

Sunrise Wind New York Cable Project

Appendix 4-I

Onshore Acoustic Assessment

Prepared for:

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Wind**

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December 9, 2020

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Onshore Acoustic Assessment

Sunrise Wind New York Cable Project

Prepared for: Sunrise Wind LLC

Prepared by: Exponent Engineering P.C.

December 2020

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Acronyms and Abbreviations

ANSI	American National Standards Institute
ASA	Acoustical Society of America
BMP	Best Management Practice
BTS	Bureau of Transportation Statistics
dB	Decibel
DC	Direct current
EPA	US Environmental Protection Agency
Eversource	Eversource Investment LLC
FHWA	Federal Highway Administration
ft	Feet
FTA	Federal Transit Administration
HAB	Horizontal auger boring
HDD	Horizontal directional drill
HVAC	Heating, ventilation, and air conditioning
ICW	Intercoastal Waterway
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Organization for Standardization
kHz	Kilohertz
km	Kilometer
LIE	Long Island Expressway
LIPA	Long Island Power Authority
LIRR	Long Island Railroad
L ₁₀	Sound level that is exceeded 10 percent of the measurement period
L ₅₀	Sound level that is exceeded 50 percent of the measurement period
L ₉₀	Sound level that is exceeded 90 percent of the measurement period
L _A	A-weighted continuous equivalent sound pressure level (sound level)
L _{Amax}	Maximum sound level over the measurement period
L _{ANS}	Natural sound weighted continuous equivalent sound pressure level
L _{eq}	Continuous equivalent sound pressure level
L _{dn}	Day-night average sound pressure level
L _w	Sound power level
mi	Mile
MPH	Miles per hour
MVA _r	Megavolt ampere reactive
OCS	Outer Continental Shelf
OnCS–DC	Onshore converter station–direct current
OREC	Offshore Wind Renewable Energy Certificate
NEMA	National Electrical Manufacturers Association
nm	Nautical Miles
NPS	National Park Service
NSR	Noise sensitive receptor
NYCRR	New York Codes, Rules and Regulations
NYS	New York State
NYPA	New York Power Authority
NYSERDA	New York State Energy Research and Development Authority
NYSDEC	New York State Department of Environmental Conservation
NYSDPS	New York State Department of Public Service
Orsted NA	Orsted North America Inc.
PDE	Project design envelope
Project	Sunrise Wind Farm Project
RCNM	Roadway Construction Noise Model
ROW	Right of way
SCP	Suffolk County Parks
SRWEC	Sunrise Wind Export Cable
Sunrise Wind	Sunrise Wind LLC

TC	Trenchless crossing
TJB	Transition joint bay
UA	Union Avenue

Executive Summary

Sunrise Wind LLC (Sunrise Wind or the Applicant), a 50/50 joint venture between Orsted North America Inc. (Orsted) and Eversource Investment LLC (Eversource) proposes to construct, own, and operate the Sunrise Wind New York Cable Project (the Project). This Onshore Acoustic Assessment presents an evaluation of the potential impacts from noise associated with construction and operation of the onshore components of the Project. An overview of the construction and operation associated with the onshore components of the Project and the applicable federal, state, and local regulations is included. The methods used to identify noise sensitive receptors (NSR) and conduct a survey of existing acoustic conditions are summarized. The potential impacts from noise associated with onshore components of the Project are assessed. As warranted, strategies for mitigation to comply with applicable regulations are evaluated and best management practices (BMP) to diminish noise impacts to the community are recommended.

Noise impacts have been evaluated according to New York State Department of Public Service Article VII, Siting of Major Utility Transmission Facilities, of the New York State Public Service Law, and applicable federal, state, and local regulations. Guidance established by the US Environmental Protection Agency (EPA) regarding chronic exposure to pervasive noise has been applied to operational noise from the Project. Policy from the New York State Department of Environmental Conservation (NYSDEC) provides guidance on the evaluation of noise impacts and applies to all onshore facilities and construction activities associated with the Project. The Suffolk County Code, Chapter 618, applies to noise from construction of the Project's Onshore Transmission Cable in County parks and along County roadways. The Town of Brookhaven's Town Code, Chapter 50, applies to both long-term operation of Project facilities and short-term construction activities associated with the Project. All applicable regulatory thresholds are described by the A-weighted equivalent continuous sound pressure level in decibels (dB).

NSRs in the vicinity of the proposed Onshore Converter Station (OnCS–DC), the Onshore Transmission Cable route, the Onshore Interconnection Cable route, the horizontal directional drills (HDD) associated with the Landfall and the Intracoastal Waterway (ICW) crossings, and other trenchless crossing (TC) locations included nearby residences, public lands, commercial properties, and industrial properties. Existing ambient conditions at NSRs were assessed using analytical methods and the results of a field survey. Unattended long-term monitoring at two locations and short-term attended monitoring at nine locations in the vicinity of Project sites was conducted from September 23 to September 26, 2020. Existing ambient conditions at NSRs were estimated to range from 45 to 65 dB during the day and from 35 to 64 dB at night.

The construction of the OnCS–DC will result in a temporary increase in noise levels near the construction site. Noise from OnCS–DC construction at either Union Avenue North or Union Avenue South will not exceed permissible sound level limits after implementing mitigative measures. Mitigative measures are required at Union Avenue North to attenuate construction noise below permissible noise limits. During the day, the construction sound level will be 78 dB or lower at NSRs in industrial areas. BMPs will be implemented to further reduce noise per NYSDEC policy. Construction at the Union Avenue South site will generate noise of approximately 58 dB at the property line of the nearest residence and lower levels at all other NSRs located in residential areas. At the closest industrial property, construction at Union Avenue South will generate noise of approximately 73 dB. Mitigation to attenuate construction noise is not warranted at Union Avenue South.

HDD will be used to connect the Sunrise Wind Export Cable (SRWEC) to the Onshore Transmission Cable at Landfall and for the Onshore Transmission Cable to cross the ICW. In addition, HDD or horizontal auger boring (HAB) construction is anticipated at six TC locations along the Onshore Transmission Cable route and two TC locations along the Onshore Interconnection Cable route. Construction activities associated with site preparation at HDD and HAB sites will generate noise of approximately 84 dB at a distance of 50 feet (ft) (15

meters [m]) after implementing noise control strategies. Permissible noise limits are not expected to be exceeded at the Landfall HDD, the ICW HDD, or TC locations along the Onshore Interconnection Cable route since the specified controls are anticipated to reduce noise at NSRs below permissible limits. Construction noise from site preparation will exceed the permissible limit at nearby NSRs for all TC locations along the Onshore Transmission Cable route, and BMPs will be implemented to further reduce noise at NSRs. Since the activities associated with site preparation are anticipated to be of relatively short duration and limited to the daytime, site preparation is not expected to cause an adverse impact. Mitigative measures are warranted at the Landfall HDD, the ICW HDD, and all HAB and HDD sites along the Onshore Transmission Cable route to attenuate construction noise from drilling operations below permissible noise limits. After implementing feasible noise controls, construction activity at the TCs of the Long Island Railroad at William Floyd Parkway, Carmans River at Montauk Highway, and Sunrise Highway at Yaphank Avenue is expected to exceed the permissible sound level as specified by Suffolk County at one or more NSRs. Drilling operations at all other sites will comply with all applicable regulations. The expected increases in ambient sound levels at NSRs necessitates that BMPs be implemented to further diminish noise from drilling operations at the ICW HDD and most of the TC locations per NYSDEC policy. Since these construction activities are anticipated to be of relatively short duration, drilling operations are not expected to cause an adverse impact. Drilling operations will require continuous operation over several months and associated equipment is also expected to run overnight.

Since the activities associated with installation of the Onshore Transmission Cable and Onshore Interconnection Cable are anticipated to be of relatively short duration and limited to daytime hours, this construction is not expected to cause adverse impacts. Construction activities associated with the Onshore Transmission Cable and Onshore Interconnection Cable will generate noise that exceeds the permissible sound level limit of 65 dB at distances of less than 550 ft (168 m). Given the proximity of residences adjacent to the roads along the Onshore Transmission Cable route, the permissible sound level is expected to be exceeded at NSRs. Construction of the Onshore Interconnection Cable is also expected to exceed the NYSDEC noise limits at NSRs adjacent to the proposed routes. Therefore, BMPs will be implemented to minimize noise impacts from construction of the Onshore Transmission Cable and Onshore Interconnection Cable. In some areas, construction along the route may be required to occur at night to mitigate traffic impacts, which would conflict with the Town of Brookhaven and Suffolk County noise codes.

Long-term operation of the OnCS–DC will introduce several new noise sources including transformers, reactors, filters, and the heating, ventilation, and air-conditioning equipment associated with cooling of electrical components. The change in ambient sound due to OnCS–DC operation at either location is not expected to result in an adverse noise impact. The predicted total sound level due to operational noise from an OnCS–DC complies with all applicable criteria as specified by the EPA, NYSDEC, and the Town of Brookhaven regulations. At NSRs in residential areas, existing conditions exceed the nighttime permissible sound level limits for operational noise per the Town of Brookhaven code, and noise controls have been specified to avoid increasing the total sound level at these NSRs per NYSDEC policy. For an OnCS–DC at either the Union Avenue North or Union Avenue South site, the converter transformers and shunt reactors will be installed with a reduced sound rated model. If the Union Avenue South site is selected for OnCS–DC operation, additional mitigation would be implemented to reduce noise from the valve cooling tower. The ambient sound level at the closest residence will be 52 dB or 54 dB at night for an OnCS–DC at the Union Avenue North or Union Avenue South site, respectively, which is an increase of 0 dB over existing conditions. As the OnCS–DC design advances, specific electrical components will be identified that have specifications meeting the assumptions used in this Onshore Acoustic Assessment such that operational noise from the facility will be consistent with the results presented herein. Alternatively, this assessment could be continued if additional data describing the proposed Project warrant subsequent analysis. Refinement may include a reevaluation of operation noise and whether additional mitigative measures would be necessary.

The operation associated with the onshore components of the Project will comply with all applicable federal, state, and local regulations and is not expected to result in a noise impact. The Project is expected to request a waiver of the regulations contained in both the Suffolk County Code (§618-5[B][3]) and the Town of Brookhaven's Town Code (§50-6 [C][7]) to perform certain construction activities. During the decommissioning phase of the Project, all activities are anticipated to be similar to or less than those expected during construction and are not separately addressed in this Onshore Acoustic Assessment.

Note that this Executive Summary does not contain all of Exponent Engineering PC's technical evaluations, analyses, conclusions, and recommendations. Hence, the main body of this report is at all times the controlling document.

1.0 Introduction

1.1 Project Background and Description

Sunrise Wind LLC (Sunrise Wind or the Applicant), a 50/50 joint venture between Orsted North America Inc.. (Orsted NA) and Eversource Investment LLC (Eversource), proposes to construct, own, and operate the Sunrise Wind New York Cable Project (the Project). Sunrise Wind executed a 25-year Offshore Wind Renewable Energy Certificate (OREC) contract related to the Project with the New York State Energy Research and Development Authority (NYSERDA) in October 2019. The Project will deliver power from the Sunrise Wind Farm (SRWF), located in federal waters on the Outer Continental Shelf (OCS), to the existing electrical grid in New York State (NYS). The Project includes offshore and onshore components within NYS that are subject to Public Service Law Article VII review and will interconnect at the existing Holbrook Substation, which is owned and operated by the Long Island Power Authority (LIPA).

Specifically, power from the SRWF will be delivered to the existing mainland electric grid via distinct transmission cable segments: the submarine segment of the export cable (SRWEC) in NYS waters (SRWEC-NYS), the terrestrial underground segment of the transmission cable (Onshore Transmission Cable), the new Onshore Converter Station (OnCS–DC), and the underground segment of the interconnection cable (Onshore Interconnection Cable). The Onshore Transmission Cable, the OnCS–DC, and Onshore Interconnection Cable are all located in the Town of Brookhaven, Suffolk County, New York.

The Project will use direct current (DC) technology to transmit power to shore and will be comprised of the following onshore infrastructure located entirely in the Town of Brookhaven:

- Onshore Transmission Cable, and associated transition joint bays (TJB);
- Fiber Optic Cable co-located with the Onshore Transmission and Onshore Interconnection Cables;
- One Onshore Converter Station (OnCS–DC); and
- Onshore Interconnection Cable.

The Onshore Transmission Cable and Onshore Interconnection Cable will likely involve horizontal directional drill (HDD) and trenchless crossing (TC) installation technologies at the locations described herein.

1.2 Project Design Envelope

A reasonable range of Project designs are being considered to allow for assessments of proposed activities and the flexibility to make development decisions prior to construction. The Project Design Envelope (PDE) involves several scenarios with potential noise impacts that are associated with onshore construction activities and operation of the OnCS–DC. This Onshore Acoustic Assessment for the Project considers the information available at this time; the precise locations, noise sources, schedule of construction, and operation scenarios may be subject to change as the engineering design progresses.

The Onshore Transmission Cable will be constructed to deliver power from the SRWEC to the OnCS–DC, while the Onshore Interconnection Cable will convey power from the OnCS–DC to the existing Holbrook Substation. For installation of the Onshore Transmission Cable, the Project will utilize TC technologies to avoid sensitive environmental resources and other physical obstructions. Two types of TC technology are anticipated along the Onshore Transmission Cable route. These include HDD and horizontal auger boring (HAB). Construction of the Onshore Transmission Cable will originate at the TJB in Smith Point County Park. The Onshore Transmission Cable will then be routed across the Intracoastal Waterway (ICW) via the ICW HDD to a

paved parking lot within Smith Point Marina. Smith Point County Park and Smith Point Marina are collectively referred to as Suffolk County Parks (SCP).

In addition to the construction at the Landfall HDD and the ICW HDD, eight TCs along the Onshore Transmission Cable and Onshore Interconnection Cable routes have been evaluated. It is anticipated that HDD technology will be used for the TCs at Carmans River, Yaphank Creek, and the Long Island Expressway (LIE). HAB will be used for shorter TCs at the Long Island Railroad (LIRR) and specified roadways. HAB and HDD are expected to require continuous operation, and associated equipment is also expected to run overnight.

Power from the Project will be delivered to the electric grid via an OnCS–DC to be constructed in the Town of Brookhaven. Two sites (Union Avenue North site and Union Avenue South site) are being considered and both parcels are bordered by Union Avenue in the vicinity of the existing Holbrook Substation. Construction and operation of an OnCS–DC at two locations (OnCS–DC–Union Avenue North, and OnCS–DC–Union Avenue South) have been evaluated as part of the PDE.

In total, 16 onshore acoustic scenarios were evaluated to assess the potential noise impacts associated with construction of the OnCS–DC, construction of the Onshore Transmission Cable, construction of the Onshore Interconnection Cable, and operation of the OnCS–DC. The scenarios, jointly defined by location and activity, are summarized in Table 1. Figure 1 presents an overview map of the possible HDD construction sites, TC locations, Onshore Transmission Cable routes, Onshore Interconnection Cable routes, and locations of the OnCS–DC that are considered within the PDE.

Table 1. Onshore acoustic scenarios.

Category	Scenario Description
Construction and operation of the OnCS–DC	Construction at Union Avenue North
	Construction at Union Avenue South
	OnCS–DC operation at Union Avenue North (OnCS–DC–Union Avenue North)
	OnCS–DC operation at Union Avenue South (OnCS–DC–Union Avenue South)
Construction at SCPs	Landfall HDD construction at Smith Point County Park
	ICW HDD construction at Smith Point Marina
Construction at TCs	HAB construction at LIRR and William Floyd Parkway (TC1)
	HDD construction at Carmans River and Montauk Highway (TC2)
	HAB construction at Sunrise Highway and Yaphank Avenue (TC3)
	HAB construction at Horseblock Road and Yaphank Avenue (TC4)
	HAB construction at the LIRR and Manor Road (TC5)
	HDD construction at LIE East (TC6)
	HDD construction at LIE West (TC7)
	HDD construction at Yaphank Creek and Montauk Highway (TC8)
Construction along onshore cable routes	Onshore Transmission Cable route construction
	Onshore Interconnection Cable route construction

1.3 Acoustic Concepts and Terminology

Acoustics is the science of mechanical waves in gases, liquids, and solids, including its production, transmission, and effects. The human ear is sensitive to variations in air pressure that are perceived as sound. Noise is generally defined as unwanted sound and exposure to noise at high levels has been associated with negative physiological and psychological outcomes.

Sound pressure levels are measured on a relative logarithmic scale where 0 decibels (dB) represents the threshold of human hearing at 1 kilohertz (kHz) (20 micropascals). The instantaneous sound pressure level varies over time and the average and maximum values are often of interest. The equivalent continuous sound pressure level (L_{eq}) is a metric that represents the average magnitude of sound over time as a single number; it is the level of constant pressure that results in the same total sound energy as the actual time-varying sound during the same time period. L_{eq} is often calculated at the resolution of 1 second or 1 hour.

The perceived loudness of sound varies with frequency as well as with sound pressure, and sound pressure level measurements are often adjusted according to a weighted scale. A-weighting was designed to approximate the subjective response of the ear at low sound amplitudes. Most noise measurements and regulatory thresholds are described by the A-weighted equivalent continuous sound pressure level (the sound level, or L_A) measured in dB. Note that changes in the sound level do not proportionately translate to changes in apparent loudness. A change in 3 dB is just perceptible, whereas a change of 5 dB is clearly noticeable. A change of 10 dB is often described as a doubling of loudness, although this rule of thumb only holds under certain circumstances.

Ambient sound is the all-encompassing sound associated with a given environment and is usually a composite of sound from many sources and many directions, near and far, including any specific sources of interest. Numerous metrics have been devised to describe ambient sound conditions and the variation of the short-term sound level over much longer periods. Percentile levels indicate the short-term sound level exceeded over a longer period, such as 1 hour. The L_{50} is the sound level exceeded 50 percent of the measurement period (the median sound level) and often is used to summarize inconsistent conditions. Similarly, the L_{10} and the L_{90} are the sound levels exceeded 10 percent and 90 percent of the measurement period, respectively; large differences between these metrics may be indicative of transient events. The L_A can be averaged over a particular period, such as the daytime hours from 7:00 AM to 10:00 PM (the daytime sound level, or day L_A) and the nighttime hours from 10:00 PM to 7:00 AM (the nighttime sound level, or night L_A). The day-night average sound level (L_{dn}) is the annual average sound level over 24 hours with an additional 10 dB added to nighttime hours. In quiet natural and residential areas, high-frequency sounds such as measurement equipment's electrical noise, wind-induced sounds, and sound from insects or birds can make large contributions to A-weighted sound pressure levels. However, these sounds do not typically have the capacity to mask, or inhibit perception of, noise sources. In addition to A-weighting, the ANS-weighted sound level (natural sound level or L_{ANS}) is an effective way to characterize conditions (ANSI 2014a). The natural sound level is the standard A-weighted sound level filtered to exclude sounds above the 1 kHz octave band. This weighting can be used to characterize sound levels in natural and quiet residential areas with respect to noise from transportation, construction, and industrial sources.

For reference, Table 2 presents qualitative examples of sounds and corresponding sound levels (Norton 2003). The examples in Table 2 merely illustrate typical sound levels; the actual received sound level in any given situation depends on the sound power level (L_W) of the particular source, the distance from the source, and many other factors that affect acoustic propagation between the source and receiver.

Table 2. Qualitative examples of sound levels.

L_A (dB)	Qualitative scale
140	Threshold of pain
120	Jet take-off at 200 ft
110	Car horn at 3 ft
100	Shouting into an ear
90	Heavy truck at 50 ft

L _A (dB)	Qualitative scale
80	Pneumatic drill at 50 ft
70	Highway traffic at 50 ft
60	Room air conditioner at 20 ft
50	Normal conversation at 10 ft
40	Wind at 11 mi per hour
30	Soft whisper at 10 ft
0	Threshold of hearing

2.0 Regulatory Framework

Potential noise impacts associated with construction and operation of onshore components of the Project have been evaluated according to Article VII, Siting of Major Utility Transmission Facilities, of the New York State Public Service Law (16 NYCRR §86.5, Exhibit 4: environmental impact). This section describes the federal, state, and local noise regulations applicable to the Project. Policies and ordinances issued by regulatory agencies specify criteria with which the onshore components of the Project must comply, including permissible noise limits. Table 3 summarizes the agencies, their jurisdictions, and the corresponding noise standards applicable to the Project.

Table 3. Summary of applicable noise regulations.

