suitable for collecting data without substantial influence from weather conditions. The air temperature ranged from 25 to 37 degrees Fahrenheit, relative humidity was 62 to 79 percent, there was no precipitation, and wind speeds were nominally 5 to 10 mph from the west.

Ambient Noise Measurement Results

Table 9 presents the overall A-weighted (dBA) and un-weighted (dB) octave-band energy-average sound levels (Leq) at the Beach Lane sea-to-shore transition vault where HDD will occur. The predominant source of noise was ocean waves on the shoreline. Existing ambient sound levels ranged from 51 to 59 dBA (Leq).

Table 9: Ambient Sound Measurement Results at the Beach Lane Sea-to-Shore Transition Vault

Location	Measurement Period	Overall[1] (Leq, dBA)	Octave-Band Sound Pressure Level (Leq, dB)[1]								
			31.5	63	125	250	500	1000	2000	4000	8000
Beach Lane Site 1	Morning (7:50 – 8:10 AM)	**58.6**	68.0	63.1	56.6	55.6	55.4	53.6	50.0	43.4	33.1
	Evening (5:10 – 5:30 PM)	**51.8**	60.1	57.5	51.0	48.1	49.6	47.6	43.7	36.2	28.3
	Night (12:00 – 12:20 AM)	**54.2**	64.7	60.0	55.2	51.0	51.7	50.4	45.5	36.6	25.6
Beach Lane Site 2	Morning (8:15 – 8:35 AM)	**57.5**	64.1	60.1	54.7	53.7	57.7	51.4	47.8	40.8	32.6
	Evening (5:40 – 6:00 PM)	**55.5**	62.0	61.0	61.8	51.6	51.7	50.6	48.6	40.9	32.0
	Night (12:25 – 12:45 AM)	**51.4**	66.5	58.3	51.7	50.1	49.5	47.0	42.8	34.2	25.3

Source, VHB, 2018.

7. Assessment

This section presents the results of the sound predictions and the impact assessment for construction and operation of the Project.

7.1 Operational

Table 10 presents the overall A-weighted and octave-band sound emissions from the operation of the SFEC – Onshore Substation at nearby receptor locations. The sound emissions include a 11.5-foot solid perimeter wall. Sound from the SFEC – Onshore Substation would be 37 dBA at the closest receptor property line location at 24 Horseshoe Drive. At all other receptor locations, sound from the SFEC – Onshore Substation would be 35 dBA (Leq) or lower. SFEC – Onshore Substation sound would be below the US EPA and Town of East Hampton noise criteria.

Octave band sound levels from the SFEC – Onshore Substation show that pure tone conditions are not anticipated. Sound levels in the 125-Hz octave band are up to 3 dB higher than adjacent bands. The criteria for determining the presence of pure tones are generally greater than 3 dB, particularly on an octave-band basis in the lower frequency range.

Table 11 presents the existing ambient nighttime sound levels at each receptor, the predicted sound from the SFEC – Onshore Substation, the future nighttime sound level, which includes existing ambient and project sources, and the increase in noise. The existing ambient nighttime sound levels range from 37.3 to 42.2 dBA (Leq). Sound from the SFEC – Onshore Substation would be below existing nighttime ambient sound levels at all locations. The greatest increase in future noise would be 2.6 dBA at 24 Horseshoe Drive. At all other receptor locations, future sound levels would increase 2 dB or less. Future increases in sound of less than 3 dBA is typically below the threshold of perception. Per the NYSDEC noise criteria, there would be a minimal effect in future noise conditions and there is no need for mitigation.

Table 10: Sound Emissions from SFEC – Onshore Substation Operations (including Sound Wall)