Agency	Jurisdiction	Policy
Environmental Protection Agency	Federal	Information on the Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety
NY State Department of Environmental Conservation	New York State	Assessing and Mitigating Noise Impacts
Suffolk County	County property	Suffolk County Noise Ordinance (Chapter 618 of the Suffolk County Code)
Town of Brookhaven	Town of Brookhaven	Town of Brookhaven Noise Ordinance (Chapter 50 of the Brookhaven Town Code)

2.1 Environmental Protection Agency

The Noise Control Act of 1972 authorized federal agencies to address sources of noise, including motor vehicles, machinery, and other commercial products, that may endanger the health and welfare of the nation's population. The act authorized the US Environmental Protection Agency (EPA) to issue noise emission regulations for noise sources and the EPA published sound levels of noise that were requisite to protect public health under the act (USEPA 1974). These levels were issued to provide guidelines for state and local governments in setting standards. The primary responsibility of regulating noise has since been delegated to state and local governments, but the Noise Control Act of 1972 and the Quiet Communities Act of 1978 remain in effect today.

To protect public health and welfare regarding interference with outdoor activity, speech intelligibility, and annoyance, the EPA specified a day-night average sound level of 55 dB for residential areas. The EPA noise guidelines are based on chronic exposure to pervasive noise over a long period. Therefore, these guidelines are not typically applied to short-term activities, such as construction activities. As such, the EPA noise

guidelines are only considered in regard to the operational noise from the OnCS-DC at noise sensitive receptors (NSR) in residential areas.

2.2 New York State

The New York State Department of Environmental Conservation (NYSDEC) policy provides guidance on the evaluation of noise, identification of when noise levels may cause a significant environmental impact, and methods for noise impact avoidance and reduction (NYSDEC 2001). The NYSDEC policy addresses noise thresholds and mitigation for both the construction and operation phases of a proposed project. Construction activities are short-term relative to operational noise and the potential impacts are assessed separately.

The NYSDEC guidance recommends that the potential for noise impacts initially be determined by a preliminary noise assessment that considers all construction and operation activities of the project. If this assessment and the subsequent impact analysis indicates that sound levels at NSRs will be "... similar to or only slightly elevated as compared to ambient conditions," no further evaluation is required. When there is an indication that "... marginal or significant noise impact may occur," a detailed noise analysis is required that includes a more comprehensive consideration of acoustic propagation, factors such as land use, and whether or not the introduction of the noise will be "considered annoying or obtrusive." If analyses indicate that a significant noise impact may occur, NYSDEC policy requires implementation of mitigation, such as reducing noise at the source or installing noise barriers, to avoid or diminish the noise effects to acceptable levels. Best management practices (BMP) should also be considered to reduce noise by means of modifying noise-generating equipment, limiting the time of noisy operations, or relocating noise sources farther away from NSRs.

The NYSDEC policy includes guidance to assess noise impacts and determine the need for mitigation. The noise thresholds are based on the increase in the sound level from the existing level, which necessitates evaluation of pre-construction ambient (baseline) conditions. As described by NYSDEC's policy, an increase in sound level "... ranging from 0-3 dB should have no appreciable effect on receptors" and does not require mitigation. An increase of greater than 3 dB has the potential for adverse impact and may require mitigation depending on the NSRs present. Mitigation is generally needed in residential areas if a long-term increase greater than 6 dB is anticipated. An increase of 10 dB deserves consideration of avoidance and mitigation measures in most cases, including short-term construction noise at residential properties.

The addition of any noise source should not raise the ambient sound level above 65 dB in a non-industrial setting, or above 79 dB in an industrial or commercial area according to NYSDEC policy. If existing conditions exceed the threshold, the total sound level considering contributions from existing sources and expected noise sources should not exceed existing conditions. It is recommended that mitigative measures and BMPs be used to minimize the effects of construction noise if analyses show that the threshold may be exceeded.

2.3 Suffolk County

The Suffolk County Code, Chapter 618, limits the level of noise produced on County-owned properties (Suffolk 1999). It applies to sources of sound located on property owned by Suffolk County, including within the limits of the right-of-way (ROW) of any County highway. Noise from construction of the Project's Onshore Transmission Cable in County parks and along County roadways falls under Suffolk County jurisdiction.

The Suffolk County noise code specifies a maximum permissible sound level that depends on the time of day and receiving property category. The maximum permissible sound level includes both the noise emitted from the Project as well as the existing sound level. The sound level limits are 65 dB at residential property boundaries between the hours of 7:00 AM and 10:00 PM, 50 dB at residential properties between the hours of

10:00 PM and 7:00 AM, 65 dB at commercial properties (all times), and 70 dB at industrial properties (all times). The code does not specify limits for receivers on County property, and residential property limits are assumed to apply.

Noise from construction activities is exempt from the permissible limits between 7:00 AM and 6:00 PM on weekdays. Noise from construction activities must meet the permissible limits specified above between the hours of 6:00 PM and 7:00 AM the following day on weekdays, and any time on weekends or legal holidays.

2.4 Town of Brookhaven

The Town of Brookhaven's Town Code, Chapter 50, prohibits excessive noise that may jeopardize the health, welfare, or safety of the citizens or degrade the quality of life (Brookhaven 1987). This local noise code applies to sound originating from sources located within the limits of the Town of Brookhaven and applies to long-term operation and short-term construction activities associated with the Project. The ordinance specifies a maximum permissible sound level that depends on the receiving property category and time of day. The maximum permissible sound level includes both the noise emitted from the Project as well as the existing sound level and is evaluated at or within the property line of the receiving property.

To maintain compliance with the Town of Brookhaven Noise Control ordinance, long-term operation of the Project facilities would be limited to generating a sound level of 65 dB at residential properties between the hours of 7:00 AM and 10:00 PM, 50 dB at residential properties between the hours of 10:00 PM and 7:00 AM, 65 dB at commercial properties (all times), and 75 dB at industrial properties (all times). Noise from construction activities is exempt from the noise limits between 7:00 AM and 6:00 PM on weekdays. Construction activities are prohibited between the hours of 6:00 PM and 7:00 AM the following day on weekdays, and any time on weekends or legal holidays.

3.0 Methodology

This section describes the methods for conducting noise impact assessments and the assumptions regarding the onshore noise-generating components of the Project. A noise impact assessment was conducted for each onshore acoustic scenario defined in Table 1. In general, conservative assumptions of design parameters have been made to evaluate the greatest potential impact. Compliance of the proposed Project was evaluated in regard to applicable noise regulations for each scenario and strategies for mitigation were evaluated as warranted. The potential impacts from noise associated with onshore construction activities and operation of an OnCS–DC were evaluated in multiple stages which include:

- identifying NSRs;
- characterizing the existing ambient sound environment;
- predicting noise emissions from Project construction and operation;
- assessing potential impacts of noise generated by the construction and operation of the Project; and,
- evaluating the need for noise mitigation or BMPs.

The assumptions used to predict noise exposure at NSRs are presented below including the expected activities, noise sources, and emissions associated with construction and operation of the onshore components of the Project.

3.1 Existing Ambient Conditions

A comprehensive sound survey that establishes existing ambient conditions is necessary to assess the potential impacts of introducing new sources of noise. The existing (i.e., pre-construction) ambient conditions can be compared to the expected noise generated by the Project to calculate the change in sound levels and total sound levels at each NSR. In addition, existing conditions may affect the context in which noise from the Project is assessed.

Several NSRs have been identified in proximity to each of the Project sites. In most cases, the closest residential properties were the most important NSRs and additional NSRs (e.g., hospitals, hotels, and other commercial or industrial properties) were identified as necessary. Georeferenced data describing land use, property lines, and the location of potential NSRs such as public schools have been obtained from Suffolk County (Suffolk 2016). The selection of appropriate survey locations is critical for establishing accurate estimates of existing ambient conditions. Most survey locations were at a corresponding NSR location. Existing ambient conditions at NSRs in some areas were based on a measurement at a representative location nearby. For example, the ambient conditions at two neighboring parcels in a residential community may be essentially equivalent if there are no major noise sources nearby.

For the most precise assessment of existing noise and conclusions concerning potential noise impact, measurements are widely recommended (ANSI 2018; FTA 2018; NYSDEC 2001). Measurements require significant resources, however, and are often rendered impractical for a variety of reasons. Alternatively, analytical methods have been developed for estimating the long-term ambient sound pressure levels. Such methods are generally considered to be less accurate but acceptable in the absence of better data for general noise assessments and situations involving short-term activity, particularly in locations where roadways or railroads are the dominant source of ambient noise (ANSI 2018; FTA 2018). Alternative methods may even be more accurate than field survey measurements in some areas where extended measurement durations are required, such as near large airports and in natural areas, due to the strong influence of weather conditions and other factors that introduce significant variability into field survey measurement data.

Given the spatial diversity of Project activities, a hybrid approach has been used that relied on several methods to estimate the existing sound level depending on the location of and specific conditions at each NSR. Existing ambient conditions have been assessed using field measurement data at most sites including: Union Avenue North and Union Avenue South; the Landfall HDD and ICW HDD; and the eight TC locations. Analytical methods have been used to estimate existing conditions along the Onshore Transmission Cable and Onshore Interconnection Cable routes.

3.1.1 Analytical Estimates of Existing Conditions

Ambient sound levels often represent the cumulative contributions of numerous sound sources. While physical modeling of acoustic propagation is a mature science, the data and computational resources required typically limit this approach to estimate noise from a few strong sources in small urban areas such as roadways, railroads, and aircraft. Guidance from the Federal Transit Administration (FTA) describes a method to estimate a neighborhood's existing noise exposure based on proximity to nearby major roadways or railroads (FTA 2018). For NSRs in proximity to major roadways along the Onshore Transmission Cable route, the existing sound level was estimated according to FTA guidelines. The type and distance to the roadway was used to determine the daytime and nighttime sound level for each NSR. These levels conservatively underestimate existing conditions to account for the reduced precision compared to field measurements.

In areas near major airports, published aircraft noise contours are recommended to estimate the existing noise exposure. Data describing airport noise contours and road noise were acquired from the National

Transportation Noise Map, compiled by the Bureau of Transportation Statistics (BTS), a division of the US Department of Transportation (BTS 2017). Relative to other sources, airport noise did not make a significant contribution at any of the NSR locations associated with the Project. BTS data were also used to verify assumptions of the FTA roadway type. Train operations are intermittent whereas Project noise is expected to be continuous. For NSRs near the LIRR, estimates were based on field data as appropriate to avoid underestimating any potential noise impacts.

In communities far from major sources of transportation noise, contributions from numerous sources and the emergence of patterns in field measurements have suggested a statistical approach to modeling ambient sound levels. A 1974 report by the EPA determined a relationship between population density and L_{dn} (USEPA 1974). This relationship has been an accepted method of estimating community noise exposure in the absence of noise measurements for decades and has since been incorporated into standard procedures (ANSI 2018). More recently, the EPA relationship was re-analyzed with additional empirical data that confirmed its applicability and updated the relationship with a correction factor to improve its accuracy (Schomer 2011). In areas away from airports, railroad tracks, and major roadways, analytical estimates of community noise were estimated based on population density. The onshore activities and facilities of the Project will be located entirely within the Town of Brookhaven, NY. The 2018 population density for the Town of Brookhaven is 1,860 persons per square mile (Suffolk 2019). This yields an L_{dn} of 52 dB based on the updated relationship for community noise. Guidance from American National Standards Institute/Acoustical Society of America (ANSI/ASA) standards was used to estimate the expected daytime and nighttime levels from the L_{dn} (ANSI 2018).

3.1.2 Field Measurements of Existing Conditions

A field survey of ambient existing conditions onshore was performed in general accordance with ANSI/ASA standards (ANSI 2004; ANSI 2005; ANSI 2018). These standards describe recommended procedures for measurement of environmental sound for environmental assessment as well as other purposes such as noise prediction, validation, and regulation. The survey protocol also conformed to existing noise regulations and ordinances as specified by the NYSDEC (NYSDEC 2001), the relevant local communities, and other authorities as described in the Regulatory Framework section above.

NYSDEC policy requires measurements when there is concern that analytical estimates are not of sufficient accuracy. Short-term attended monitoring was used to characterize existing conditions at NSRs near sites of temporary construction activities. Short-term survey locations were sampled to characterize ambient conditions for 30 minutes or longer during both daytime and nighttime periods. Long-term measurements using continuous unattended monitoring were conducted at sites where greater accuracy was required and access was available. At sites where long-term operational noise sources are expected (i.e., the OnCS–DC), measurements were conducted over 24 hours of the day to quantify the range of existing ambient conditions during the daytime and nighttime periods. Unattended long-term measurements were also collected in Smith Point County Park due to the prevalence of natural sources of sound and expected duration of construction activities at the Landfall HDD and ICW HDD. The quietest ambient conditions usually occur during the night or early morning hours, but can occur at other times, especially in non-urban environments. At minimum, each long-term measurement occurred over at least two days to assess the variability in environmental sound levels over multiple days.

Measurements of ambient conditions were collected with sound level meters certified to have Class 1 accuracy (ANSI 2014b). A-weighted and one-third octave band sound pressure levels were measured. Sound pressure level data were logged continuously at 1-second resolution allowing for review of acceptable conditions and statistical metrics, such as percentile and continuous equivalent sound pressure levels, to be calculated as

necessary. During visits to each survey location, observations of the local weather, terrain, and prominent sound sources were recorded. Unattended long-term monitoring also included collection of high-resolution continuous audio to aid in identification of the specific sources present and interpretation of recorded data. Spurious data from anomalous events that are not representative of baseline conditions were discarded. Meteorological data were also collected on site during all measurements.

3.2 Predictive Noise Modeling

Analyses of the scenarios described in Section 1.2 were conducted to calculate the noise radiated from sources associated with the construction and operation of the Project. The results of predictive noise modeling provide the spatial distribution of the expected sound levels from proposed activities and mitigation, including sound levels at NSR locations.

3.2.1 SoundPLAN

Detailed predictive noise analyses take into account numerous factors that affect acoustic propagation. These factors include the sound power level and location of noise sources, meteorological conditions, ground cover, terrain, and intervening objects such as walls and buildings. The Project scenarios were analyzed with SoundPLAN acoustic modeling software. SoundPLAN is a standards-based software providing industrial noise calculations in accordance with all known international standards, including the International Organization for Standardization (ISO) 9613 standard for sound propagation outdoors (ISO 1996). The ISO 9613 standard describes an analytical method of calculating the attenuation of sound propagation outdoors that accounts for numerous physical effects. The results are often conservative, in part because it assumes meteorological conditions favorable to propagation such as moderate downwind conditions or a temperature inversion.

Assumptions used to assess the Project scenarios include the location, height above ground, size, and sound power level of each noise source. The schedule of activity including duration and time of day were also considered for construction scenarios. Data describing the topographic detail of local terrain was acquired from the Cornell University Geospatial Information Repository at 30-foot (ft) (9-meter [m]) resolution (CUGIR 1995). Ground type such as water, grass, paved, or gravel was inferred from satellite imagery or Project facility layouts as applicable, and absorption coefficients were specified accordingly. The interaction between structures and propagating sound was accounted for assuming a reflection loss of 1 dB. Data describing building locations and dimensions were obtained from Open Street Map (OSM 2020) and Project facility layouts. Parameters describing weather conditions were set to annual average conditions for Long Island (temperature of 52.0 degrees Fahrenheit [11 degrees Celsius] and 63 percent relative humidity). Assuming wintertime defoliate conditions, no losses were accounted for due to vegetation intervening with noise propagation. The heights of all NSRs were specified at 5 ft (1.5 m) above ground level.

3.2.2 Roadway Construction Noise Model

The Federal Highway Administration's (FHWA) Roadway Construction Noise Model (RCNM) is a national model for the prediction of construction noise (FHWA 2006). The RCNM was originally developed in support of the Central Artery/Tunnel in Boston, Massachusetts, the largest urban construction project conducted in the United States at the time. As part of that project, a construction equipment noise database was compiled that includes noise emission data and acoustical usage factors for commonly used equipment. In addition to manufacturer data, the RCNM database was used to obtain information regarding the equipment associated with all of the construction noise scenarios.

The noise levels resulting from Project construction activities will vary depending on factors such as the operations performed, environmental conditions, specific equipment model, and condition of the equipment.

RCNM provides a standard method for assessing construction noise consistent with federal guidelines. The RCNM database includes usage factors and maximum sound levels for construction equipment. The usage factor is the fraction of time that a given piece of construction equipment is operating at full power during a construction operation. The equivalent continuous sound level of construction equipment is obtained by modifying the maximum sound level by the usage factor. When available, FHWA measured sound levels from the RCNM database were used in RCNM assessments, as opposed to data sourced from manufacturer specifications.

Construction activities will introduce temporary noise that varies depending on the phase of construction and the particular onshore acoustic scenario. All equipment of a given phase of construction was assumed to be operating simultaneously and the total noise was modeled using RCNM assumptions. Construction equipment will often consist of both stationary equipment (e.g., pumps and generators), mobile equipment (e.g., loaders and jackhammers) that is expected to move around the construction site, and equipment that moves to and from the site (e.g., trucks). Per FTA guidance, equipment was assumed to operate at the center of the construction site footprint. At HDD and HAB sites, construction equipment was positioned at the center of the entry or exit pit location, as appropriate.

3.3 Construction Noise

3.3.1 OnCS–DC Construction

The phases of OnCS–DC construction generally consist of site preparation, construction of foundations and buildings, installation of equipment, and finishing. Site preparation consists of clearing, excavation, and grading. Demolition of existing buildings would also be required for the Union Avenue South site, and a chipper is anticipated for tree processing at the Union Avenue North site. Foundation work includes construction of reinforced concrete foundations for structures such as the control building, transformers, reactors, and switchgear. Installation includes construction of all underground electrical conduits and drainage systems as well as above-ground structures. The primary equipment typically used to accomplish the phases of OnCS–DC construction has been identified and alternative equipment that produces less noise may be used to accomplish the phases of OnCS–DC construction. It has been assumed that work on construction phases may occur concurrently and all construction noise sources were assumed to be operating simultaneously. The primary noise generating equipment anticipated for construction of the OnCS–DC is summarized in Table 4.

Table 4. OnCS–DC construction equipment and noise emissions.

Equipment	Utilization Factor, %	L _{Amax} at 50 ft, dB	Time	Site
Backhoe	40	77.6	Day	Both
Crane	16	80.6	Day	Both
Front End Loader	40	79.1	Day	Both
Generator	50	80.6	Day	Both
Excavator	40	80.7	Day	Both
Dump Truck	40	76.5	Day	Both
Dozer	40	81.7	Day	Both
Grader	40	85.0	Day	Both
Chipper	74	89.7	Day	Union Avenue North

Construction of the OnCS–DC is expected to take approximately 21 months. Construction activities are expected to occur primarily during the daytime, and nighttime construction activities have not been separately evaluated.

3.3.2 Onshore Cable Route Construction

Construction activities associated with installation of the Onshore Transmission Cable and Onshore Interconnection Cable will generate temporary sources of noise. The Onshore Transmission Cable route extends from the Landfall and ICW HDDs at Smith Point County Park and Smith Point Marina to the OnCS–DC and is up to 17.5 mi (28 km) long as shown in Figure 1. Two potential routes for the Onshore Interconnection Cable are currently under consideration from the OnCS–DC to the existing Holbrook Substation. Similar construction activities would be used regardless of the final route selected. The majority of the Onshore Transmission Cable and Onshore Interconnection Cable will be installed within the ROW of public roads and thus no overhead transmission infrastructure was evaluated.

Construction of an underground transmission cable generally involves removing pavement, trenching, welding and laying pipe, constructing the duct bank and vaults, installing and testing cable, and site restoration. Representative noise-generating construction equipment anticipated for the various phases of construction along the onshore route is summarized in Table 5. Work on construction phases may occur simultaneously to minimize interference with traffic, and all sources were assumed to be operating simultaneously.

Table 5. Onshore cable route construction equipment and noise emissions.

Equipment	Utilization Factor, %	L _{Amax} at 50 ft, dB	Time
Generator	50	80.6	Day
Concrete Saw	20	89.6	Day
Backhoe	40	77.6	Day
Dump Truck	40	76.5	Day
Welder / Torch	40	74.0	Day
Crane	16	80.6	Day
Concrete Truck	20	81.4	Day
Roller	20	80.0	Day
Paver	50	77.2	Day

Construction of the onshore cables is expected to take up to 21 months. Installation will progress along the cable route during this time such that exposure to construction noise at any particular location along the route will be of relatively short duration. Excluding construction activities at TCs, construction activities are expected to occur primarily during the daytime along the route. Night work may be required in some locations to alleviate disruptions to traffic and has not been separately evaluated.

3.3.3 Construction at HDD and HAB sites

Several construction sites that involve drilling operations are anticipated along the Onshore Transmission Cable and Onshore Interconnection Cable routes. Construction at the Landfall HDD is expected to occur over 5 months and construction at the ICW HDD is expected to occur over 7 months, and construction is planned to occur outside of the summer season. The construction phases at HDD and HAB sites include site preparation, drilling operations including cable installation, and restoration.

Construction activities for site preparation are anticipated at all HAB and HDD sites prior to drilling operations. Site preparation will include offloading equipment, excavating pits on either side of a crossing, and shoring. Shoring involves the installation of a temporary sheet pile anchor wall adjacent to the drilling rig to provide stability while conducting drilling activities. In addition to the anchor wall, the workspace may also require the installation of other temporary sheet piles to aid in anchoring the rig and to provide soil stabilization of the excavated area.

The phase of construction with the greatest potential for noise impacts will be the drilling operations. HDD operations are anticipated at Landfall, at the ICW, at the TC of Yaphank Creek at Montauk Highway, and at the TC of Carmans River at Montauk Highway. At the Landfall HDD and ICW HDD, the preferred entry area has been considered and noise from proposed fallback areas will be similar. HAB technology will be used for shorter crossings of roadways and the LIRR including scenarios as indicated in Table 1.

Construction sites for drilling operations consist of an entry side and exit side, and varying construction equipment and activities are at each location. The majority of equipment, including the drilling rig, is typically located at the entry side of the construction site. The noise associated with the exit side operations is generally lower than the noise generated at the entry side. Potential entry and exit locations for the TC locations along the onshore route have been selected assuming two circuits will be needed, and each will require a 48-inch casing. HAB sites assume that the casing will be at least 10 ft (3 m) below grade to clear other utilities. HDD sites assume that the casing will be 40 ft (12 m) below grade to provide no less than 20 ft (6 m) of cover while crossing the waterway. The exit side of the Landfall HDD is located approximately 0.9 mi (1.5 km) offshore. Noise from the exit side of the Landfall HDD is unlikely to significantly influence the acoustic environment onshore and is not included in this Onshore Acoustic Assessment.

Noise levels from drilling operations are dependent on the equipment used. The length of crossing, bore diameter, and ground conditions influence the type and power of the equipment required. HAB sites will require a machine that can accommodate a 48-inch casing and has sufficient power. At HDD sites, installation of a 48-inch casing will likely require a large, modular HDD rig with a trailer-mounted carriage, engine-driven hydraulic power unit, control skid, and anchorage components. The modular HDD rig is also operated in conjunction with a mud mixing/cleaning system, high volume pump, fluid and mud tanks, equipment for managing pipe, and other ancillary equipment to facilitate operations. It was assumed that a large HDD rig will be required at the Landfall HDD and the ICW HDD, whereas a typical HDD rig will be required at the TC of Yaphank Creek at Montauk Highway, at the TC of Carmans River at Montauk Highway, and at the TC locations along the Onshore Interconnection Cable routes. Expected sound power levels for suitable diesel powered HAB rigs were obtained from manufacturer data. Octave-band power levels for HDD operations were obtained from analyses of empirical data from construction sites around the United States (Burge 2009).

Drilling operations proceed through multiple stages, some of which require uninterrupted operation until complete. Since the overall operation can span multiple days, nighttime operation for this activity is expected. Construction involving the HAB and HDD equipment is assumed to occur 24 hours a day, whereas typical construction activities such as pipe assembly are expected to be limited to daytime hours. Specifically, the noise sources that operate during both day and night include the HAB or HDD rig, mud pump, and generator. The equipment that operates during the daytime varies between the entry side and exit side. The noise sources associated with the HDD entry side are the drilling rig, pumps, electric generators, crane, loaders, dump trucks, trailer trucks, and welders. The noise sources associated with the exit side include pumps, electric generators, crane, and backhoe. Representative noise-generating construction equipment anticipated at HDD and HAB sites is summarized in Table 6. Excluding the drilling rigs, sound levels and usage factors of construction equipment were acquired from RCNM.

Table 6. HDD and HAB construction equipment and noise emissions.

Activity	Equipment	Utilization Factor, %	L _{Amax} at 50 ft, dB	Time
Site Preparation	Generator	50	80.6	Day
	Crane	16	80.6	Day
	Impact Pile Driver	20	101.3	Day
	Excavator	40	80.7	Day

Activity	Equipment	Utilization Factor, %	L _{Amax} at 50 ft, dB	Time
	Dump truck	40	76.5	Day
	Flat Bed Truck	40	74.3	Day
	Jackhammer	20	88.9	Day
Drilling Operations (entry side)	HAB Rig	100	75.0	Day and Night
	HDD Rig, large	100	86.3	Day and Night
	HDD Rig, typical	100	74.3	Day and Night
	Pumps	50	80.9	Day and Night
	Generator	50	80.6	Day and Night
	Crane	16	80.6	Day
	Dump Truck	40	76.5	Day
	Flat Bed Truck	40	74.3	Day
	Front End Loader	40	79.1	Day
Drilling Operations (exit side)	Pumps	50	80.9	Day and Night
	Generator	50	80.6	Day and Night
	Crane	16	80.6	Day
	Backhoe	40	77.6	Day
	Welder / Torch	40	74.0	Day

After drilling operations are completed, all work areas and temporary laydown yards will be graded, backfilled, and returned to pre-construction conditions in accordance with landowner requests and permit requirements. Noise from this phase will be limited to typical construction activities associated with equipment such as tracked graders, backhoes, and trucks, and is not separately addressed in this Onshore Acoustic Assessment.

3.4 Operational Noise

The OnCS–DC is the only evaluated onshore Project component that will generate noise during operation. There is no long-term operational noise associated with the Onshore Transmission Cable or the Onshore Interconnection Cable. Operational noise from a single OnCS–DC at either one of the two locations (Union Avenue North or Union Avenue South) is anticipated. Design drawings describing the layout of equipment and buildings for each scenario were directly imported into geographic information system and SoundPLAN modeling software. The final layout will depend on local environmental conditions and may vary based on subsequent engineering design.

The most prominent noise sources of an OnCS–DC are the converter transformers, reactors, filters, and outdoor heating, ventilation, and air conditioning (HVAC) equipment associated with the valve hall. Other noise sources such as corona sources, switching devices, generators, DC equipment, and thyristor valves are transient, insulated within buildings, or otherwise do not typically make significant contributions to the overall equivalent continuous sound level. A preliminary design describing the components and layout of an OnCS–DC has been completed. The primary noise generating components of the OnCS–DC and corresponding A-weighted sound power levels are summarized in Table 7. Predictive models assumed simultaneous operation

of the transformers and other prominent OnCS–DC components under maximum operating conditions, and operational noise was assumed to be constant over 24 hours of the day.

Table 7. OnCS–DC components and sound power levels.

Component		Quantity	L _w , dB
Converter Transformer (single phase)		3	112
Shunt Reactors (fixed and variable)		4	100
Harmonic Filters	Alternating Current Filter Reactor	6	90
	Alternating Current Filter Capacitor Stack	6	105
Valve Cooling Tower		1	105

National Electrical Manufacturers Association (NEMA) standards establish ratings to designate the maximum noise level radiated from electrical components, and it is anticipated that components installed as part of the Project will conform to relevant Institute of Electrical and Electronics Engineers (IEEE) and NEMA standards. At this time, elements of the OnCS–DC design including specific equipment models have not been specified and the corresponding NEMA ratings are not available. The sound power level of the converter transformers was calculated from the anticipated electric power capacity and device dimensions, and octave band spectra were estimated from established guidelines based on representative equipment (CIGRÉ 2002; CROCKER 2007). Estimated sound power levels of the reactors, harmonic filters, and cooling tower were based on measurement data from representative equipment (CIGRÉ 2002). Valves, DC equipment, and harmonic filters were assumed to be located indoors, and all buildings were assumed to consist of heavy, acoustically damped walls and roof. Building heights were estimated based on the components and typical configurations.

As the OnCS–DC design advances, it is expected that specific electrical components will be identified that have specifications meeting the assumptions used in this Onshore Acoustic Assessment such that operational noise from the OnCS–DC will be consistent with the results presented herein. Alternatively, this noise study may be continued based on additional data describing the proposed Project; potential refinement of this study could include a reevaluation of operational OnCS–DC noise and whether additional mitigative measures may be necessary.

4.0 Existing Conditions

This section presents the results of the field survey of existing ambient conditions, locations of NSRs, and the existing conditions at NSRs used to assess potential noise impacts.

4.1 Field Survey Results

A field survey of ambient existing conditions was conducted at 11 locations according to the methods described in Section 3.1.2. Unattended long-term monitoring was conducted at two survey locations (SL-1 and SL-2) and short-term attended monitoring was conducted at nine survey locations (SS-3 to SS-11) from September 23 to September 26, 2020. Given the potential for 24-hour activity (operation and/or construction) at Project sites, both day (7:00 AM to 6:00 PM) and night (10:00 PM to 7:00 AM) conditions were assessed at short-term survey locations. The locations of the field survey measurements appear in Figure 4 through Figure 12.

Pertinent observations and details of the equipment, measurements, survey sites, and conditions prevailing during the survey were recorded. The survey was conducted with Larson Davis Model 831 sound level meters and PCB 377C20 random incidence microphones. Laboratory calibration certificates are provided in Appendix A. Instruments were field calibrated before and after each measurement with a Larson Davis CAL200 Acoustic

Calibrator. Per ANSI standards, the microphone was mounted on a tripod at a height of approximately 5 ft (1.5 m) and positioned to minimize the influence of large reflecting surfaces and nearby noise sources such as roadways.

The local wind velocity, air temperature, relative humidity, and precipitation was measured on site with a Vaisala WXT-536 Weather Sensor. The weather during the survey provided conditions suitable for environmental sound measurements. In general, atmospheric conditions were calm with partly cloudy skies during the day and overcast skies at night. There was no precipitation during the survey period. The average wind speed was 1 mi per hour (MPH) (0.4 m per second [m/s]) with a maximum of 5 MPH (2 m/s) during the daytime measurements. The air temperature ranged from 54 degrees Fahrenheit (12 degrees Celsius) at night to 78 degrees Fahrenheit (26 degrees Celsius) during the day, and the average relative humidity was 73 percent.

The existing sound levels (L_{ANS}) at survey locations ranged between 45 to 65 dB during the day and 35 to 64 dB at night. L_{ANS} was used to characterize existing conditions at NSRs due to the significant influence of insects, birds, leaf rustle, and other natural sources of sound on the A-weighted sound level measurements during the field survey. Use of L_{ANS} circumvents the distortion of measurement data by high frequency natural sounds on L_A while having a minimal effect when these sounds are not present (ANSI 2014a). Table 8 presents a summary of the existing ambient conditions during day and night periods at survey locations described by A-weighted and ANS-weighted equivalent continuous levels as well as A-weighted percentile levels. Additional field survey data including one-third octave band spectra and hourly history of the measurements from unattended long-term survey locations are presented in Figure 2 and Figure 3.

Table 8. Field survey measurements of existing ambient conditions.

Survey Site	Survey Location	Time period	L_A , dB	L_{ANS} , dB	L_{10} , dB	L_{50} , dB	L_{90} , dB
SL-1	Smith Point County Park	Day	52	50	51	47	46
		Night	50	44	50	48	45
SL-2	Union Avenue North	Day	57	56	59	55	52
		Night	58	52	58	57	55
SS-3	36 Peters Drive	Day	55	45	57	54	53
		Night	59	35	60	59	58
SS-4	87 Northern Boulevard	Day	56	56	58	52	50
		Night	56	50	56	55	54
SS-5	North of Smith Road and Montauk Highway	Day	63	61	64	61	58
		Night	52	50	55	48	45
SS-6	39 Yaphank Avenue	Day	68	65	69	67	66
		Night	65	63	67	64	61
SS-7	55 Yaphank Avenue	Day	60	59	63	58	55
		Night	49	48	52	46	43
SS-8	748 Long Island Avenue	Day	56	55	57	55	53
		Night	58	58	61	57	54
SS-9	78 Avenue C	Day	59	57	58	56	54
		Night	61	61	63	61	60
SS-10	199 Morris Avenue	Day	54	52	55	50	48
		Night	65	64	67	64	60

Survey Site	Survey Location	Time period	LA, dB	LANS, dB	L10, dB	L50, dB	L90, dB
SS-11	152 Fairfield Drive East	Day	61	60	66	57	53
		Night	57	54	56	53	52

4.2 Union Avenue Sites

There are two sites under consideration for the OnCS-DC, both located on Union Avenue in the Town of Brookhaven. One location is located north of Union Avenue (Union Avenue North site) and is bordered by the LIE to the north, a New York Power Authority (NYPA) generation facility to the east and west, and land zoned as industrial to the south. The other site is located south of Union Avenue (Union Avenue South site). The site is bordered by utilities to the north, land zoned as industrial to the east and west, and the LIRR to the south.

Figure 4 shows the locations of field survey measurements, NSRs, and other features in the vicinity of the proposed OnCS-DC sites at Union Avenue. Land zoned as utilities or transportation was categorized as industrial in regard to the applicable regulations. The closest residential NSRs to the Union Avenue North site are properties located to the east on Morris Avenue and are approximately 1,300 ft (396 m) distant. Nearby residential properties are also located to the south on Fairfield Drive East; these are the closest NSRs to the Union Avenue South site and are also approximately 1,300 ft (396 m) distant.

The NSR locations and the existing sound levels at these locations are summarized in Table 9. Field measurements of existing ambient conditions were conducted at four survey locations near the Union Avenue North and Union Avenue South sites. Existing ambient conditions at survey locations were influenced by typical community noise sources such as road traffic. Other prominent sources of sound at survey locations were insects, birds, leaf rustle, and noise from nearby industrial facilities. Existing ambient conditions at NSRs were associated with representative survey measurements as shown in Table 9. Existing conditions exceeded the nighttime permissible sound level limits for operational noise per the Town of Brookhaven noise code and the day-night average sound level as specified by the EPA at NSRs in residential areas.

Table 9. NSRs in the vicinity of the Union Avenue sites and existing conditions.

NSR	NSR Location	Category	Survey Location	Day LANS, dB	Night LANS, dB
UA-1	140 Morris Avenue	Residential	SS-9	57	61
UA-2	191 Morris Avenue	Residential	SL-2	56	52
UA-3	193 Morris Avenue	Residential	SL-2	56	52
UA-4	195 Morris Avenue	Residential	SL-2	56	52
UA-5	197 Morris Avenue	Residential	SL-2	56	52
UA-6	199 Morris Avenue	Residential	SL-2	56	52
UA-7	647 Union Avenue	Residential	SL-2	56	52
UA-8	2 Lindsey Place	Residential	SS-11	60	54
UA-9	201 Fairfield Drive East	Residential	SS-11	60	54
UA-10	202 Fairfield Drive East	Residential	SS-11	60	54
UA-11	152 Fairfield Drive East	Residential	SS-11	60	54
UA-12	23 Trail Blazer Court	Residential	SL-2	56	52
UA-13	35 Jenna Court	Residential	SL-2	56	52
UA-14	568 Union Avenue	Residential	SL-2	56	52
UA-15	610 Union Avenue	Industrial	SL-2	56	52

NSR	NSR Location	Category	Survey Location	Day L _{ANS} , dB	Night L _{ANS} , dB
UA-16	614 Union Avenue	Industrial	SL-2	56	52
UA-17	607 Union Avenue	Industrial	SL-2	56	52

4.3 Suffolk County Parks

Landfall HDD construction is anticipated to occur within the paved parking lot at Smith Point County Park on Fire Island. The ICW HDD will route the Onshore Transmission Cable across the ICW from the entry site located at the paved parking lot within Smith Point Marina to the exit site located at the west end of Smith Point County Park. Both SCP are managed by Suffolk County and are zoned as Preserved Recreation and Open Space.

Figure 5 shows the locations of field survey measurements and seven NSRs in the vicinity of the Landfall HDD and ICW HDD construction sites. The Smith Point County Park campground is approximately 500 ft (152 m) east of the Landfall HDD construction site. The western boundary of Smith Point County Park is shared with Fire Island National Seashore, which is managed by the National Park Service (NPS). This adjacent section of Fire Island is federally designated wilderness (Otis Pike Fire Island High Dune Wilderness). Several NSRs were identified in proximity to the entry site of the ICW HDD at the closest property line of nearby residences; the closest NSR was approximately 900 ft (274 m) away.

The NSR locations in the vicinity of SCPs and the existing sound levels at these locations are summarized in Table 10. Field measurements of existing ambient conditions were conducted at two survey locations near the Landfall HDD and ICW HDD construction sites. Existing ambient conditions at survey locations were influenced by typical community noise sources such as road traffic. Other prominent sources of sound at survey locations were insects, birds, ocean surf, watercraft, and general aviation. Existing ambient conditions at NSRs were associated with representative survey measurements as shown in Table 10.

Table 10. NSRs in the vicinity of SCPs and existing conditions.

NSR	NSR Location	Category	Survey Location	Day L _{ANS} , dB	Night L _{ANS} , dB
SCP-1	Smith Point County Park, campground	Natural	SL-1	50	44
SCP-2	Smith Point County Park, at NPS boundary	Natural	SL-1	50	44
SCP-3	36 Peters Drive	Residential	SS-3	45	35
SCP-4	100 Lombardy Drive	Residential	SL-1	50	44
SCP-5	55 William Floyd Parkway	Residential	SL-1	50	44
SCP-6	8 Bay Fair Drive	Residential	SL-1	50	44
SCP-7	14 Huntington Drive	Residential	SS-3	45	35

4.4 Onshore Cable Routes

The Onshore Transmission Cable route extends from the TJB at the Landfall HDD to the OnCS–DC through the Town of Brookhaven. The most critical NSRs are the residential properties that directly abut the Onshore Transmission Cable route. The existing sound level at most NSRs was estimated to be 50 dB during the day and 44 dB during the night per methods for predicting community noise described in Section 3.1.1.

There are two major roadways within close proximity to the Onshore Transmission Cable route, and existing conditions at nearby NSRs are expected to vary with proximity to the roadway. The LIE was categorized as an ‘interstate highway’ by the FTA method. The closest NSRs are approximately 135 ft (41 m) from the property

line to the geometric mean of the LIE and existing sound levels were estimated to be 65 dB during the day. NYS Route 27 (Sunrise Highway) was categorized as an 'other roadway' according to the FTA method. The closest NSR is approximately 220 ft (67 m) from the property line to the geometric mean of this roadway and existing ambient sound levels were estimated to be 55 dB during the day.

The NYSDEC policy specifies a sound level limit of 65 dB for construction noise in residential areas. If existing ambient sound levels exceed this limit, the policy is to not exceed existing conditions. Excluding activity at TC locations, the same noise sources will be involved in installing the Onshore Transmission Cable along the route. Therefore, while the existing noise level varies with location along the Onshore Transmission Cable route, the construction activities must satisfy the same noise limits along the entire route. Because existing ambient sound levels at residential areas along the Onshore Transmission Cable route were estimated to not exceed 65 dB, the daytime construction noise limit is 65 dB per NYSDEC policy.

The Onshore Interconnection Cable route is expected to proceed primarily along the LIE Service Road or Union Avenue. Union Avenue is a neighborhood street that is not classified as a major roadway. Existing conditions at NSRs are expected to vary with proximity to the LIE. The closest NSRs are approximately 200 ft (61 m) from the property line to the geometric mean of the LIE and existing sound levels were estimated to be 65 dB during the day by the FTA method. Therefore, the permissible sound limit for construction along the Onshore Interconnection Cable route is identical to the Onshore Transmission Cable route. The expectation is that existing sound levels do not exceed 65 dB during the daytime at residential NSRs and the daytime construction noise limit is 65 dB per NYSDEC policy.

4.5 Trenchless Crossings

Construction using TC technologies (HAB and HDD) is anticipated along the Onshore Transmission Cable and Onshore Interconnection Cable routes at locations where the routes cross the LIRR, Carmans River, and specific roads as identified in Table 1. In total, 63 NSRs were identified at the eight TC locations. At each TC, the most critical NSRs were identified based on land use and the expected locations of the drilling operation entry and exit pits. Most nearby properties are zoned as residential, although commercial, industrial, open space, and federally-managed natural areas are also in close proximity to construction sites at some TCs. The locations of most NSRs were conservatively identified at the property line nearest to the construction site as appropriate.

The NSR locations in proximity to TCs and estimated existing ambient levels at these locations are summarized in Table 11. Field measurements were conducted at one or more survey locations near each TC. The locations of NSRs and field survey measurements in the vicinity of TC1 through TC8 are shown in Figure 6 through Figure 13, respectively. Existing ambient conditions at survey locations were strongly influenced by typical community noise sources such as road traffic. Other prominent sources of sound at survey locations were insects, birds, and landscaping equipment. Noise from the LIRR was not present during the short-term measurements. Existing ambient conditions at most NSRs were associated with representative survey measurements as shown in Table 11. Existing conditions exceeded the nighttime permissible sound level limits for construction noise per the Suffolk County noise code at NSRs associated with TC3. Several NSRs along the Onshore Interconnection Cable route are in close proximity to the LIE and the existing conditions at these NSRs (a subset of NSRs associated with TC6 and TC7) were estimated by the FTA method as indicated in Table 11.

Table 11. NSRs in the vicinity of TCs and existing conditions.