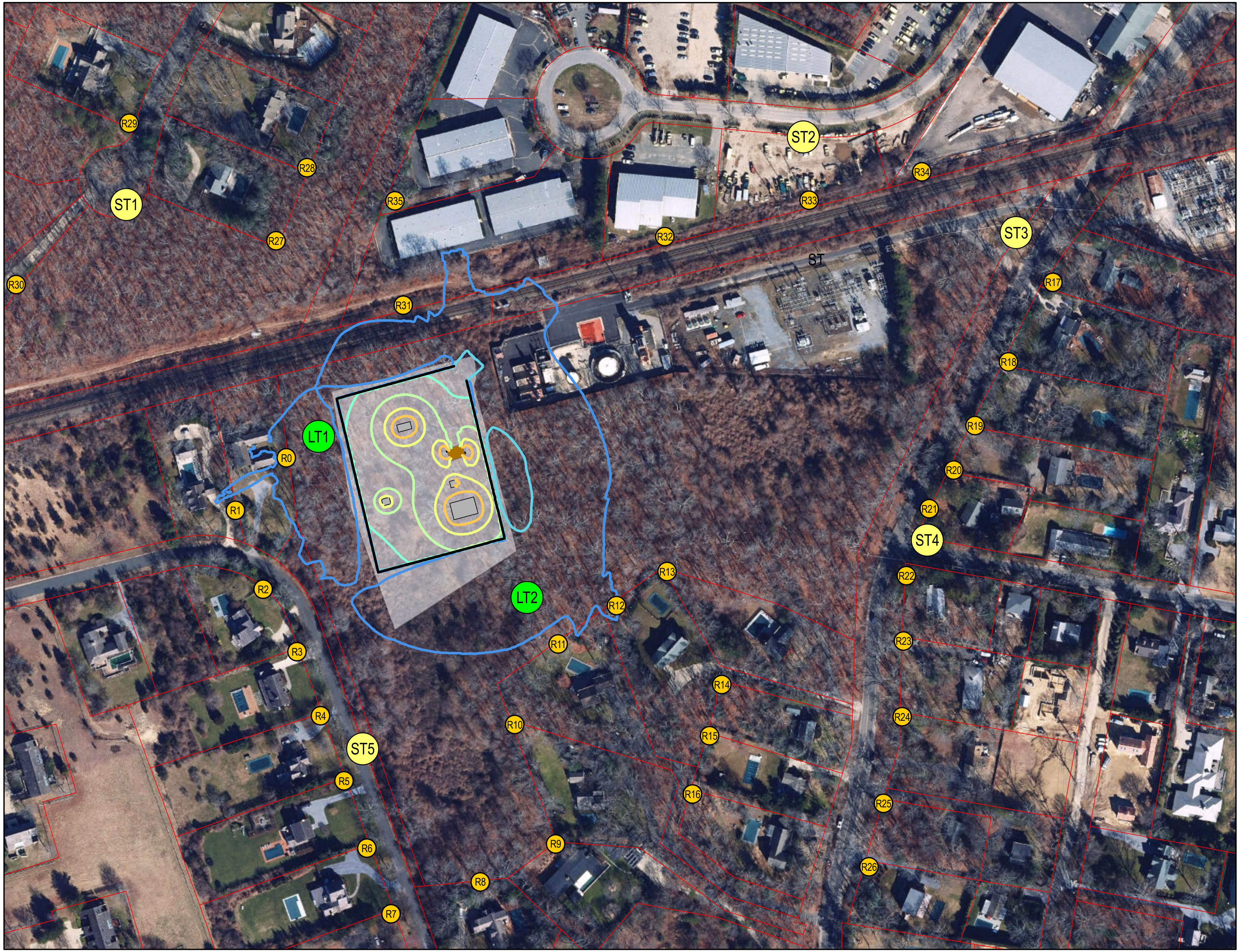
Receptor	Location	Overall (Leq, dBA)	Octave-Band Sound Pressure Level (Leq, dB)								
			31.5	63	125	250	500	1000	2000	4000	8000
R0	24 HORSESHOE DR	37	39	38	41	34	37	30	24	18	9
R1	26 HORSESHOE DR	33	37	35	37	29	33	28	22	15	5
R2	23 HORSESHOE DR	34	36	35	37	30	34	28	22	16	6
R3	21 HORSESHOE DR	32	36	34	37	28	32	27	21	16	5
R4	19 HORSESHOE DR	32	34	33	36	27	31	27	22	15	2
R5	17 HORSESHOE DR	32	33	32	34	27	31	27	21	14	-3
R6	15 HORSESHOE DR	28	31	30	33	23	28	23	18	9	-9
R7	11 HORSESHOE DR	27	29	29	31	22	26	21	15	7	-14
R8	14 HORSESHOE DR	29	31	30	32	24	29	24	18	9	-11
R9	73 COVE HOLLOW RD	29	32	30	33	23	29	24	19	11	-10
R10	73 COVE HOLLOW RD	32	35	34	36	28	32	27	21	13	-1
R11	COVE HOLLOW RD	34	36	35	38	31	34	29	23	16	2
R12	COVE HOLLOW RD	35	36	35	38	30	35	30	24	16	1
R13	51 COVE HOLLOW RD	32	36	34	36	28	32	26	20	12	-2
R14	COVE HOLLOW RD	20	29	27	28	22	18	13	6	-5	-29
R15	63 COVE HOLLOW RD	28	31	30	33	24	28	23	17	8	-13
R16	65 COVE HOLLOW RD	23	30	28	30	23	21	17	10	-1	-25
R17	22 COVE HOLLOW RD	23	28	26	28	18	23	17	10	-2	-34
R18	26 COVE HOLLOW RD	24	29	27	29	19	24	18	11	0	-29
R19	30 COVE HOLLOW RD	24	30	27	29	20	24	19	12	1	-26
R20	38 COVE HOLLOW RD	25	30	28	30	20	25	19	13	2	-25
R21	42 COVE HOLLOW RD	25	30	28	30	21	25	20	13	3	-23
R22	73 BUELLS LA EXT	25	31	28	31	21	26	20	13	3	-22
R23	56 COVE HOLLOW RD	25	30	28	30	21	25	19	13	2	-24
R24	60 COVE HOLLOW RD	18	27	24	25	19	18	11	5	-6	-32
R25	64 COVE HOLLOW RD	20	28	26	28	20	20	13	6	-6	-32
R26	70 COVE HOLLOW RD	24	26	26	28	19	24	18	12	0	-30
R27	24 SURREY CT	30	34	33	35	26	30	25	18	10	-7
R28	20 SURREY CT	29	34	32	33	24	29	25	19	10	-10
R29	19 SURREY CT	26	30	28	31	21	26	20	14	4	-22
R30	31 SURREY CT	26	30	28	31	21	26	21	14	4	-21
R33	7 HARDSCRABBLE CT	34	41	38	40	33	34	28	22	14	1
R34	5 HARDSCRABBLE CT	32	35	34	37	27	31	27	22	13	-7
R35	3 HARDSCRABBLE CT	26	32	30	31	21	26	20	14	4	-20
R36	1 COVE HOLLOW RD	24	30	28	29	19	24	18	12	1	-29
R37	9 HARDSCRABBLE CT	21	33	29	29	23	20	10	3	-6	-23

Source: VHB, 2018.

Table 11: Existing and Future Sound Levels with SFEC – Onshore Substation Operations

Receptor	Location	Overall Sound Level (Leq, dBA)			
		Existing Nighttime	Project Noise	Future Nighttime	Increase
R0	24 HORSESHOE DR	37.5	36.6	40.1	2.6
R1	26 HORSESHOE DR	37.5	33.1	38.8	1.3
R2	23 HORSESHOE DR	37.5	33.6	39.0	1.5
R3	21 HORSESHOE DR	37.3	32.4	38.5	1.2
R4	19 HORSESHOE DR	38.5	31.7	39.3	0.8
R5	17 HORSESHOE DR	38.5	31.5	39.3	0.8
R6	15 HORSESHOE DR	38.5	28.0	38.9	0.4
R7	11 HORSESHOE DR	38.5	26.5	38.8	0.3
R8	14 HORSESHOE DR	38.5	29.1	39.0	0.5
R9	73 COVE HOLLOW RD	38.5	29.3	39.0	0.5
R10	73 COVE HOLLOW RD	37.3	31.8	38.4	1.1
R11	COVE HOLLOW RD	37.3	34.1	39.0	1.7
R12	COVE HOLLOW RD	37.3	35.1	39.3	2.0
R13	51 COVE HOLLOW RD	37.3	31.5	38.3	1.0
R14	COVE HOLLOW RD	37.3	19.6	37.4	0.1
R15	63 COVE HOLLOW RD	37.3	28.2	37.8	0.5
R16	65 COVE HOLLOW RD	37.3	22.5	37.4	0.1
R17	22 COVE HOLLOW RD	39.0	22.5	39.1	0.1
R18	26 COVE HOLLOW RD	39.0	23.5	39.1	0.1
R19	30 COVE HOLLOW RD	39.0	24.2	39.1	0.1
R20	38 COVE HOLLOW RD	38.9	24.6	39.1	0.2
R21	42 COVE HOLLOW RD	38.9	25.2	39.1	0.2
R22	73 BUELLS LA EXT	38.9	25.3	39.1	0.2
R23	56 COVE HOLLOW RD	38.9	24.8	39.1	0.2
R24	60 COVE HOLLOW RD	38.9	18.1	38.9	0.0
R25	64 COVE HOLLOW RD	38.9	20.2	39.0	0.1
R26	70 COVE HOLLOW RD	38.9	23.6	39.0	0.1
R27	24 SURREY CT	42.2	30.2	42.5	0.3
R28	20 SURREY CT	42.2	29.3	42.4	0.2
R29	19 SURREY CT	42.2	25.6	42.3	0.1
R30	31 SURREY CT	42.2	25.7	42.3	0.1
R33	7 HARDSCRABBLE CT	42.2	34.2	42.8	0.6
R34	5 HARDSCRABBLE CT	39.8	32.0	40.5	0.7
R35	3 HARDSCRABBLE CT	39.8	25.7	40.0	0.2
R36	1 COVE HOLLOW RD	39.8	23.7	39.9	0.1
R37	9 HARDSCRABBLE CT	42.2	20.5	42.2	0.0

Source: VHB, 2018.



Locator Map

Legend

- Receptor
- Long-Term Sound Measurement Site
- Short-Term Sound Measurement Site
- Proposed Sound Wall

Operational Sound Contours (dBA)

- 35
- 40
- 45
- 50
- 55
- 60
- Transformers and Reactors
- Substation Control House
- Substation Site
- Parcels

N

0 0.03 0.06
Miles

0 0.065 0.13
Kilometers

SOUTH FORK WIND FARM

Figure 1

SFEC-Onshore Substation Measurement and Receptor Locations

vhb

DVR \\vhb\proj\LongIsland\29137.05 DWW SFWF Article VII\GIS\Project\Noise\20170620_SFWF_MapTemplate1.mxd JRoss 4/13/2018 4:38:08 PM

Sources:
Town of East Hampton, NY, VHB, Deepwater Wind

7.2 Construction

Construction noise has been predicted at the proposed Beach Lane landing site, along the SFEC – Onshore route, and at the SFEC – Onshore Substation, as described in Section 5.3.2.

Figure 2 presents the HDD operational construction noise levels at the Beach Lane sea-to-shore transition vault site and Figure 3 presents the HDD site preparation construction noise levels. Table 12 presents construction noise levels for HDD site preparation and operations. During HDD operations, which will last approximately 10 to 12 weeks, the highest noise levels at nearby residential buildings would be 48 dBA (Leq[8h]) or lower. HDD operational noise would be between 50 and 55 dBA (Leq[8h]) at the closest locations on residential properties in yard areas near the road. Construction during HDD operations already implements several sound attenuating features such as using a quieter model HDD and a 14-foot perimeter sound wall to attenuate sound from propagating to nearby residences. During HDD site preparation, it has been assumed that the 14-foot perimeter sound wall would not yet be installed as it may conflict with the equipment setup during site preparation. Site preparation for HDD operations, including sheet piling, will last approximately two days, and the highest noise levels at nearby residential buildings would be 76 dBA (Leq[8h]) or lower. HDD site preparation noise would be up to 87 dBA (Leq[8h]) at the closest locations on residential properties in yard areas near the road.

As described in Section 6.1.2, existing ambient sound levels ranged from 51 to 59 dBA (Leq) during the day and night. Therefore, HDD operational noise would generally be below existing ambient sound levels and below all applicable construction noise criteria. During HDD site preparation, noise levels would be up to approximately 17 to 25 dBA higher than ambient conditions, but would only occur for a brief period of time.

Since HDD operational noise would be below all applicable daytime noise criteria, mitigation or additional BMPs to further attenuate construction noise are not warranted. HDD site preparation construction activities would occur during the daytime period (7:00 AM to 8:30 PM) and would comply with the Town of East Hampton noise code. However, since HDD site preparation noise levels would exceed the NYSDEC noise guidelines, BMPs need to be considered. During site preparation, BMPs to further attenuate construction noise associated with sheet pile driving will be implemented as feasible and safe (See Section 8.2 for additional details).

Continuous HDD operations are typically needed to minimize potential soil settlement and equipment failures. Therefore, HDD operations would occur during the nighttime period and would conflict with the Town of East Hampton noise code. Deepwater Wind South Fork, LLC (i.e., the Applicant) may need to seek a variance from the Town for nighttime construction. Based on the fact that HDD construction sound would be below existing ambient sound levels and would be planned outside the summer months, there would be minimal effects from continuous HDD construction.

Table 12: Construction Sound at Beach Lane Landing Site

Receptor	Location	Overall (Leq[8h], dBA)	
		HDD Operations	HDD Site Preparation
L0	104 Beach Lane (front yard)	51	84
L1	104 Beach Lane (building)	48	76
L2	98 Beach Lane (building)	47	71
L3	84 Beach Lane (pool)	41	60
L4	84 Beach Lane (building)	40	58
L5	85 Beach Lane (building)	38	60
L6	112 Beach Lane (building)	44	67
L7	112 Beach Lane (front yard)	48	71
L8	126 Beach Lane (building)	43	63
L9	115 Beach Lane (building)	43	64
L10	38 Association Road (building)	38	61
L11	34 Association Road (building)	34	58
L12	32 Association Road (building)	36	60
L13	30 Association Road (pool)	32	56
L14	90 Beach Lane (tennis court)	40	63
L15	88 Beach Lane (pool)	36	60
L16	114 Beach Lane (building)	39	61
L17	30 Association Road (building)	34	58
L18	73 Beach Lane (tennis court)	34	57
L19	98 Beach Lane (front yard)	55	75
L20	103 Beach Lane (front yard)	54	87

Source: VHB, 2018.

Locator Map

Legend

- Backhoe
- Crane
- HDD Rig
- Generator
- Mud Pump
- Receptor
- Short-Term Sound Measurement Site
- Proposed Construction Sound Wall

HDD Construction Sound (dBA)