NSR	NSR Location	Category	Survey Location	Day L _{ANS} , dB	Night L _{ANS} , dB
TC1-1	83 Northern Boulevard	Residential	SS-4	56	50
TC1-2	49 Northern Boulevard	Residential	SS-4	56	50
TC1-3	152 Mastic Boulevard East	Residential	SS-4	56	50
TC1-4	130 Mastic Boulevard West	Residential	SS-4	56	50
TC1-5	532 William Floyd Parkway	Commercial	SS-4	56	50
TC2-1	2976 Montauk Highway	Residential	SS-5	61	50
TC2-2	2964 Montauk Highway	Residential	SS-5	61	50
TC2-3	2958 Montauk Highway	Residential	SS-5	61	50
TC2-4	2956 Montauk Highway	Residential	SS-5	61	50
TC2-5	52 River Road	Residential	SS-5	61	50
TC2-6	35 River Road	Residential	SS-5	61	50
TC2-7	393 Smith Road	Commercial	SS-5	61	50
TC2-8	383 Smith Road	Residential	SS-5	61	50
TC3-1	39 Yaphank Avenue	Residential	SS-6	65	63
TC3-2	29 Yaphank Avenue	Residential	SS-6	65	63
TC3-3	28 Yaphank Avenue	Residential	SS-6	65	63
TC3-4	38 Yaphank Avenue	Residential	SS-6	65	63
TC3-5	43 Yaphank Avenue	Residential	SS-6	65	63
TC3-6	45 Yaphank Avenue	Residential	SS-6	65	63
TC4-1	70 Horseblock Road	Commercial	SS-7	59	48
TC4-2	481 Horseblock Road	Residential	SS-7	59	48
TC4-3	80 Yaphank Avenue	Residential	SS-7	59	48
TC4-4	28 Williamsburg Way	Residential	SS-7	59	48
TC4-5	32 Williamsburg Way	Residential	SS-7	59	48
TC4-6	34 Williamsburg Way	Residential	SS-7	59	48
TC4-7	524 Horseblock Road	Residential	SS-7	59	48
TC4-8	55 Yaphank Avenue	Residential	SS-7	59	48
TC5-1	748 Long Island Avenue	Commercial	SS-8	55	58
TC5-2	766 Long Island Avenue	Residential	SS-8	55	58
TC5-3	745 Long Island Avenue	Residential	SS-8	55	58
TC5-4	749 Long Island Avenue	Residential	SS-8	55	58
TC5-5	21 Manor Road	Commercial	SS-8	55	58
TC6-1	1 Zebra Plaza	Commercial	FTA	60	55
TC6-2	52 Lakeside Drive	Residential	SS-9	57	61
TC6-3	60 Lakeside Drive	Residential	SS-9	57	61
TC6-4	140 Morris Avenue	Residential	FTA	55	50
TC6-5	5276 Express Drive North	Commercial	FTA	60	55
TC6-6	178 Morris Avenue	Industrial	FTA	55	50
TC6-7	182 Morris Avenue	Industrial	FTA	55	50
TC6-8	191 Morris Avenue	Residential	SL-2	56	52

NSR	NSR Location	Category	Survey Location	Day L _{ANS} , dB	Night L _{ANS} , dB
TC7-1	41 Avenue C	Residential	FTA	55	50
TC7-2	49 Avenue C	Residential	FTA	60	55
TC7-3	53 Avenue C	Residential	FTA	60	55
TC7-4	63 Avenue C	Residential	FTA	60	55
TC7-5	67 Avenue C	Residential	FTA	60	55
TC7-6	71 Avenue C	Residential	SS-9	57	61
TC7-7	30 Lakeside Drive	Residential	SS-9	57	61
TC7-8	38 Lakeside Drive	Residential	SS-9	57	61
TC7-9	1 Zebra Plaza	Commercial	FTA	60	55
TC8-1	24 Old South Country Road	Residential	SS-5	61	50
TC8-2	36 Old South Country Road	Residential	SS-5	61	50
TC8-3	46 Old South Country Road	Residential	SS-5	61	50
TC8-4	2797 Montauk Highway	Residential	SS-7	59	48
TC8-5	2793 Montauk Highway	Residential	SS-7	59	48
TC8-6	2785 Montauk Highway	Residential	SS-7	59	48
TC8-7	2777 Montauk Highway	Residential	SS-7	59	48
TC8-8	2769 Montauk Highway	Residential	SS-7	59	48
TC8-9	2761 Montauk Highway	Residential	SS-7	59	48
TC8-10	14 Old South Country Road	Residential	SS-7	59	48
TC8-11	2747 Montauk Highway	Residential	SS-7	59	48
TC8-12	2731 Montauk Highway	Residential	SS-7	59	48
TC8-13	2729 Montauk Highway	Residential	SS-7	59	48
TC8-14	2714 Montauk Highway	Commercial	SS-7	59	48

5.0 Impact Assessment

5.1 Construction Noise at Union Avenue Sites

5.1.1 Union Avenue North

During the day, construction noise is exempt from both the Town of Brookhaven and Suffolk County noise ordinances. Existing conditions have been estimated at NSRs in the vicinity of Union Avenue North, and construction noise should be limited to 65 dB at residential properties and 79 dB at industrial properties per NYSDEC policy. OnCS–DC construction noise is expected to exceed the NYSDEC criterion of 79 dB at nearby NSRs in industrial areas if unmitigated. Therefore, mitigative measures are warranted at Union Avenue North. BMPs will also be implemented to minimize the noise generated per NYSDEC policy. A temporary noise barrier approximately 10 ft (3 m) high should be installed on the northern and western perimeter of the construction site. There are several potential approaches to configure an adequate noise barrier. Acoustical insulation that consists of a sound absorptive material bonded to a mass-loaded vinyl curtain may be attached to a chain link fence in overlapping sections. Alternatively, a cost-effective barrier system could be constructed of 1-inch-thick plywood panels. The inside surface of the barrier should be covered with sound absorptive material (such as 2-inch-thick fiberglass duct board) over at least 50 percent of the area.

Figure 14 presents the predicted daytime sound levels due to construction at Union Avenue North. Table 12 summarizes the estimated daytime sound levels due to existing conditions, Project activities, and contributions from both (i.e., the predicted total sound level) at the Union Avenue NSRs. These results provide an indication of the level of noise that can be expected with application of the proposed mitigative measures and show that construction activities will comply with NYSDEC policy after implementing mitigative measures.

Table 12. OnCS–DC construction noise at Union Avenue North.

NSR	Existing		Project	Total		Increase	
	Day L _A , dB	Night L _A , dB	L _A , dB	Day L _A , dB	Night L _A , dB	Day L _A , dB	Night L _A , dB
UA-1	57	61	49	58	61	1	0
UA-2	56	52	54	58	52	2	0
UA-3	56	52	58	60	52	4	0
UA-4	56	52	57	60	52	4	0
UA-5	56	52	52	58	52	2	0
UA-6	56	52	56	59	52	3	0
UA-7	56	52	54	58	52	2	0
UA-8	60	54	51	60	54	0	0
UA-9	60	54	52	61	54	1	0
UA-10	60	54	51	61	54	1	0
UA-11	60	54	54	61	54	1	0
UA-12	56	52	41	56	52	0	0
UA-13	56	52	47	57	52	1	0
UA-14	56	52	49	57	52	1	0
UA-15	56	52	66	66	52	10	0
UA-16	56	52	62	63	52	7	0
UA-17	56	52	78	78	52	22	0

5.1.2 Union Avenue South

OnCS–DC construction at Union Avenue South will generate a sound level of approximately 86 dB at a distance of 50 ft (15 m) from the center of construction activities. During the day, construction noise is exempt from both the Town of Brookhaven and Suffolk County noise ordinances. Existing conditions have been estimated at NSRs in the vicinity of Union Avenue South, and construction noise should be limited to 65 dB at residential properties and 79 dB at industrial properties per NYSDEC policy. Assuming conditions favorable to noise propagation, construction would exceed 65 dB at distances less than 550 ft (168 m) and 79 dB at distances less than 110 ft (34 m). Table 13 summarizes the expected OnCS–DC construction noise at distances from construction at Union Avenue South.

Table 13. OnCS–DC construction noise at Union Avenue South.

Distance, ft (m)	L _A , dB
50 (15)	86
110 (34)	79
550 (168)	65

The closest residential NSR is approximately 1,300 ft (396 m) away from the center of construction activities at Union Avenue South. Construction would generate noise of approximately 58 dB at the closest residential NSR and lower levels at all other NSRs in residential areas. The closest industrial property is approximately 220 ft (67 m) away from the center of construction activities at Union Avenue South. Construction will generate a sound level of approximately 73 dB at the closest industrial NSR. This evaluation indicates that construction noise at Union Avenue South would not exceed permissible sound level limits at NSRs. As noise from OnCS–DC construction will be below applicable criteria, mitigation to attenuate construction noise is not warranted. Construction noise is expected to exceed 65 dB at nearby industrial NSRs and BMPs will be implemented to minimize noise per NYSDEC policy.

5.2 Construction Noise at HDD and HAB Sites

Nine scenarios involving drilling operations have been evaluated per Table 1, including HDD construction at SCPs and HDD or HAB construction at eight TC locations along the Onshore Transmission Cable and Onshore Interconnection Cable routes. During the day, construction noise is exempt from both the Town of Brookhaven and Suffolk County noise criteria. Daytime construction noise limits per NYSDEC policy are 65 dB in residential areas and 79 dB in commercial and industrial areas as described above. Some HDD construction equipment will require continuous (24-hour) operation including the drilling rig, pumps, and generators. Construction is prohibited by the Town of Brookhaven’s policy at night. Nighttime construction activities will impose noise limits from Suffolk County regulations when the noise source is located in SCPs and within the limits of the ROW of a County highway. Therefore, Suffolk County regulations apply to construction at the Landfall HDD, ICW HDD, and at TC1, TC2, TC3, TC4, and TC8.

5.2.1 Site Preparation

Noise from site preparation was estimated to produce a sound level of 94 dB at a distance of 50 ft (15 m) from the center of HDD and HAB construction activities. Given the proximity of NSRs at many TCs, noise from site preparation will exceed the NYSDEC criterion of 65 dB in nearby residential areas if unmitigated. At some TCs, the NYSDEC criterion of 79 dB in commercial areas will also be exceeded. Site preparation activities associated with the installation of sheet piling is expected to take approximately two days. While these construction activities are short term, the mitigative measures described herein are warranted to attenuate construction noise at NSRs.

The pile driver used for installation of shoring is likely to be the dominant noise source during site preparation. Impact pile-driving should be avoided whenever possible in favor of vibratory or other driving methods where the geological conditions permit their use. An impact or vibratory pile driver should be completely shielded within an acoustically-treated enclosure. Typically, the acoustically-treated enclosure is a long steel box lined with sound absorptive material that may include a mass-loaded vinyl curtain attached at the bottom to completely enclose the pile driving equipment. Further noise reduction may be achieved by applying suitable absorptive materials (i.e., an impact cushion) to piles and equipping the diesel-engine-driven hydraulic pump with a more effective muffler. Alternatively, use of a bore piling rig and augured holes for cast-in-place piles is another approach that can produce noise levels significantly lower than vibratory pile driving, and an enclosure may not be necessary.

After implementing noise control strategies for pile driving, site preparation is expected to produce a total sound level of approximately 84 dB at 50 ft (15 m). Assuming conditions favorable to noise propagation, construction would exceed 65 dB at distances less than 460 ft (140 m). Permissible noise limits are not expected to be exceeded at the Landfall HDD, the ICW HDD, or TC locations along the Onshore Interconnection Cable route. Construction noise from site preparation would exceed NYSDEC criteria at nearby NSRs for all TC locations

along the Onshore Transmission Cable route. Therefore, BMPs for construction as outlined in Section 6 will be implemented to further reduce noise levels at these sites. BMPs will also be implemented at TC6 along the Onshore Interconnection Cable route. At sites where noise barriers or other mitigative measures are planned for subsequent drilling operations (as described below in Section 5.2.2 Drilling Operations), the barriers should be erected prior to construction and quiet technology utilized to also reduce noise impacts from site preparation. As the activities associated with site preparation are anticipated to be of relatively short duration and limited to the daytime hours, this construction is not expected to cause an adverse impact after implementing mitigative measures.

5.2.2 Drilling Operations

Unmitigated, construction activities will result in significant increases in the sound level at many nearby NSRs. At the Landfall HDD, ICW HDD, and all TC locations along the Onshore Transmission Cable route involving HDD or HAB construction, noise limits would be exceeded at one or more NSRs per NYSDEC policy, Suffolk County policy, or both criteria. Therefore, the following mitigative measures are warranted at HAB and HDD sites to attenuate construction noise from drilling operations at NSRs. Construction noise from TC7 along the Onshore Interconnection Cable route is not expected to exceed permissible sound level limits at NSRs and mitigation or implementation of BMPs is not warranted.

The noise mitigation plan for drilling operations at HDD and HAB sites should include acoustically-treated construction equipment. Quiet technology pumps and generators that are designed with a complete sound attenuating enclosure and include exhaust mufflers will provide a noise reduction of 15 to 20 dB over standard models. A quieter HDD rig should be used that incorporates engine exhaust silencers and partial noise barriers around the hydraulic power unit, engine jacket-water coolers, and mud mixing/cleaning system. Employing full enclosures for HDD equipment is typically not feasible due to cooling requirements and costs. At HAB sites, a newer model HAB rig should be used which is up to 15 dB quieter than typical older rigs.

At specified HDD and HAB sites, a temporary noise barrier system should also be installed around the perimeter of the construction site to reduce the noise of drilling operations. There are several potential approaches to configure an adequate noise barrier. Acoustical insulation that consists of a sound absorptive material bonded to a mass-loaded vinyl curtain may be attached to a chain link fence in overlapping sections. A cost-effective barrier system could be constructed of 1-inch-thick plywood panels up to 16 ft (5 m) high. The inside surface of the barrier should be covered with sound absorptive material (such as 2-inch-thick fiberglass duct board) over at least 50 percent of the area. Other material may be conveniently utilized for portions of the temporary barrier such as hay bales or the strategic placement of mobile storage tanks and site storage containers, as practical. Alternatively, a large acoustically-lined tent may be used to enclose the workspace, although this must accommodate access by mobile equipment and typically requires a large area. The mitigation required for each scenario involving drilling operations is summarized in Table 14.

Table 14. Mitigation strategies for drilling operations at HBB and HDD sites.

Scenario	Mitigation
Landfall HDD construction at Smith Point County Park	<ul style="list-style-type: none"> • Acoustically treated HDD rig • Quiet technology pumps and generators
ICW HDD construction at Smith Point Marina	<ul style="list-style-type: none"> • Acoustically treated HDD rig • Quiet technology pumps and generators • BMPs for exit side operations

Scenario	Mitigation
HAB construction at LIRR and William Floyd Parkway (TC1)	<ul style="list-style-type: none"> • Newer HAB rig • Quiet technology pumps and generators • Partial noise barriers surrounding both entry and exit side operations, at least 12 ft (4 m) tall • BMPs
HDD construction at Carmans River and Montauk Highway (TC2)	<ul style="list-style-type: none"> • Acoustically treated HDD rig • Quiet technology pumps and generators • Partial barrier for entry side operations, at least 12 ft (4 m) tall • BMPs
HAB construction at Sunrise Highway and Yaphank Avenue (TC3)	<ul style="list-style-type: none"> • Newer HAB rig • Quiet technology pumps and generators • Partial noise barriers surrounding both entry and exit side operations, at least 12 ft (4 m) tall • BMPs
HAB construction at Horseblock Road and Yaphank Avenue (TC4)	<ul style="list-style-type: none"> • Newer HAB rig • Quiet technology pumps and generators • BMPs
HAB construction at LIRR and Manor Road (TC5)	<ul style="list-style-type: none"> • Newer HAB rig • Quiet technology pumps and generators • BMPs
HDD construction at LIE East (TC6)	<ul style="list-style-type: none"> • No mitigation required for drilling operations • BMPs
HDD construction at LIE West (TC7)	<ul style="list-style-type: none"> • No mitigation required for drilling operations
HDD construction at Yaphank Creek and Montauk Highway (TC8)	<ul style="list-style-type: none"> • Acoustically treated HDD rig • Quiet technology pumps and generators • Partial noise barriers surrounding both entry and exit side operations, at least 12 ft (4 m) tall

Table 15, Table 16, and Table 17 summarize the estimated day and night sound levels due to existing conditions, Project activities, and contributions from both (i.e., the predicted total sound level) at the NSRs for scenarios involving drilling operations. Figure 15 through Figure 24 present the predicted daytime sound levels due to construction activities. These results provide an indication of the level of noise that can be expected with application of the proposed mitigative measures described in Table 14. If drilling operations at two sites were to occur simultaneously, the total sound level at some NSRs would increase, but the increase would not require any changes to the mitigative measures specified.

BMPs for construction activities as outlined in Section 6 will also be implemented for the scenarios designated in Table 14 to further minimize the total sound level. At NSRs associated with TC1, TC2, TC3, and TC4, existing conditions are equivalent to one or more permissible sound level limits for construction noise, and existing conditions exceed the nighttime permissible sound level limits for construction noise per the Suffolk County noise code at NSRs associated with TC3. After implementing feasible noise controls, construction activity at TC1, TC2, and TC3 is expected to exceed the permissible sound level specified by Suffolk County. BMPs have been recommended to further attenuate noise levels at NSRs associated with TC1, TC2, and TC3. BMPs were also specified for TC4, TC5, and TC6 to further reduce noise in industrial and commercial areas per NYSDEC policy. BMPs were recommended for exit side operations of the ICW HDD in consideration of the sensitive nature of designated wilderness areas adjacent to Project activities.

Table 15. Landfall HDD construction noise.

NSR	Existing		Project		Total	
	Day L _A , dB	Night L _A , dB	Day L _A , dB	Night L _A , dB	Day L _A , dB	Night L _A , dB
SCP-1	50	44	49	44	52	47
SCP-2	50	44	37	33	50	44
SCP-3	45	35	27	23	45	35
SCP-4	50	44	28	24	50	44
SCP-5	50	44	34	29	50	44
SCP-6	50	44	34	30	50	44
SCP-7	45	35	38	34	46	38

Table 16. ICW HDD construction noise.

NSR	Existing		Project		Total	
	Day L _A , dB	Night L _A , dB	Day L _A , dB	Night L _A , dB	Day L _A , dB	Night L _A , dB
SCP-1	50	44	31	24	50	44
SCP-2	50	44	57	44	58	47
SCP-3	45	35	38	34	46	37
SCP-4	50	44	40	36	50	44
SCP-5	50	44	49	45	52	47
SCP-6	50	44	50	46	53	48
SCP-7	45	35	29	24	45	35

Table 17. HAB and HDD construction noise at TCs along onshore cable routes.

NSR	Existing		Project		Total	
	Day L _A , dB	Night L _A , dB	Day L _A , dB	Night L _A , dB	Day L _A , dB	Night L _A , dB
TC1-1	56	50	46	32	56	50
TC1-2	56	50	54	40	58	50
TC1-3	56	50	57	44	60	51
TC1-4	56	50	46	32	56	50
TC1-5	56	50	55	41	58	50
TC2-1	61	50	51	47	61	52
TC2-2	61	50	44	38	61	50
TC2-3	61	50	41	34	61	50
TC2-4	61	50	30	24	61	50
TC2-5	61	50	43	33	61	50
TC2-6	61	50	36	29	61	50
TC2-7	61	50	64	51	66	54
TC2-8	61	50	54	41	62	51
TC3-1	65	63	61	47	67	63
TC3-2	65	63	51	38	65	63
TC3-3	65	63	54	40	65	63
TC3-4	65	63	55	42	65	63

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NSR	Existing		Project		Total	
	Day LA, dB	Night LA, dB	Day LA, dB	Night LA, dB	Day LA, dB	Night LA, dB
TC3-5	65	63	59	45	66	63
TC3-6	65	63	53	39	65	63
TC4-1	59	48	69	55	69	56
TC4-2	59	48	52	38	60	48
TC4-3	59	48	45	31	59	48
TC4-4	59	48	55	41	60	49
TC4-5	59	48	57	43	61	49
TC4-6	59	48	55	41	61	49
TC4-7	59	48	57	43	61	49
TC4-8	59	48	60	46	62	50
TC5-1	55	58	73	60	73	62
TC5-2	55	58	54	40	57	58
TC5-3	55	58	57	43	59	58
TC5-4	55	58	62	48	63	58
TC5-5	55	58	75	61	75	63
TC6-1	60	55	68	67	69	67
TC6-2	57	61	48	46	57	61
TC6-3	57	61	49	47	58	61
TC6-4	55	50	45	44	55	51
TC6-5	60	55	64	62	65	63
TC6-6	55	50	72	70	72	70
TC6-7	55	50	62	60	63	61
TC6-8	56	52	47	45	56	53
TC7-1	55	50	56	54	58	56
TC7-2	60	55	57	55	62	58
TC7-3	60	55	59	58	63	60
TC7-4	60	55	59	58	63	60
TC7-5	60	55	61	59	63	61
TC7-6	57	61	60	58	62	63
TC7-7	57	61	49	47	58	61
TC7-8	57	61	46	44	57	61
TC7-9	60	55	59	57	63	59
TC8-1	61	50	39	27	61	50
TC8-2	61	50	40	28	61	50
TC8-3	61	50	43	31	61	50
TC8-4	59	48	50	38	60	48
TC8-5	59	48	51	39	60	49
TC8-6	59	48	55	43	61	49
TC8-7	59	48	58	46	61	50
TC8-8	59	48	55	42	60	49
TC8-9	59	48	53	40	60	49

NSR	Existing		Project		Total	
	Day LA, dB	Night LA, dB	Day LA, dB	Night LA, dB	Day LA, dB	Night LA, dB
TC8-10	59	48	54	41	60	49
TC8-11	59	48	53	41	60	49
TC8-12	59	48	57	44	61	49
TC8-13	59	48	51	38	60	48
TC8-14	59	48	62	49	64	52

5.3 Construction Noise along the Onshore Cable Routes

The noise levels associated with construction along the Onshore Transmission Cable and Onshore Interconnection Cable routes were analyzed with RCNM, which provides the received noise level at specified distances from the construction activity. During the day, construction noise is exempt from both the Town of Brookhaven and Suffolk County noise ordinances. Existing conditions have been estimated at NSRs along the routes, and construction noise should be limited to 65 dB during the day per NYSDEC policy as described in Section 4.