- 50
- 55
- 60
- 65
- Roads
- Parcels

N

0 0.03 0.06
Miles

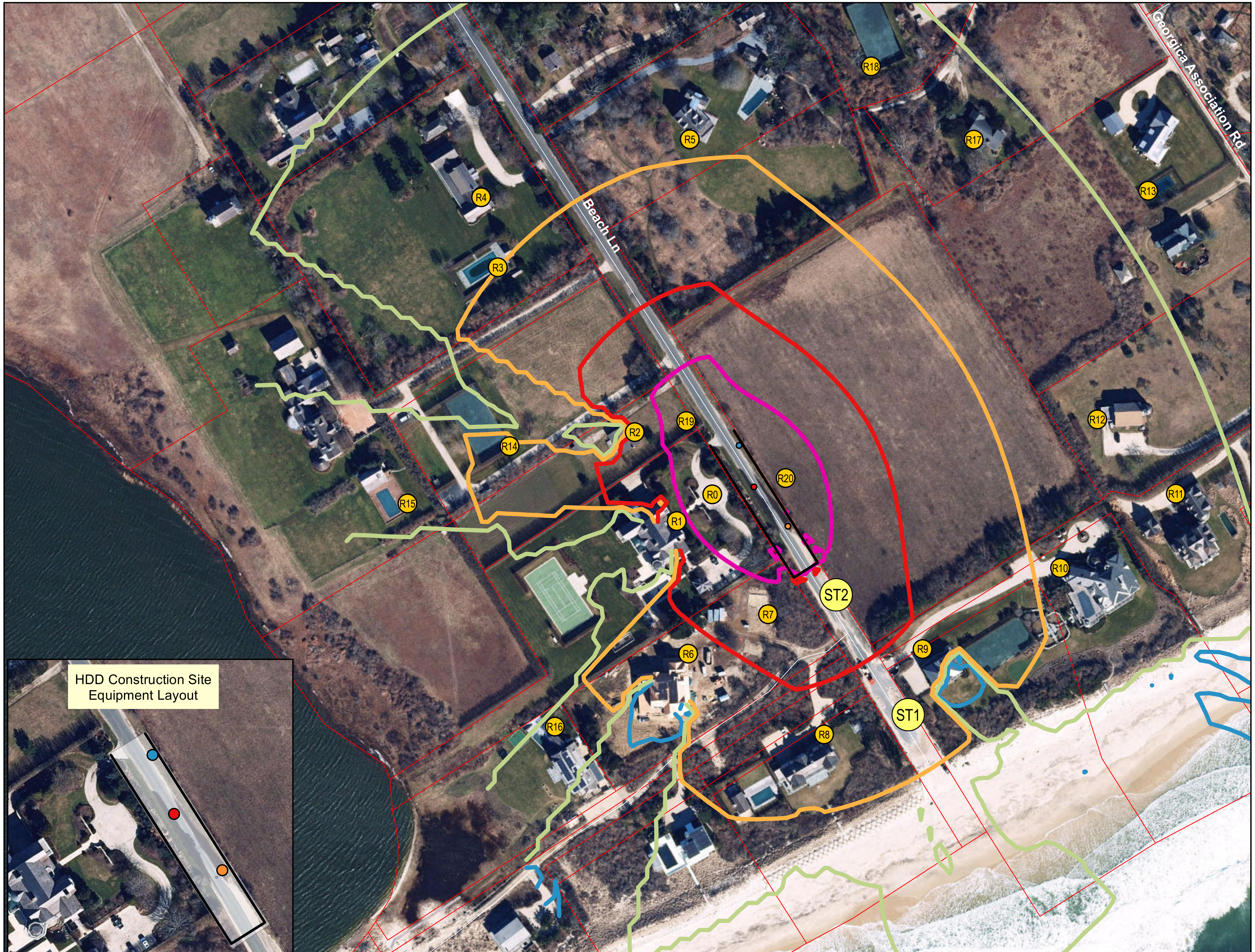
0 0.065 0.13
Kilometers

Figure 2

Beach Lane Landing Site
HDD Operations

DVR \\vhb\proj\LongIsland\29137.05 DWW SFWF Article VII\GIS\Project\Noise\20180509 HDD Construction Updated D330.mxd JRoss 5/9/2018 1:04:43 PM

Sources:
Town of East Hampton, NY, VHB, Deepwater Wind



Locator Map

Legend

- Crane
- Excavator
- Impact Pile Driver
- Receptor
- Short-Term Sound Measurement Site
- Roads
- Proposed Construction Sound Wall

HDD Site Prep Construction (dBA)

- 50
- 55
- 60
- 65
- 70
- Parcels

N

0 0.03 0.06
Miles

0 0.065 0.13
Kilometers

SOUTH FORK WINDFARM

Figure 3

Beach Lane Landing Site
HDD Site Preparations

vhb

DVR \\vhb\gis\proj\Hauppauge\29137.05 DWW SFWF Article VII\gis\Project\Noise\Figure 4-12-2 (Tech Report Figure 2) Beach Lane HDD Construction 20180515.mxd JRoss 2/4/2020 4:05:57 PM

Sources:
Town of East Hampton, NY, VHB, Deepwater Wind

As shown in Table 13, construction of the underground SFEC - Onshore cable within public road ROWs or LIRR ROW would generate noise of approximately 80 dBA (Leq[8h]) at a distance of 50 feet from the center of construction activities. At a distance of 200 feet, construction noise would be 65 dBA (Leq[8h]), which is the NYSDEC noise guideline limit for construction activities. Therefore, as shown in Figure 4, construction noise would approach or exceed 65 dBA (Leq[8h]) at most first-row receptors immediately adjacent to the road or railroad ROWs. Section 8.2 for further information on BMPs to minimize noise from the underground export cable construction.

Table 13: SFEC - Onshore Cable Construction Noise

Construction Equipment	Sound Level (dBA)	Utilization Factor
Dump Truck [A]	**76 dBA at 50 feet**	**40%**
Backhoe [A]	**78 dBA at 50 feet**	**40%**
Jackhammer, Hoe Ram or Concrete Saw [A]	**90 dBA at 50 feet**	**20%**
Generator (75 kW)[B]	**56 dBA at 50 feet**	**40%**
8-hour Cable Construction Noise at 50 feet		**80 dBA (Leq[8h])**
8-hour Cable Construction Noise at 200 feet		**65 dBA (Leq[8h])**

Source: VHB, 2018.

Table 14 and Figure 5 present the construction noise levels at specific receptor locations for the SFEC – Onshore Substation. The highest construction noise levels would be 58 dBA (Leq[8h]) at the nearest property line at 24 Horseshoe Drive. This does not take into account any sound attenuation from the perimeter wall that would be constructed, as it is assumed that would occur at the end of the SFEC – Onshore Substation construction activities. Since substation construction would occur during the daytime, it would meet all applicable construction noise criteria. Therefore, BMPs to reduce noise are not warranted for construction of the SFEC – Onshore Substation.

Locator Map

Legend

SFEC Route Construction Sound (65 dBA)

HDD Construction Sound (dBA)

- 50
- 55
- 60
- 65

Substation Construction Sound (dBA)

- 50
- 55
- 60
- 65

Roads

N

0 0.25 0.5
Miles

0 0.55 1.1
Kilometers

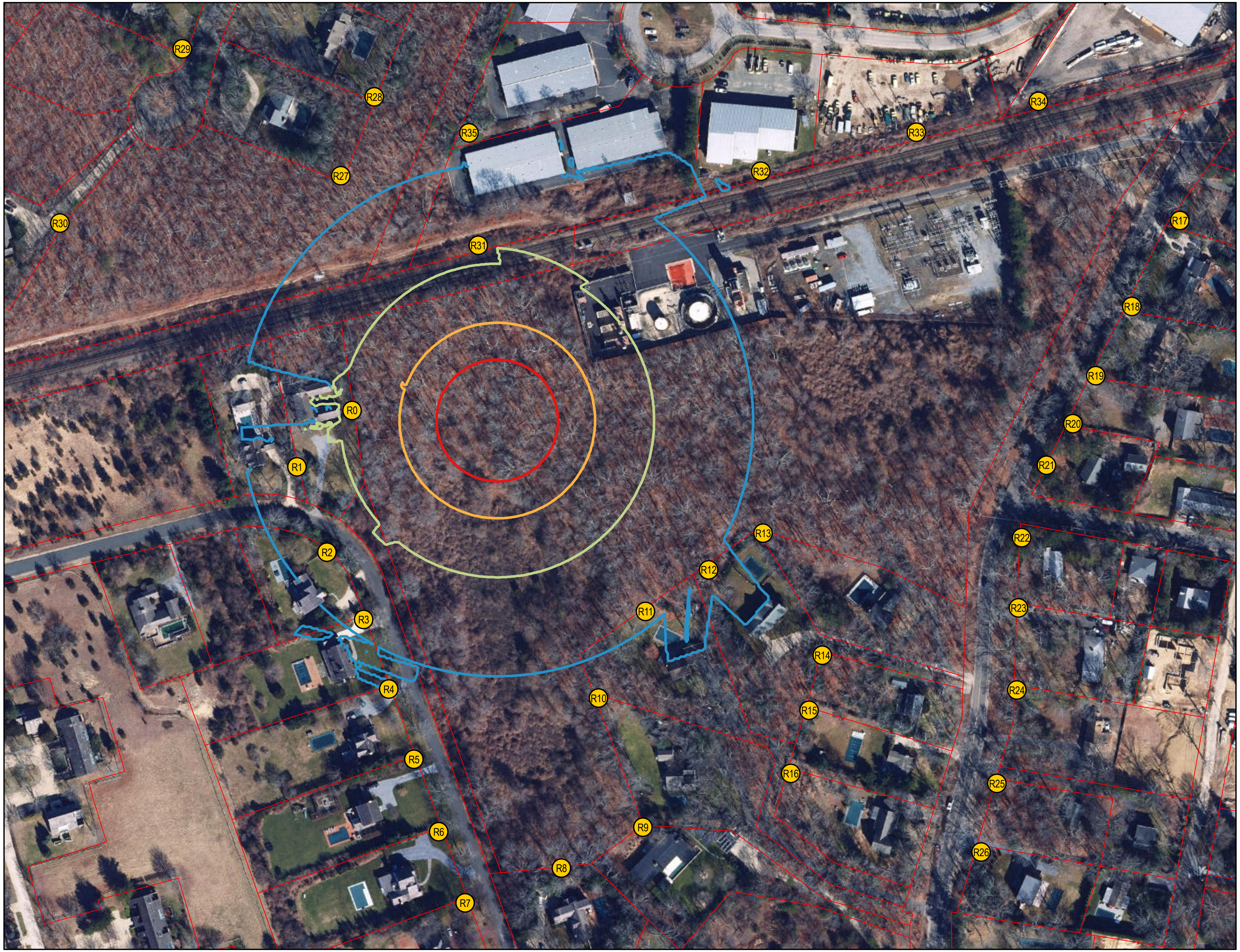
SOUTH FORK WIND FARM

Figure 4
SFEC - Onshore Route, HDD Site & Substation Construction

vhb

DVR \\vhb\proj\LongIsland\29137.05 DWW SFWF Article VII\GIS\Project\Noise\20180409 HDD Construction.mxd JRoss 4/9/2018 6:16:24 PM

Sources:
Town of East Hampton, NY, VHB, Deepwater Wind



Locator Map

Legend

Receptor

Construction Sound Contours (dBA)

- 50
- 55
- 60
- 65
- Parcels

N

0 0.03 0.06
Miles

0 0.06 0.12
Kilometers

SOUTH FORK WIND FARM

Figure 5

SFEC-Onshore Substation Construction

vhb

Sources:
Town of East Hampton, NY, VHB, Deepwater Wind

Table 14: Construction Sound at SFEC – Onshore Substation Site

Receptor	Location	Overall (Leq, dBA)
R0	24 HORSESHOE DR	58
R1	26 HORSESHOE DR	52
R2	23 HORSESHOE DR	52
R3	21 HORSESHOE DR	51
R4	19 HORSESHOE DR	49
R5	17 HORSESHOE DR	49
R6	15 HORSESHOE DR	45
R7	11 HORSESHOE DR	44
R8	14 HORSESHOE DR	47
R9	73 COVE HOLLOW RD	47
R10	73 COVE HOLLOW RD	49
R11	COVE HOLLOW RD	51
R12	COVE HOLLOW RD	52
R13	51 COVE HOLLOW RD	49
R14	COVE HOLLOW RD	35
R15	63 COVE HOLLOW RD	45
R16	65 COVE HOLLOW RD	40
R17	22 COVE HOLLOW RD	40
R18	26 COVE HOLLOW RD	41
R19	30 COVE HOLLOW RD	42
R20	38 COVE HOLLOW RD	42
R21	42 COVE HOLLOW RD	43
R22	73 BUELLS LA EXT	43
R23	56 COVE HOLLOW RD	43
R24	60 COVE HOLLOW RD	38
R25	64 COVE HOLLOW RD	39
R26	70 COVE HOLLOW RD	41
R27	24 SURREY CT	49
R28	20 SURREY CT	47
R29	19 SURREY CT	44
R30	31 SURREY CT	44
R33	7 HARDSCRABBLE CT	54
R34	5 HARDSCRABBLE CT	49
R35	3 HARDSCRABBLE CT	43
R36	1 COVE HOLLOW RD	42
R37	9 HARDSCRABBLE CT	39

Source: VHB, 2018.

8. Mitigation and Best Management Practices

This section discusses the need for mitigation to attenuate sound from the SFEC – Onshore Substation and BMPs to minimize construction noise effects.

8.1 SFEC – Onshore Substation Sound Attenuation

As presented in Section 7.1, the SFEC – Onshore Substation, as designed, would generate sound below existing ambient sound levels. According to federal, state and local noise standards, there would be no impact and no need for mitigation due to the operation of the SFEC – Onshore Substation. As the SFEC – Onshore Substation design advances, specific transformers, reactors, and HVAC equipment will be identified that have "guaranteed" sound levels meeting the assumptions used in this analysis. Should the substation design be modified in such a way that would affect the locations or the "guaranteed" sound emissions of the equipment, it may be possible to modify the perimeter sound wall design to result in sound levels consistent with those presented in this study. For example, based on a sound optimization analysis of the SFEC – Onshore Substation, similar sound emissions could be achieved with reactors that are 10 dB louder than those assumed in the sound study with a sound wall that is 13 feet in height (rather than 11.5 feet).