The most critical NSRs are the abutting residential properties along the Onshore Transmission Cable route. Although distance varies along the route, the property line of many residential areas is set back approximately 40 ft (12 m) from the road centerline along which the route proceeds. Construction of the Onshore Transmission Cable will generate noise of approximately 88 dB at a distance of 40 ft (12 m) from the center of construction activities. Construction noise from the Onshore Transmission Cable route will exceed 65 dB at distances of up to 550 ft (168 m). Figure 25 shows the Onshore Transmission Cable route and the distance at which the NYSDEC limit is reached.

Construction of the Onshore Interconnection Cable is also expected to exceed the NYSDEC noise limits at NSRs adjacent to the proposed routes. No significant difference in noise impact is anticipated between construction of the two Onshore Interconnection Cable routes. Therefore, the BMPs outlined in Section 6 should be implemented to diminish noise impacts from construction of the Onshore Transmission Cable and Onshore Interconnection Cable routes. Because construction will continuously progress along the route, exposure to noise at any particular location will be temporary. If issues are identified and further attenuation is required, temporary barriers or curtains may be erected around the noisiest equipment or the entire work area, as practical. Acoustical insulation that consists of a sound absorptive material bonded to a mass-loaded vinyl curtain may be attached to a chain link fence in overlapping sections. Alternatively, barriers can be constructed on the work site from common construction building materials (plywood, block, stacks, or spoils) if necessary. To be effective, these should be lined with sound absorbing material and strategically placed as close to the noise source or NSR as possible.

In some areas, construction along the Onshore Transmission Cable and Onshore Interconnection Cable routes may be requested to occur at night to mitigate traffic impacts. As described in Section 2, nighttime construction activities may impose noise limits from Suffolk County in certain areas and these limits would be exceeded. In addition, nighttime construction activities are prohibited by the Town of Brookhaven's policy.

5.4 Operational Noise at OnCS–DC Sites

The sound levels due to operation of the OnCS–DC at the Union Avenue North and Union Avenue South sites are presented in Figure 26 and Figure 27, respectively. Table 18 and Table 19 summarize the estimated sound levels due to existing conditions, Project operation, the total sound level (day and night) including contributions from both existing conditions and the Project, and the increase of the ambient sound level over existing

conditions (day and night) at NSRs for these two scenarios. These results provide an indication of the noise that can be expected with application of the proposed mitigative measures. The predicted total sound level of OnCS–DC at either site (Union Avenue North or Union Avenue South) with mitigative measures applied complies with all applicable criteria as specified by the EPA, NYSDEC, and the Town of Brookhaven regulations.

For the OnCS–DC at either the Union Avenue North or Union Avenue South site, the converter transformers and shunt reactors will be installed with a reduced sound rated model. Reduced sound transformers incorporate various forms of acoustical treatments and have a sound power level less than a NEMA standard transformer. If reduced sound transformers and reactors will not provide sufficient attenuation, these components will be provided with sound attenuation walls to achieve the required sound levels. If the Union Avenue South site is selected for the OnCS–DC, additional mitigation would be implemented to reduce noise from the valve cooling tower by 3 dB.

The highest Project sound levels due to OnCS–DC operation at either the Union Avenue North or Union Avenue South site will be at nearby industrial properties. There is stronger likelihood of conflict at residential NSRs, which have lower permissible noise limits. At NSRs in residential areas, existing conditions exceed the nighttime permissible sound level limits for operational noise per the Town of Brookhaven noise code and the day-night average sound level as specified by the EPA. As limits are already exceeded due to existing conditions, noise controls have been specified to avoid increases in the total sound levels at NSRs per NYSDEC policy. Considering residences only, the highest Project sound level from OnCS–DC at the Union Avenue North site will be at NSRs UA-6 and UA-7. The total sound level at these NSRs will be approximately 52 dB at night, which is an increase of 0 dB over existing conditions. Considering operation of the OnCS–DC at the Union Avenue North site and the residential NSRs, the highest Project sound level will be at NSR UA-11. The total sound level at UA-11 will be approximately 54 dB at night which is an increase of 0 dB over existing conditions. The OnCS–DC operational noise is constant and although daytime levels were also considered, the sound level at night is the limiting case because the threshold for increased noise is lower during this time period.

Table 18. Operational noise of OnCS–DC–Union Avenue North.

NSR	Existing		Project L _A , dB	Total		Increase	
	Day L _A , dB	Night L _A , dB		Day L _A , dB	Night L _A , dB	Day L _A , dB	Night L _A , dB
UA-1	57	61	36	57	61	0	0
UA-2	56	52	41	56	52	0	0
UA-3	56	52	41	56	52	0	0
UA-4	56	52	41	56	52	0	0
UA-5	56	52	41	56	52	0	0
UA-6	56	52	42	56	52	0	0
UA-7	56	52	42	56	52	0	0
UA-8	60	54	34	60	54	0	0
UA-9	60	54	34	60	54	0	0
UA-10	60	54	35	60	54	0	0
UA-11	60	54	37	60	54	0	0
UA-12	56	52	33	56	52	0	0
UA-13	56	52	32	56	52	0	0

NSR	Existing		Project	Total		Increase	
	Day L _A , dB	Night L _A , dB	L _A , dB	Day L _A , dB	Night L _A , dB	Day L _A , dB	Night L _A , dB
UA-14	56	52	40	56	52	0	0
UA-15	56	52	55	59	57	3	5
UA-16	56	52	46	56	53	0	1
UA-17	56	52	63	63	63	7	11

Table 19. Operational noise of OnCS–DC–Union Avenue South.

NSR	Existing		Project	Total		Increase	
	Day L _A , dB	Night L _A , dB	L _A , dB	Day L _A , dB	Night L _A , dB	Day L _A , dB	Night L _A , dB
UA-1	57	61	33	57	61	0	0
UA-2	56	52	37	56	52	0	0
UA-3	56	52	37	56	52	0	0
UA-4	56	52	36	56	52	0	0
UA-5	56	52	38	56	52	0	0
UA-6	56	52	38	56	52	0	0
UA-7	56	52	42	56	52	0	0
UA-8	60	54	37	60	54	0	0
UA-9	60	54	41	60	54	0	0
UA-10	60	54	40	60	54	0	0
UA-11	60	54	42	60	54	0	0
UA-12	56	52	38	56	52	0	0
UA-13	56	52	34	56	52	0	0
UA-14	56	52	28	56	52	0	0
UA-15	56	52	55	58	56	2	4
UA-16	56	52	69	69	69	13	17
UA-17	56	52	46	56	53	0	1

6.0 Best Management Practices

This section presents BMPs to minimize noise impacts to the community. In addition to the specific mitigative measures for noise abatement described above, BMPs will be implemented to reduce noise from specified Project construction activities. The BMPs should be implemented when reasonable and effective while maintaining public safety and adhering to other Project requirements as applicable. The following BMPs include guidance for both equipment and administrative controls:

- Construction equipment should be appropriately specified for the task. Overpowered or underpowered equipment may unnecessarily generate excessive noise.
- The quietest equipment feasible should be used for construction activities. Newer equipment is generally quieter than old equipment. Using quiet machinery is one of the most effective methods for diminishing noise impacts.

- Construction equipment should be equipped with noise-reducing devices including mufflers, silencers, covers, guards, and vibration isolators, as applicable. Mobile equipment, such as jackhammers and welders, should be shielded with portable enclosures or shrouds, as applicable. Noise producing equipment using internal combustion engines should be equipped with effective inlet silencers and exhaust mufflers to control engine noise.
- Ensure that construction equipment is well maintained. Loose or worn parts can result in increased noise levels.
- To the extent feasible, restrict the noisiest operations to normal work hours during the day.
- Relocate the noisiest equipment far from NSRs whenever possible. During the planning stages of the Project, it may be possible to designate storage areas far from NSRs. When this is not possible, the storage of waste materials, earth, and other supplies may be able to be positioned such that it also functions as a noise barrier.
- Erect additional sound barriers around the noisiest equipment or near the noise sensitive receptor, as practical.
- Route truck traffic away from residential streets and select streets with the fewest homes if other alternatives are not available.
- Do not allow engine-driven equipment to idle unnecessarily near NSRs.
- Back-up alarms should be used when required for safety only and replaced with strobe lights when possible.
- Inform the public about the time and nature of construction activities. Open communication and providing neighbors with information is a critical step towards minimizing noise impacts to the community.

7.0 Figures

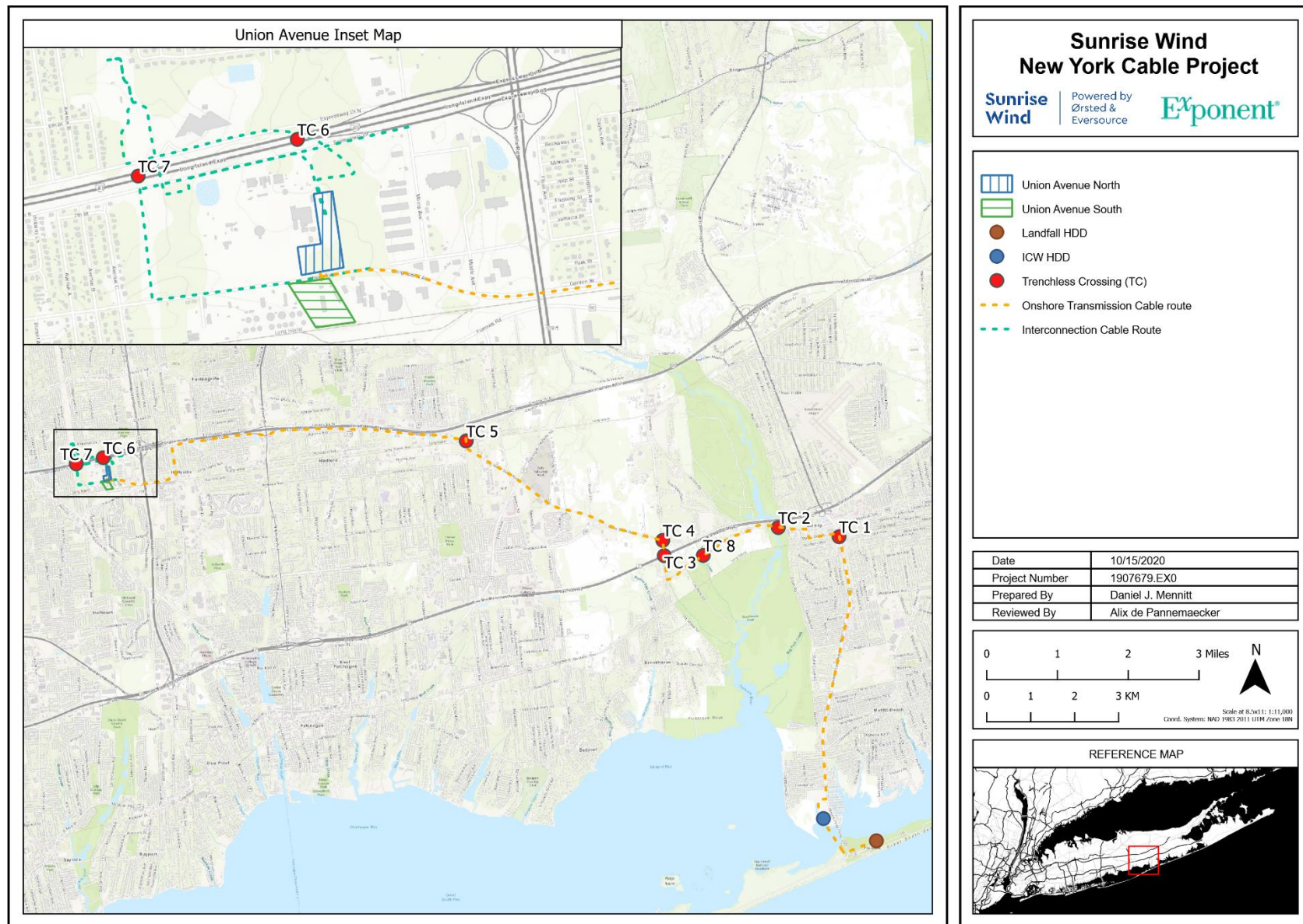


Figure 1. Onshore components of the Project.

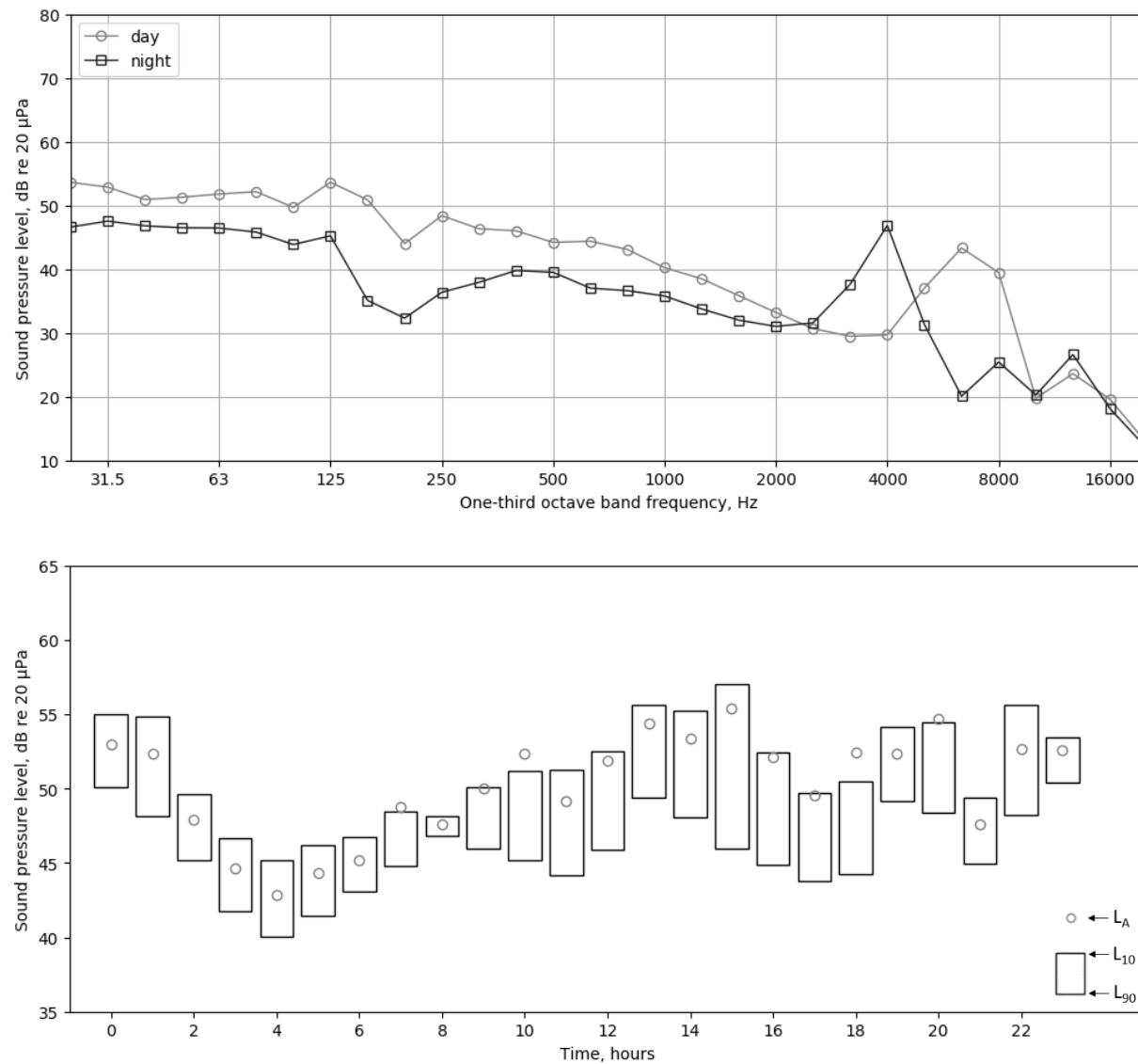


Figure 2. Field survey measurement data from SL-1 including the average one-third octave band spectra over day and night hours (top panel) and hourly history of the L_{10} , L_{90} , and L_A (bottom panel).

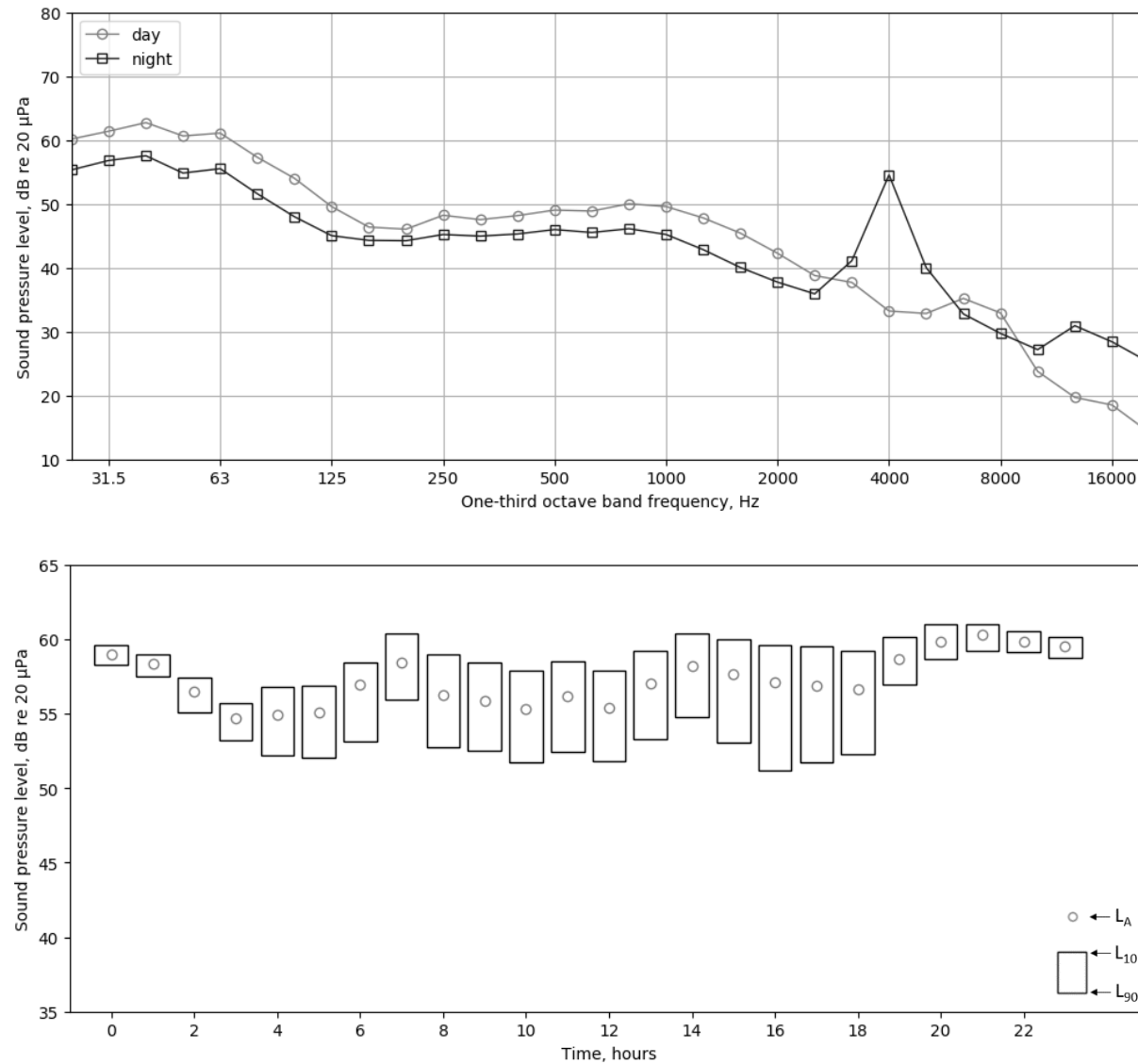


Figure 3. Field survey measurement data from SL-2 including the average one-third octave band spectra over day and night hours (top panel) and hourly history of the L_{10} , L_{90} , and L_A (bottom panel).