8.2 Construction Noise BMPs

The construction noise assessment shows that sound levels from HDD operations at the Beach Lane landing site and the construction of the SFEC – Onshore Substation would be below applicable limits, and BMPs to reduce HDD operational noise are not warranted. The Beach Lane landing site, as planned, already implements several sound attenuating features such as using a quieter model HDD and a 14-foot perimeter sound wall to attenuate sound from propagating to nearby residences. During HDD site preparation, it has been assumed that the 14-foot perimeter sound wall would not yet be installed as it may conflict with the equipment setup during site preparation. The sound wall may not be tall enough to attenuate sound during the start of sheet piling equipment. Since HDD site preparation would exceed NYSDEC construction noise guidelines, BMPs will be implemented such as: notifying nearby residences of the days and times that sheet piling will occur; installing the perimeter sound wall prior to sheet pile driving, if construction logistics allow; and using quieter methods (i.e. push in piling) to install sheet piling, as geological conditions allow.

Underground SFEC - Onshore cable installation would generally occur during daytime hours in accordance with the Town of East Hampton construction noise criteria. However, since construction activities would generate sound approaching or exceeding 65 dBA (Leq) at most first-row receptors within 200 feet of the route, BMPs to minimize construction noise should be implemented in accordance with NYSDEC policy.

BMPs for reducing construction noise during cable installation may include:

- Replacing back-up alarms with strobes, as allowed within Occupational Safety and Health Administration (OSHA) regulations, to eliminate the annoying impulsive sound.
- Assuring that equipment is functioning properly and is equipped with mufflers and other noise-reducing features.
- Locating especially noisy equipment as far from sensitive receptors as possible.
- Using quieter construction equipment and methods, as feasible, such as smaller backhoes.
- Using path noise control measures such as portable enclosures for small equipment (e.g., jackhammers and saws).
- Limiting the periods of time when construction may occur is a common approach to minimizing impact. Implementing the time of day restrictions in the Town of East Hampton noise ordinance would help minimize impact to residences.
- Maintaining strong communication and public outreach with adjacent neighbors is an important step in minimizing impact. Often, providing abutters information about the time and nature of construction activities can minimize the effects of construction noise.

Appendix

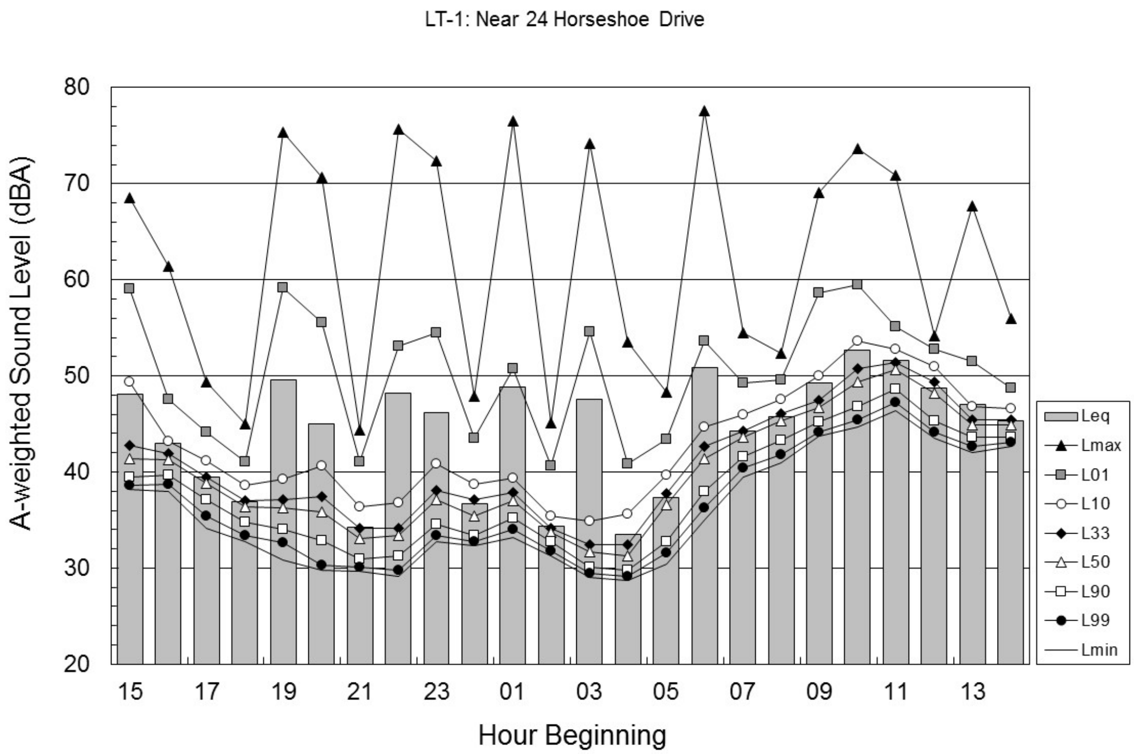


Figure 6: Hourly Ambient Sound Monitoring Results (LT-1)

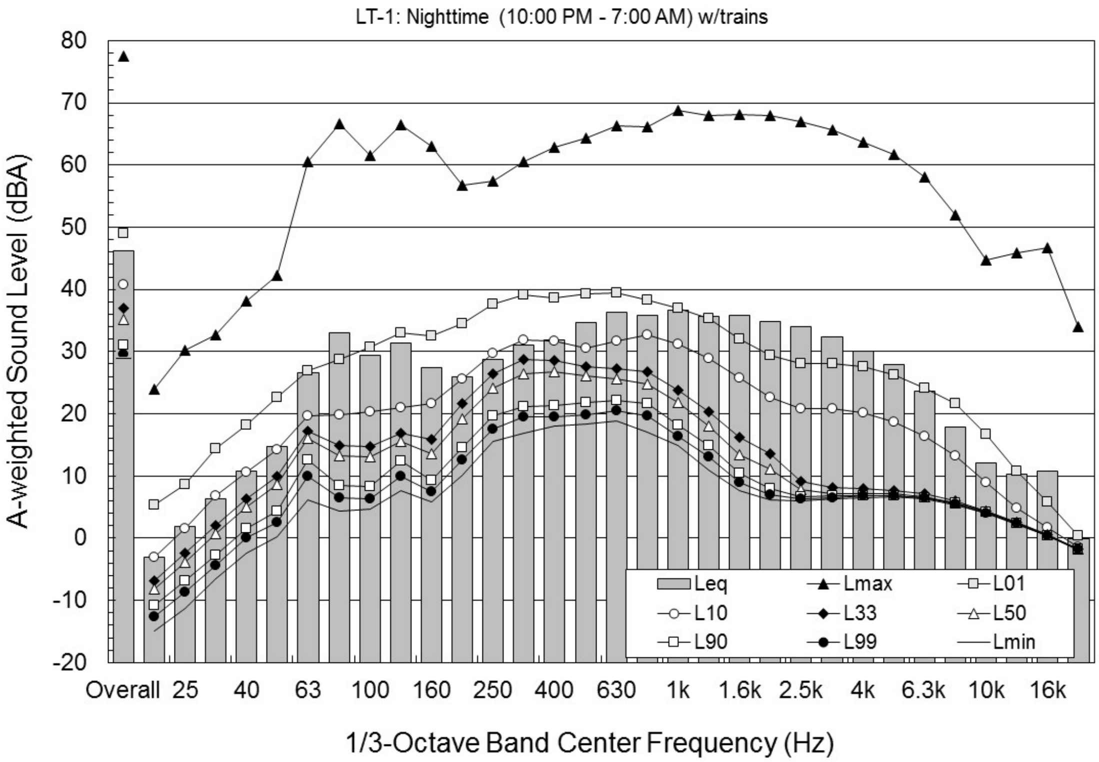


Figure 7: Nighttime Ambient Sound 1/3-Octave Band Spectra with Train Events (LT-1)

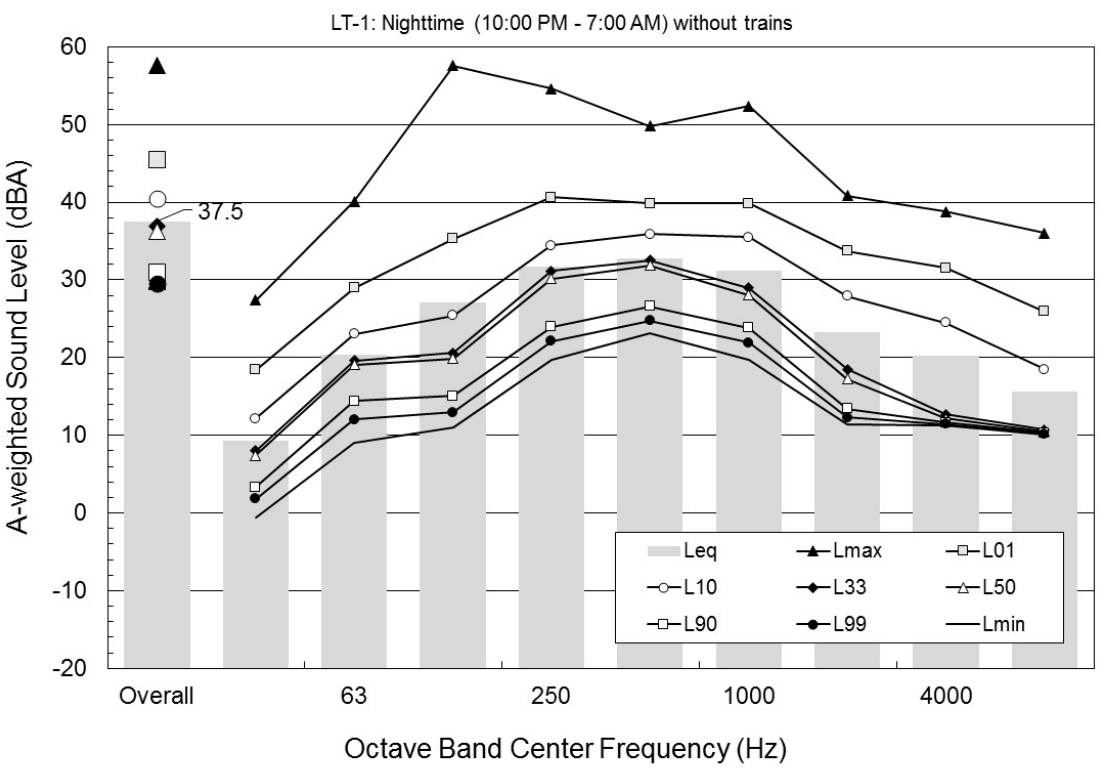


Figure 8: Nighttime Ambient Sound Octave Band Spectra Excluding Train Events (LT-1)

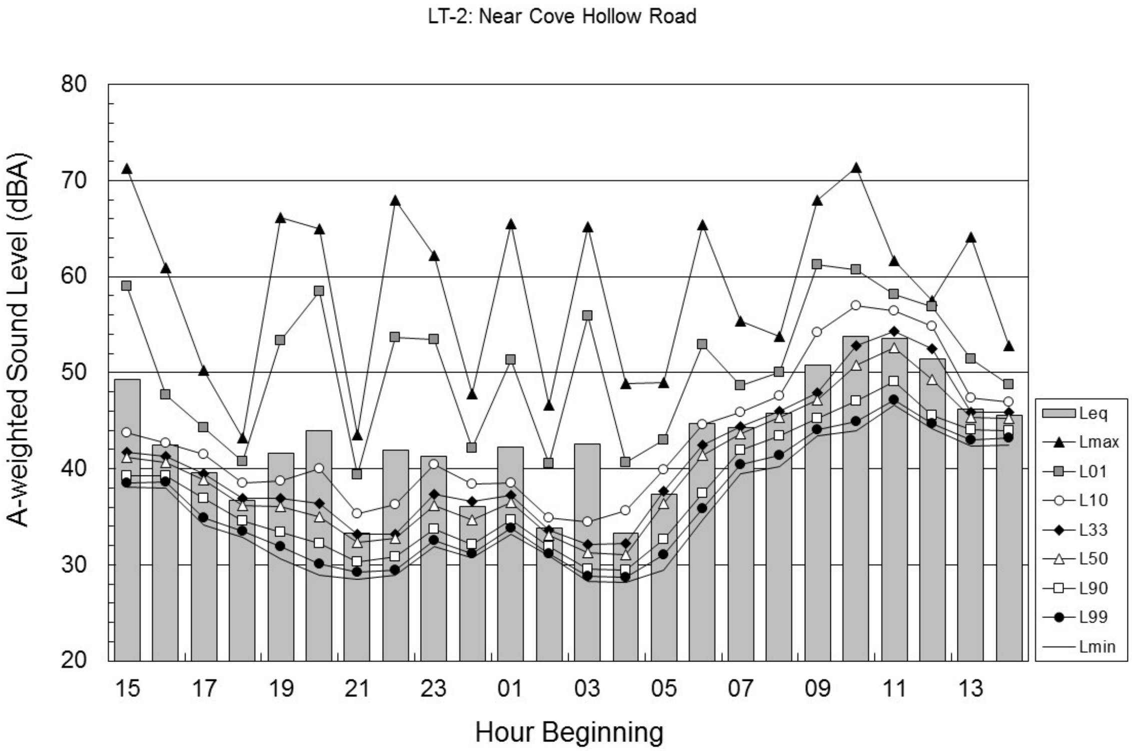


Figure 9: Hourly Ambient Sound Monitoring Results (LT-2)