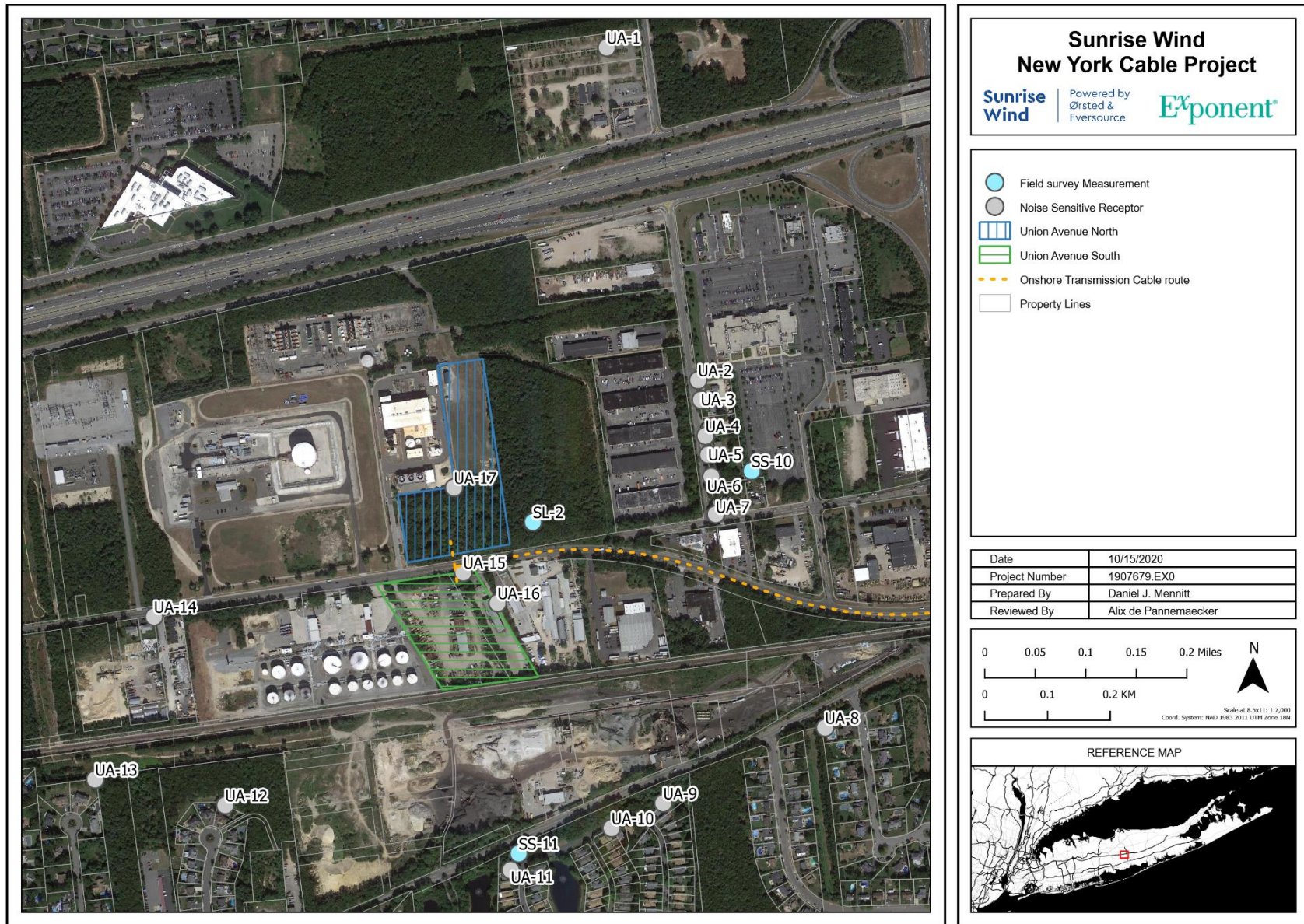


Figure 4. Field survey measurement and NSR locations in the vicinity of the Union Avenue North and Union Avenue South sites.

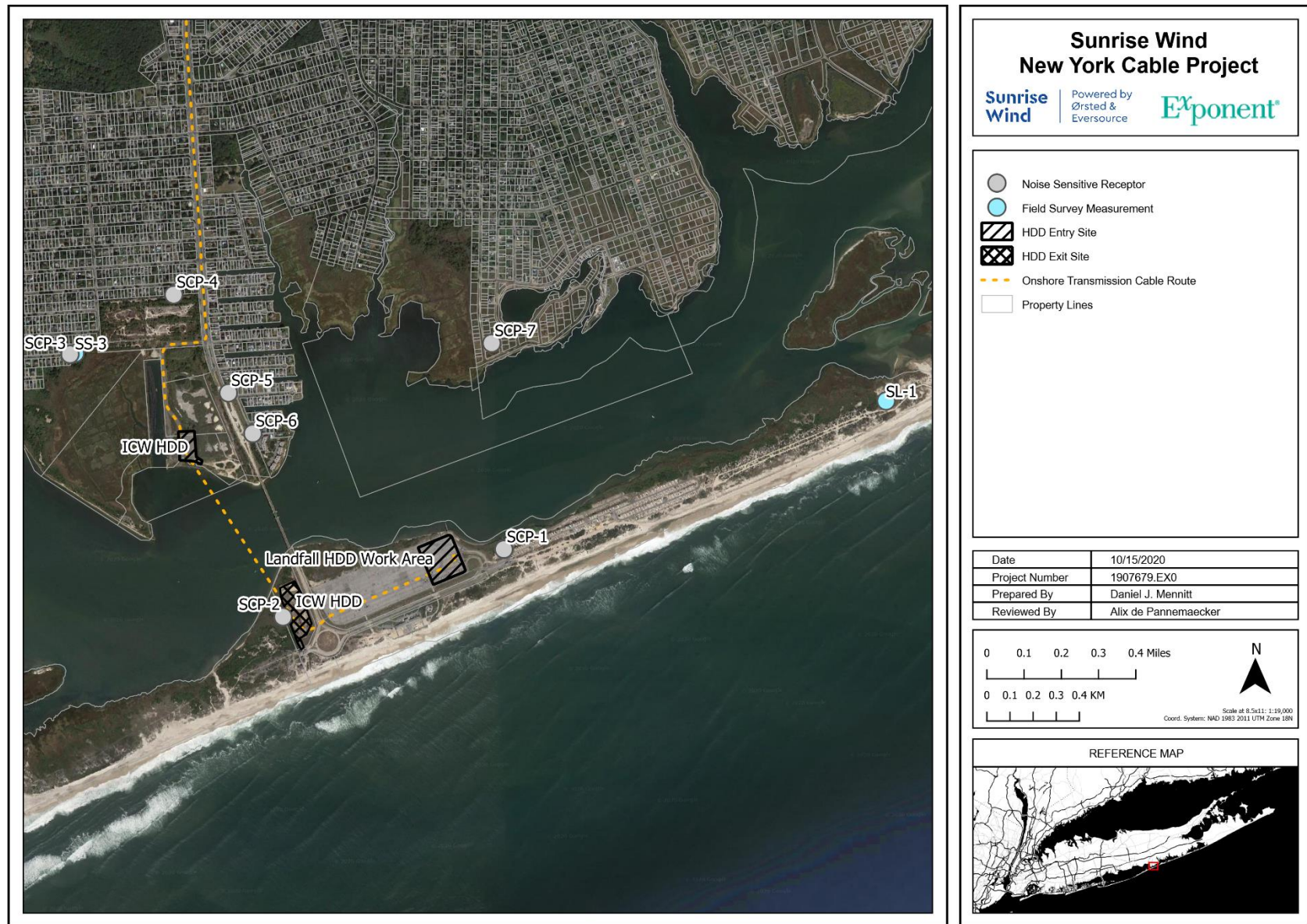


Figure 5. Field survey measurement and NSR locations in the vicinity of the Landfall HDD and ICW HDD.



Figure 6. Field survey measurement and NSR locations in the vicinity of TC1.

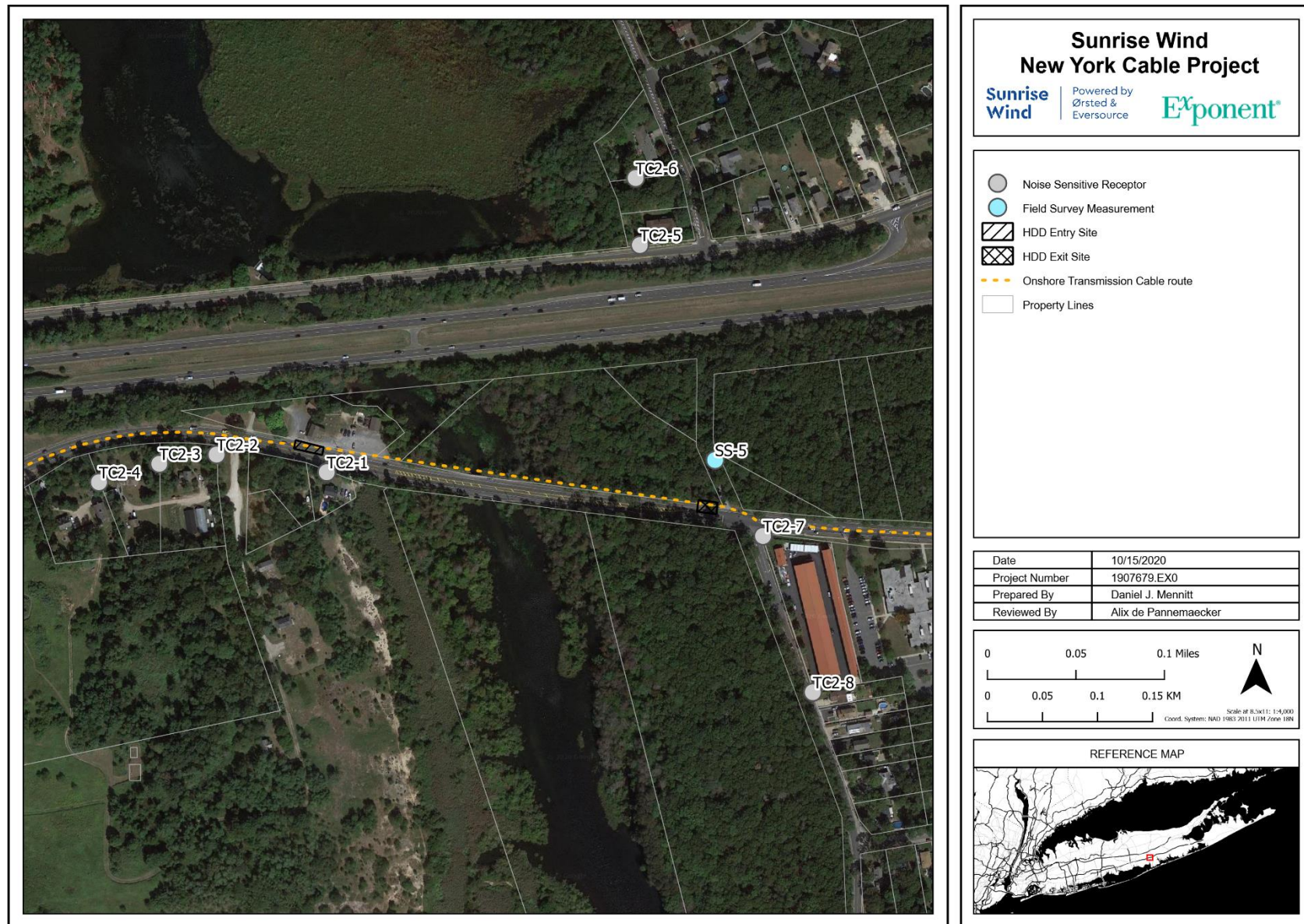


Figure 7. Field survey measurement and NSR locations in the vicinity of TC2.

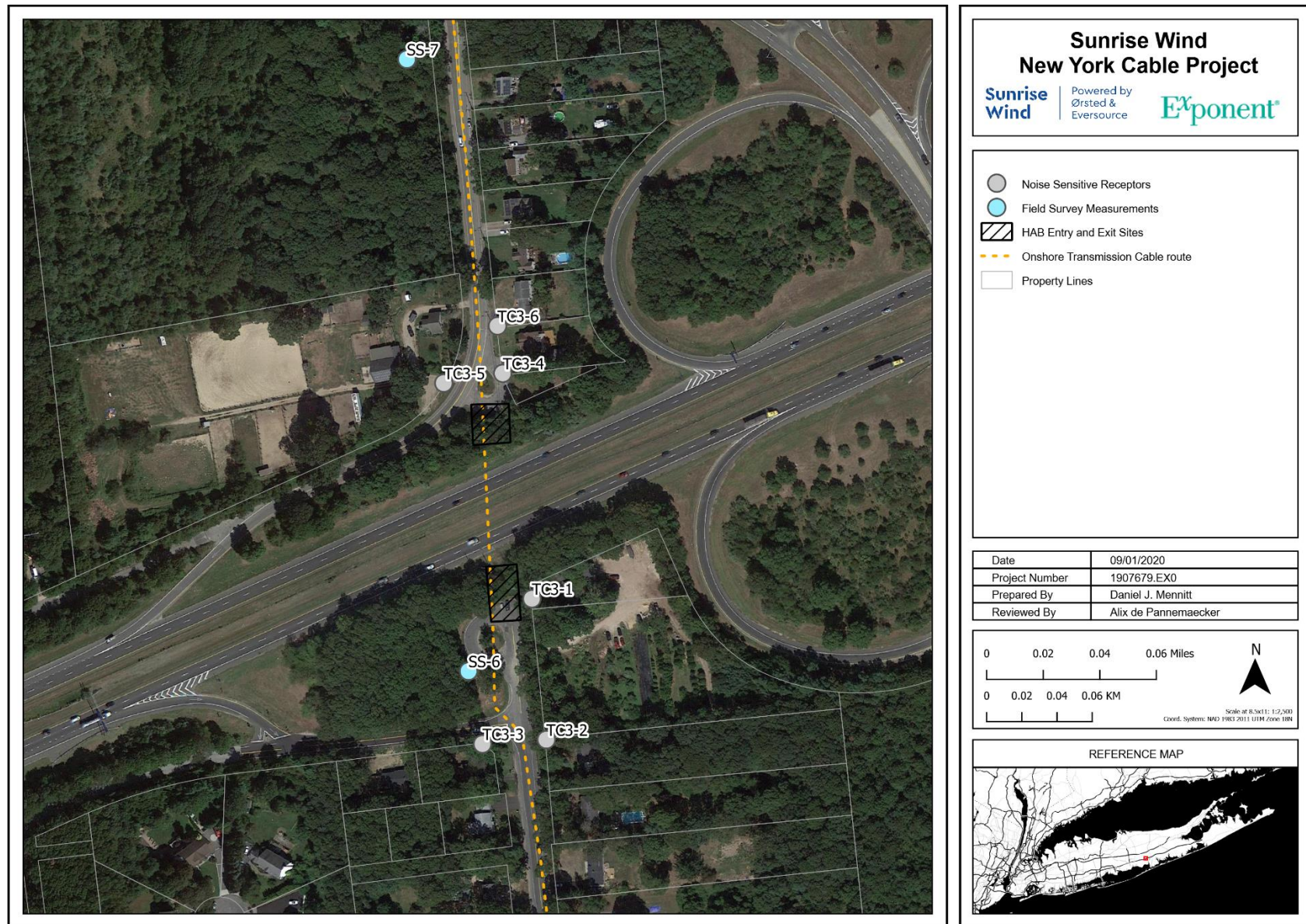


Figure 8. Field survey measurement and NSR locations in the vicinity of TC3.

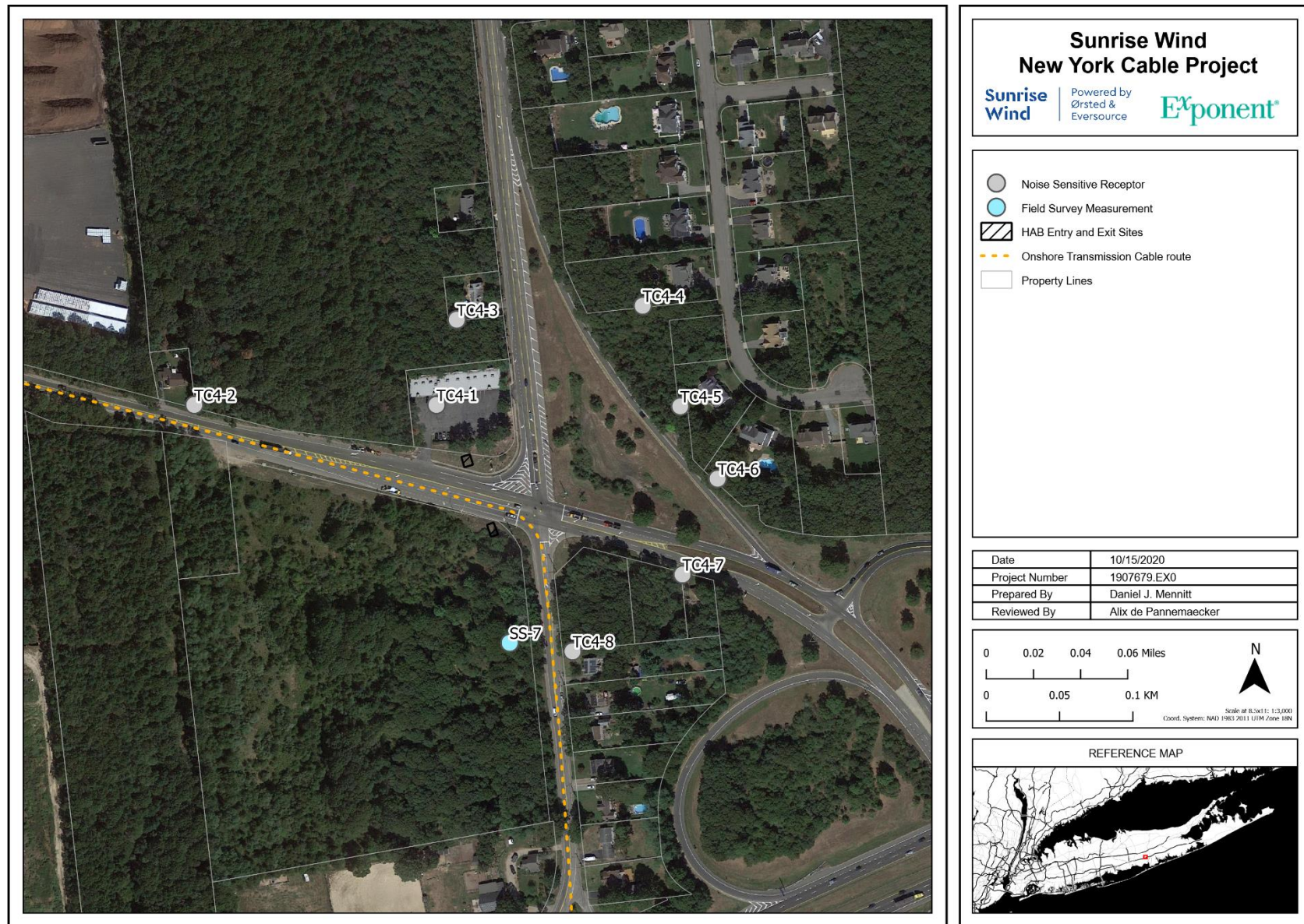


Figure 9. Field survey measurement and NSR locations in the vicinity of TC4.

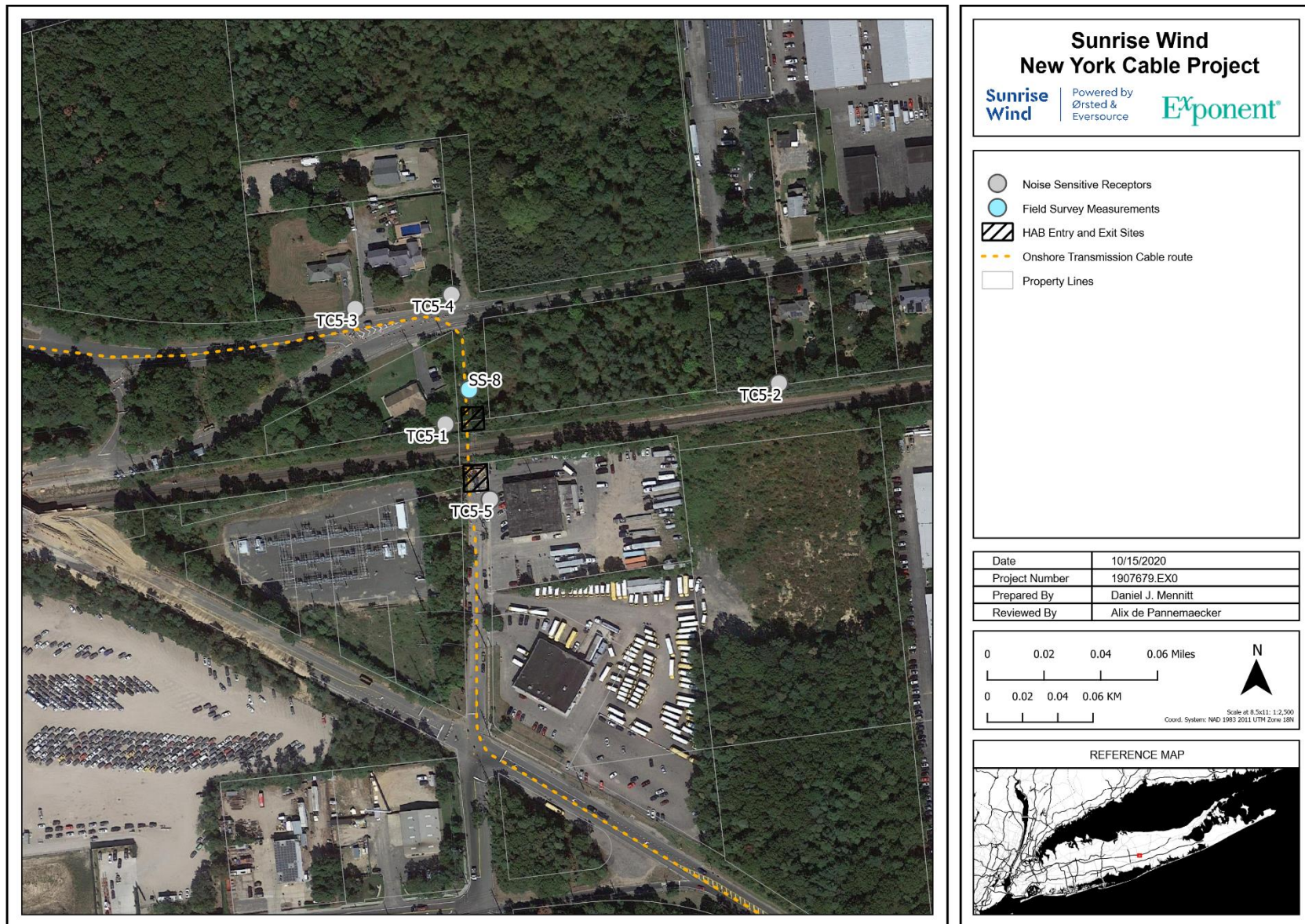


Figure 10. Field survey measurement and NSR locations in the vicinity of TC5.

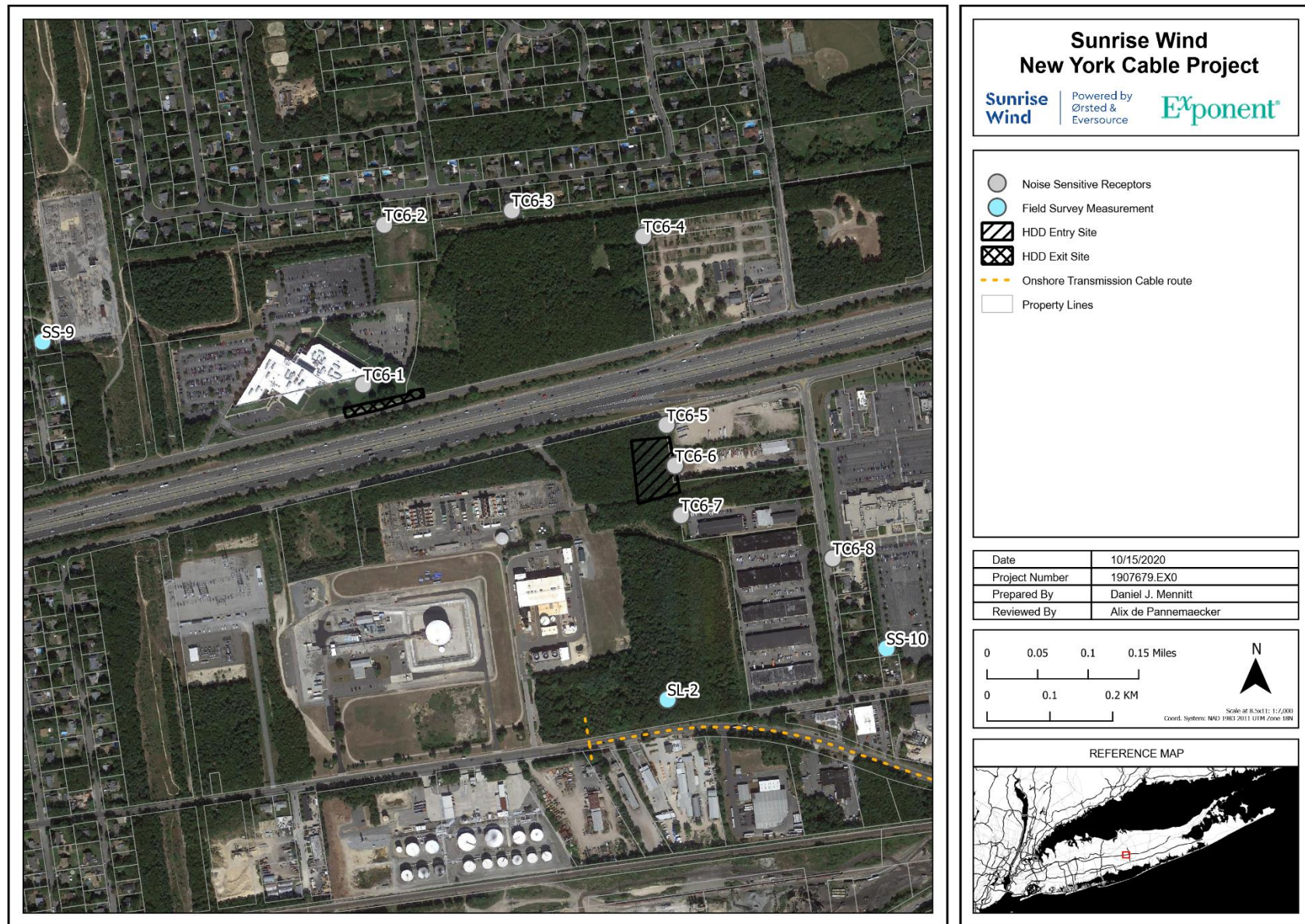


Figure 11. Field survey measurement and NSR locations in the vicinity of TC6.

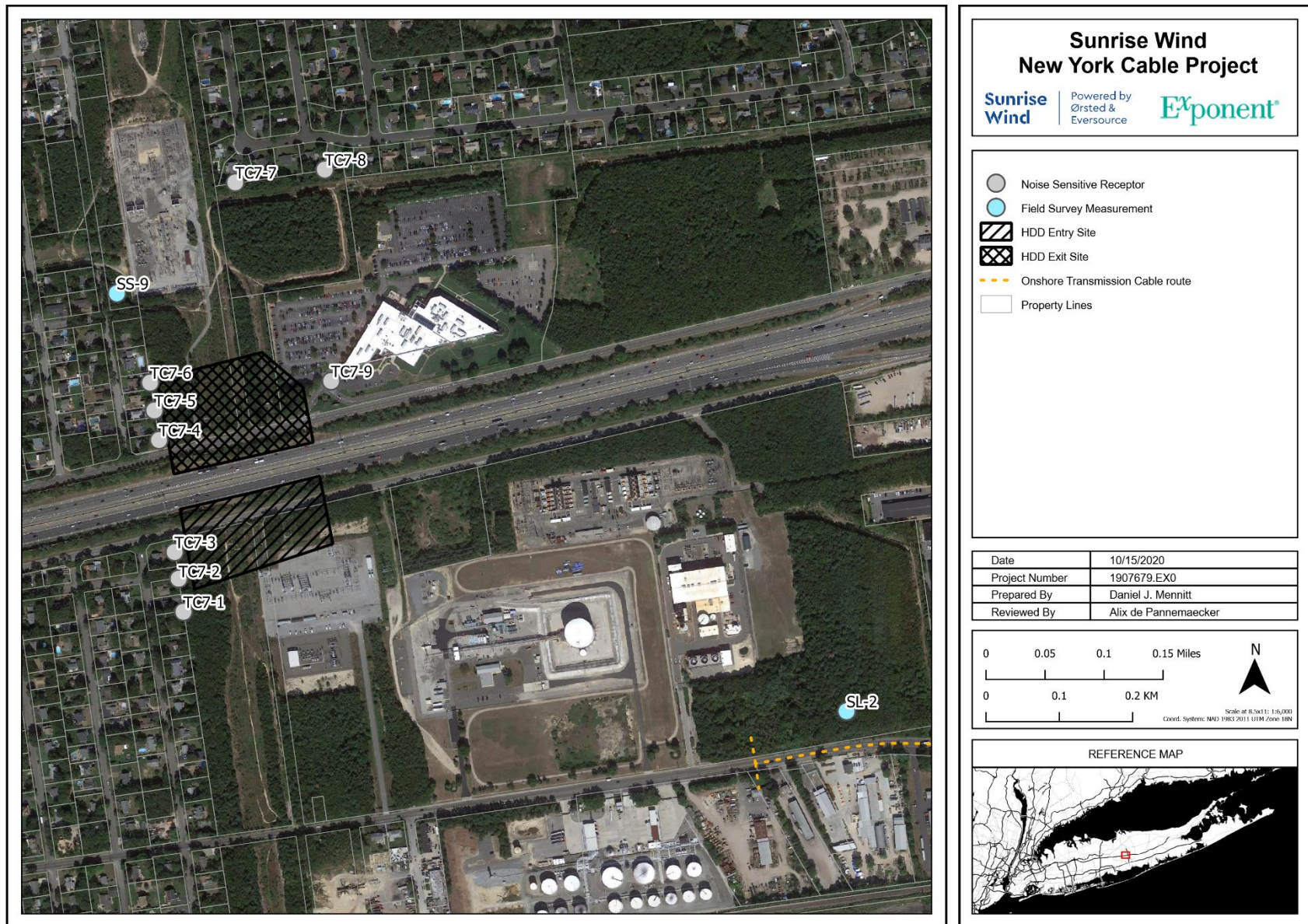


Figure 12. Field survey measurement and NSR locations in the vicinity of TC7.

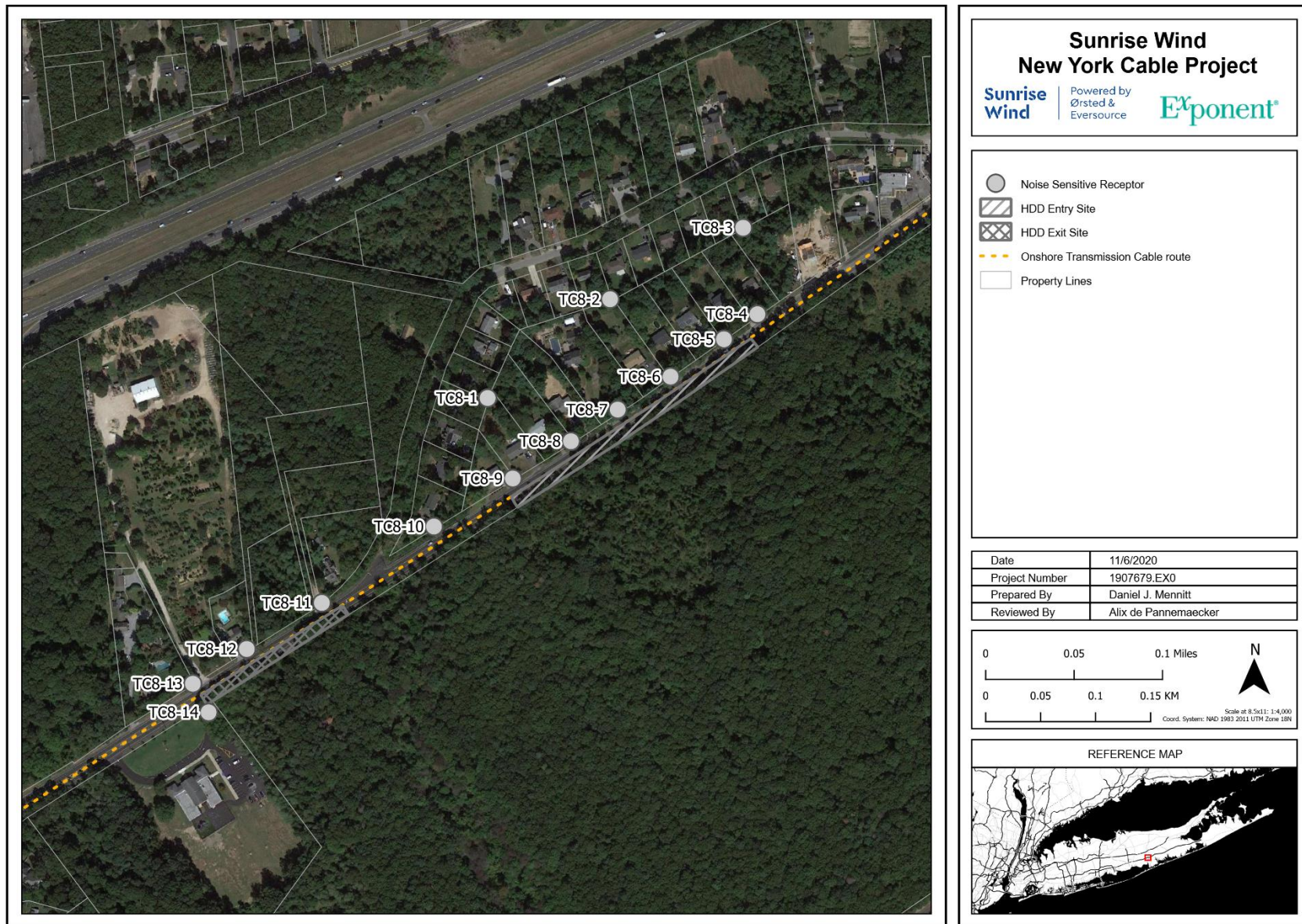


Figure 13. Field survey measurement and NSR locations in the vicinity of TC8.

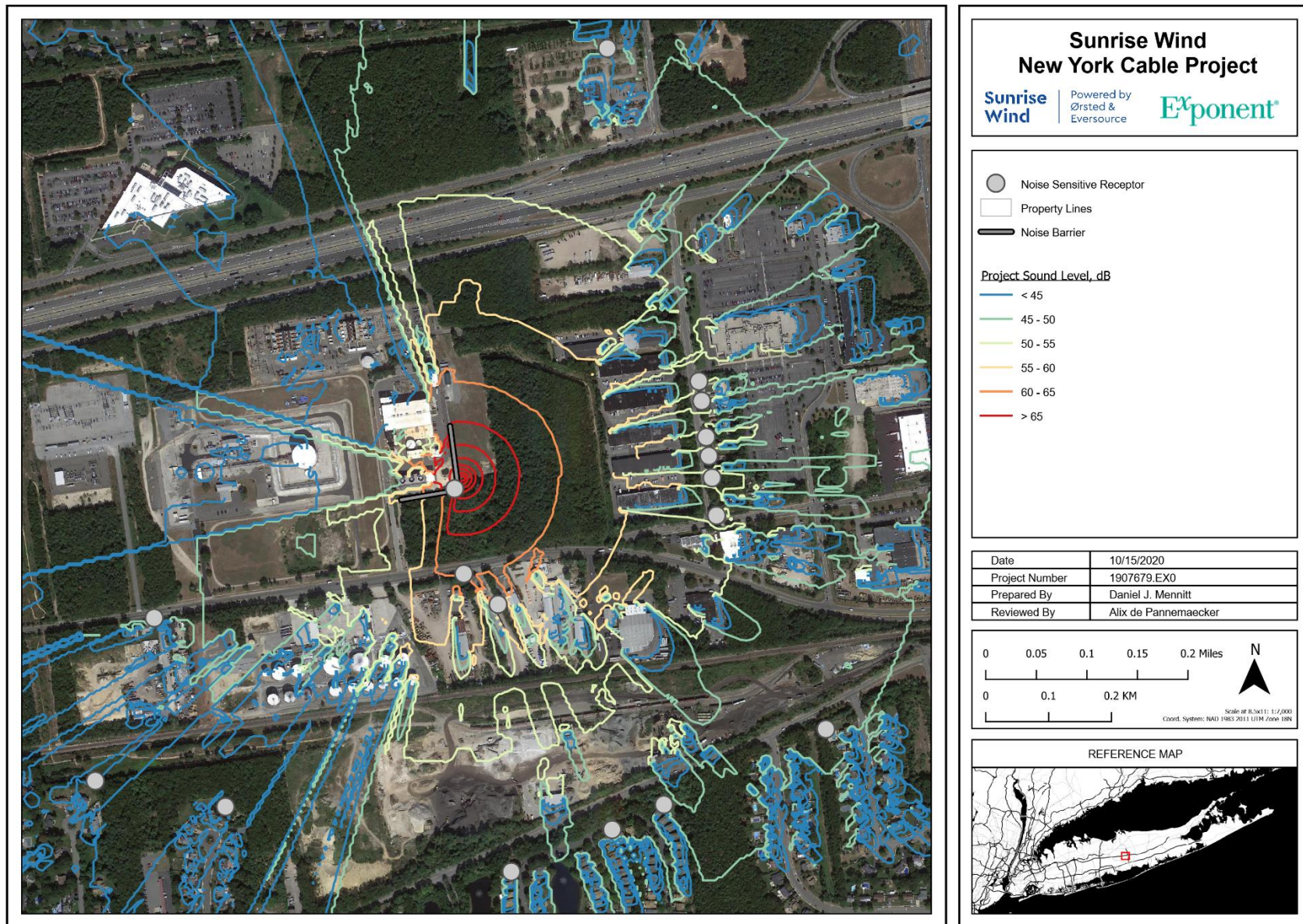


Figure 14. Union Avenue North daytime construction noise contours.

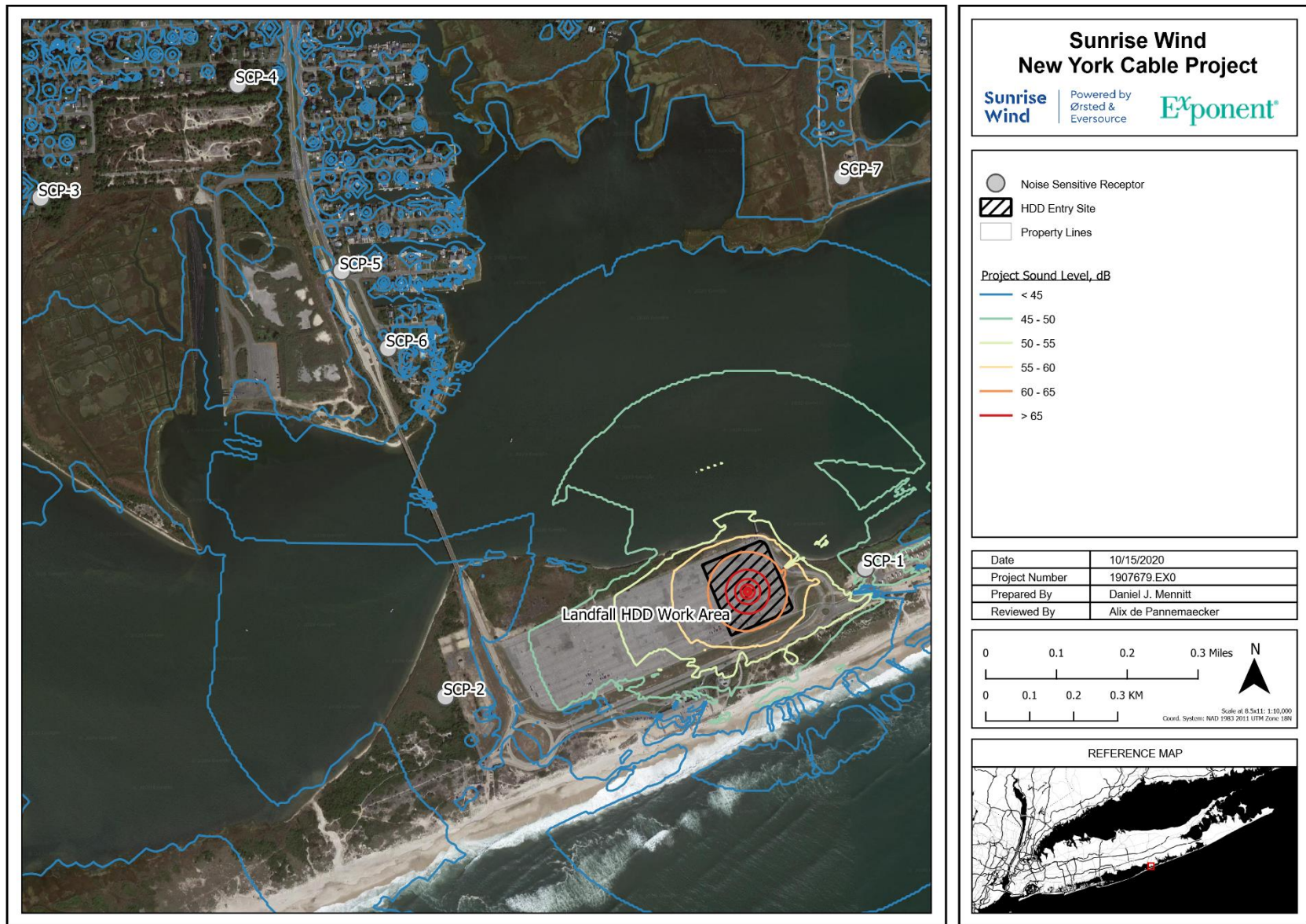


Figure 15. Landfall HDD daytime construction noise contours.