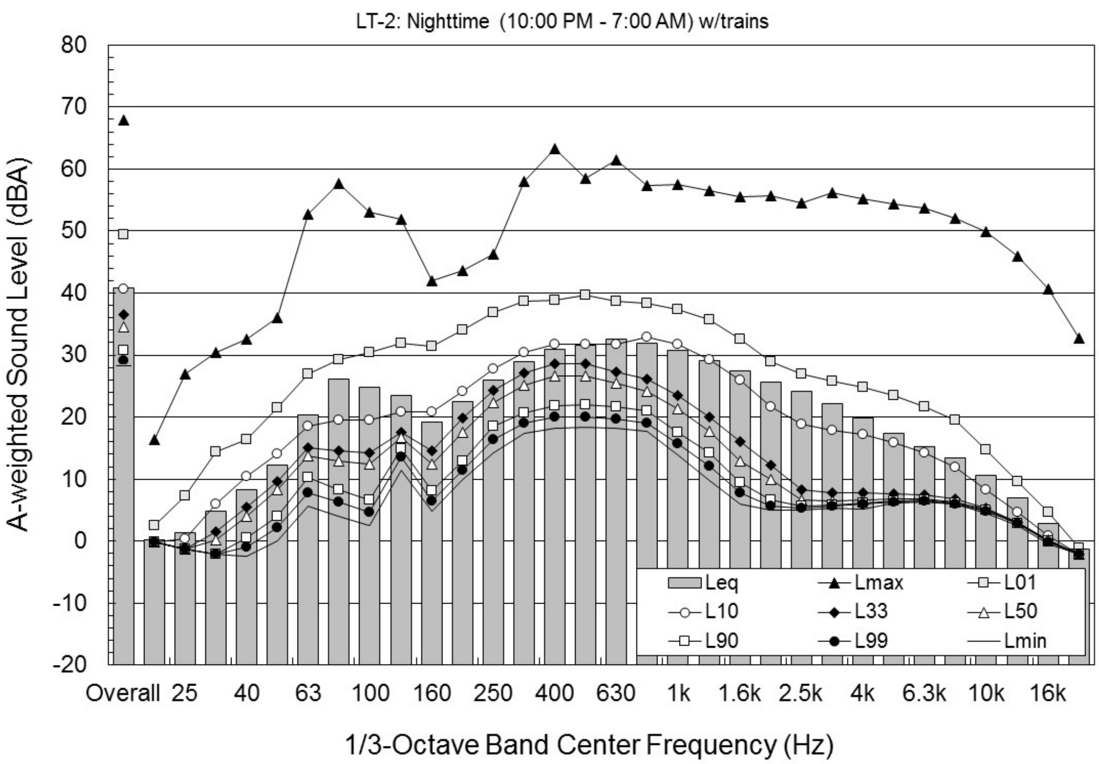


Figure 10: Nighttime Ambient Sound 1/3-Octave Band Spectra with Train Events (LT-2)

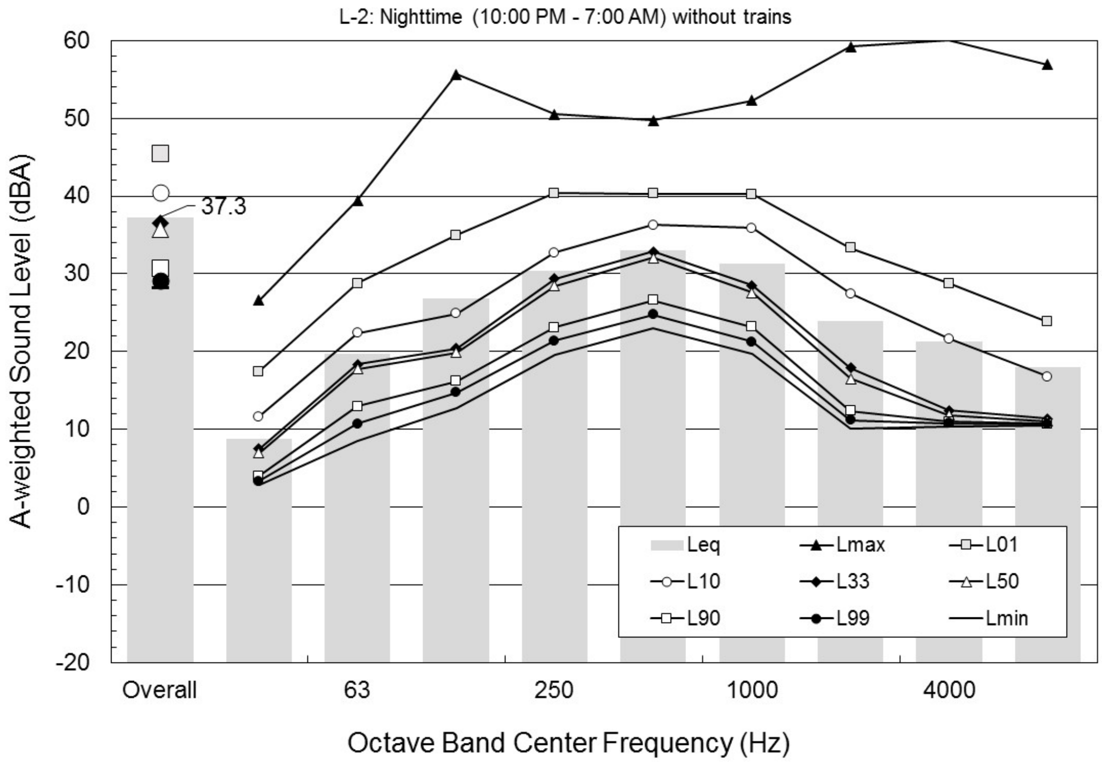


Figure 11: Nighttime Ambient Sound Octave Band Spectra Excluding Train Events (LT-2)