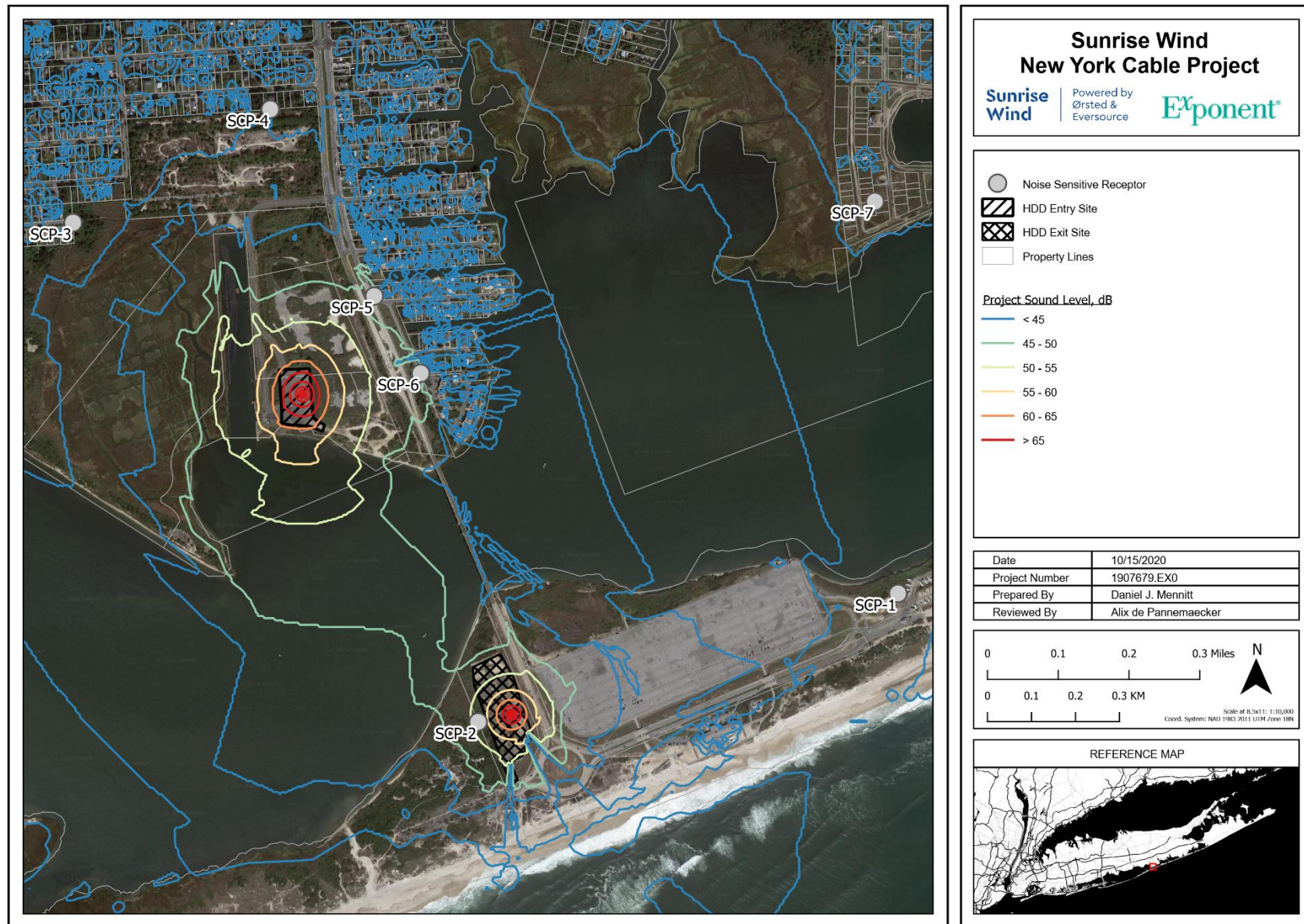


Figure 16. ICW HDD daytime construction noise contours.

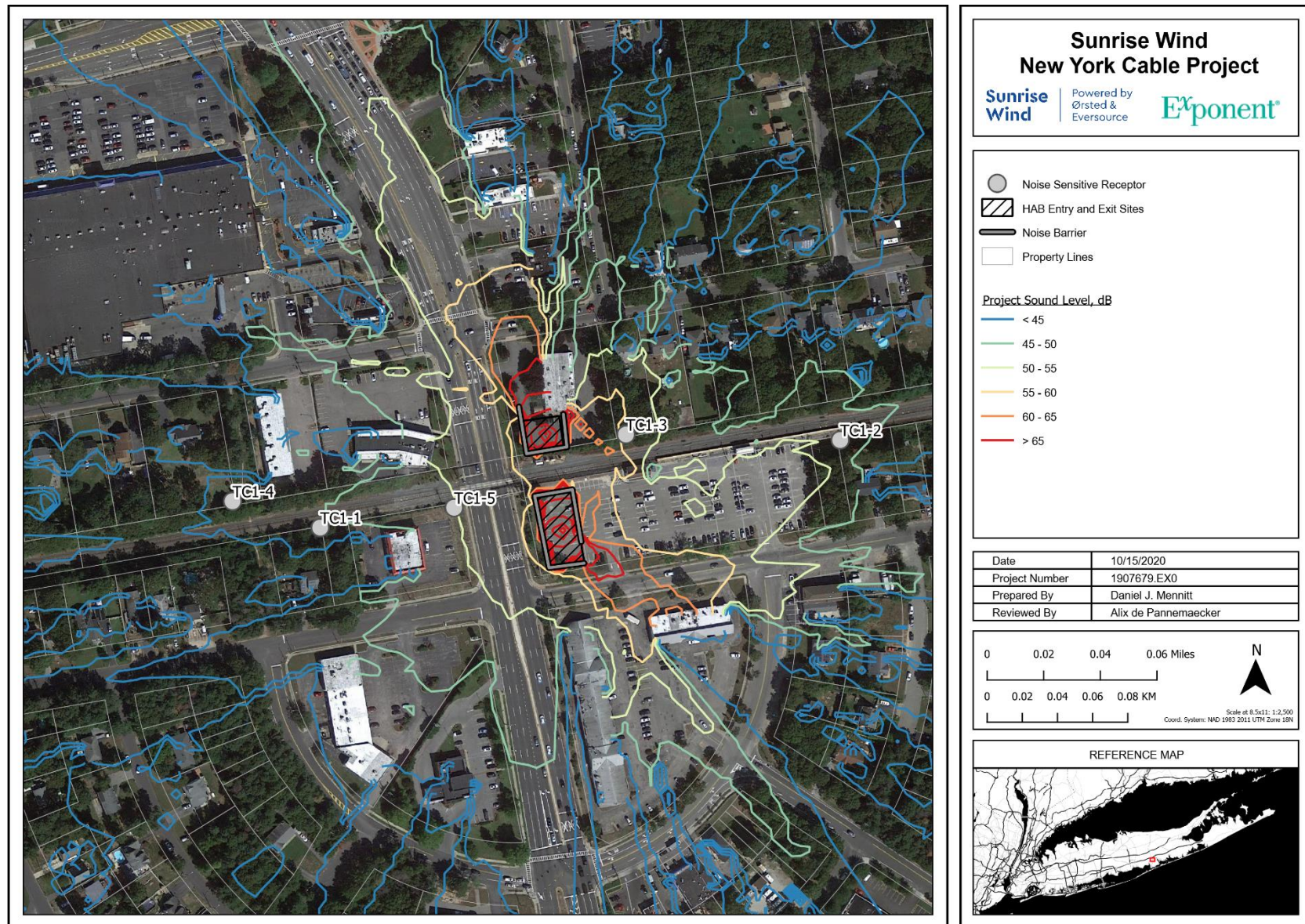


Figure 17. TC1 HAB daytime construction noise contours.

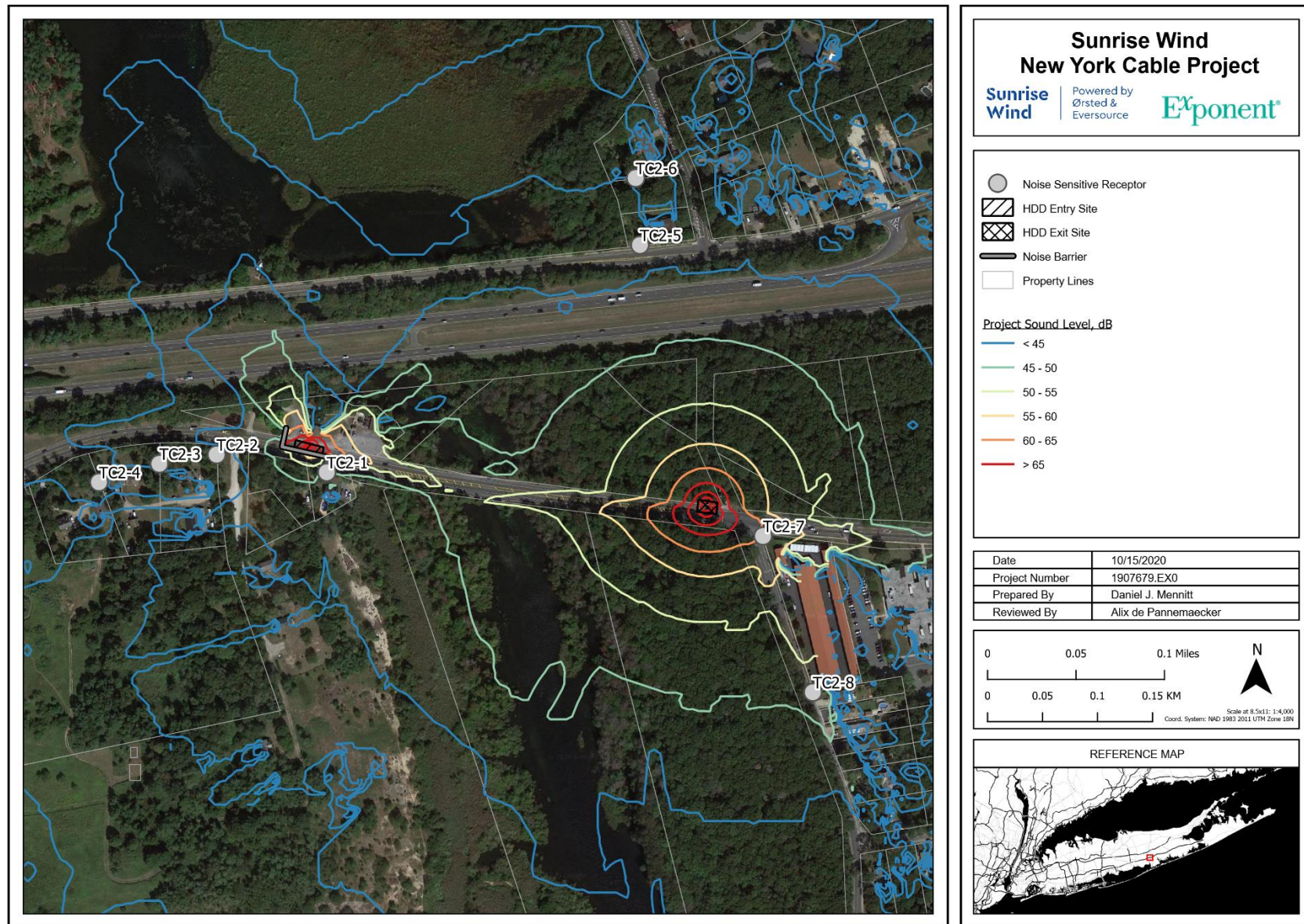


Figure 18. TC2 HDD daytime construction noise contours.

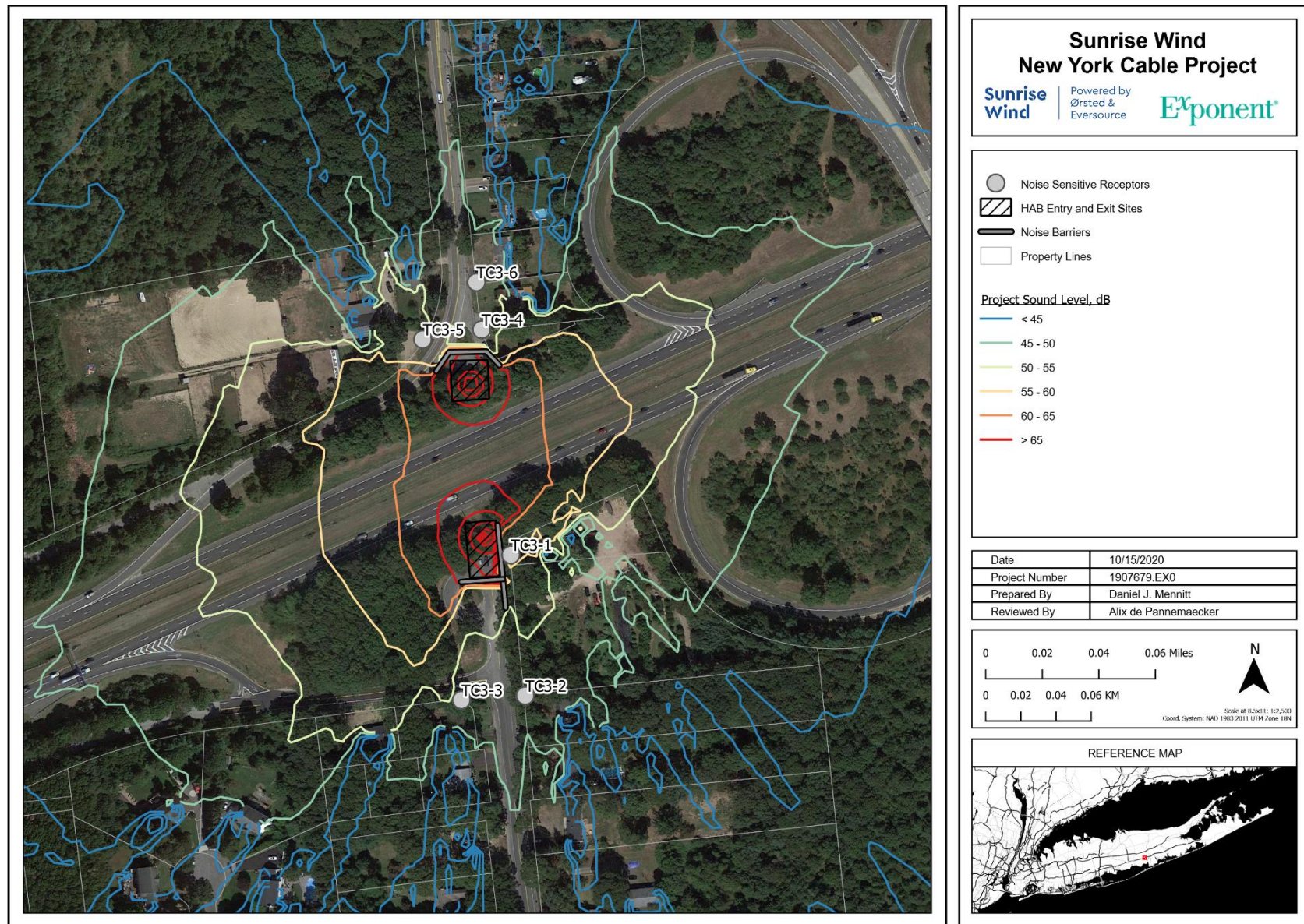


Figure 19. TC3 HAB daytime construction noise contours.

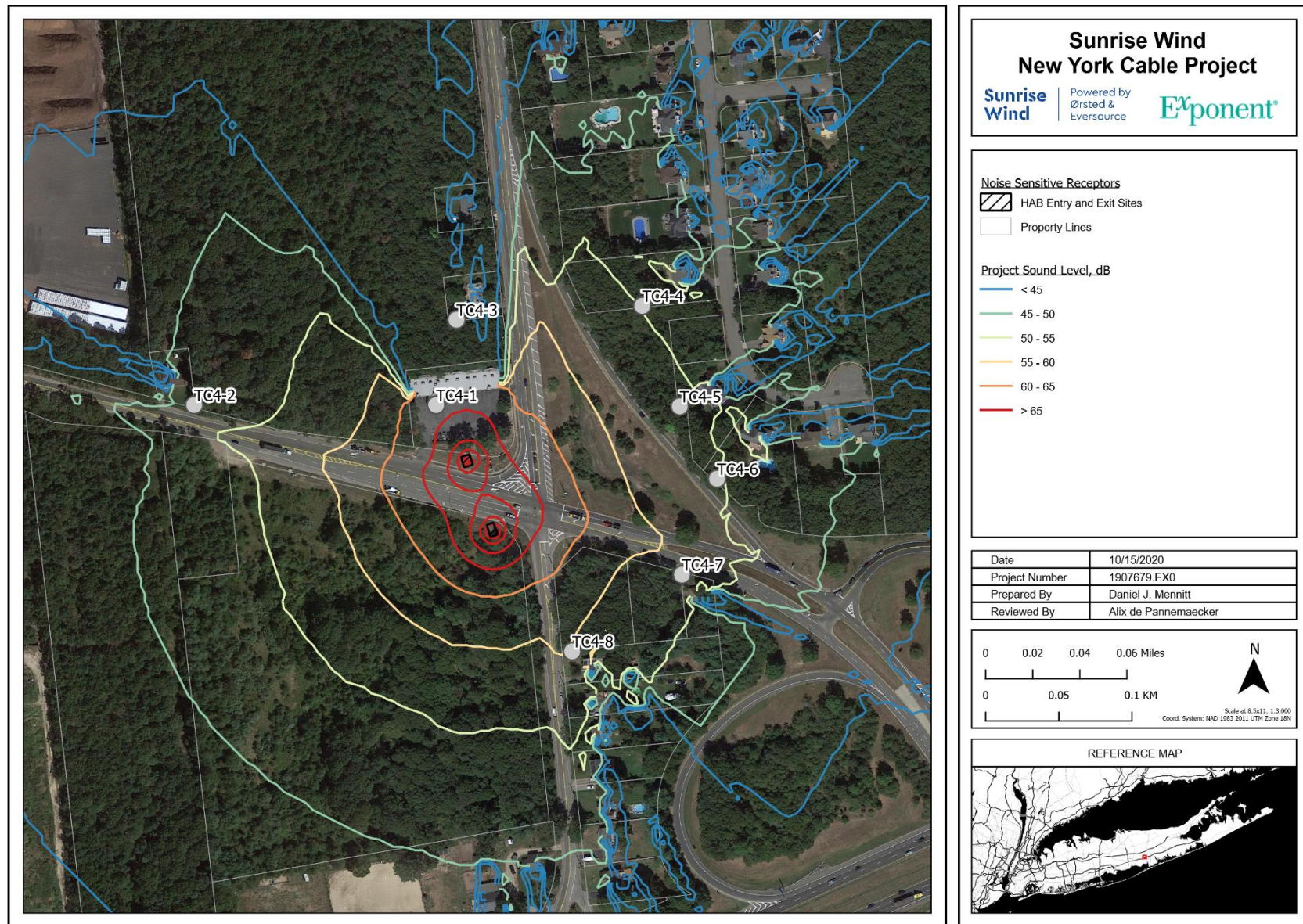


Figure 20. TC4 HAB daytime construction noise contours.

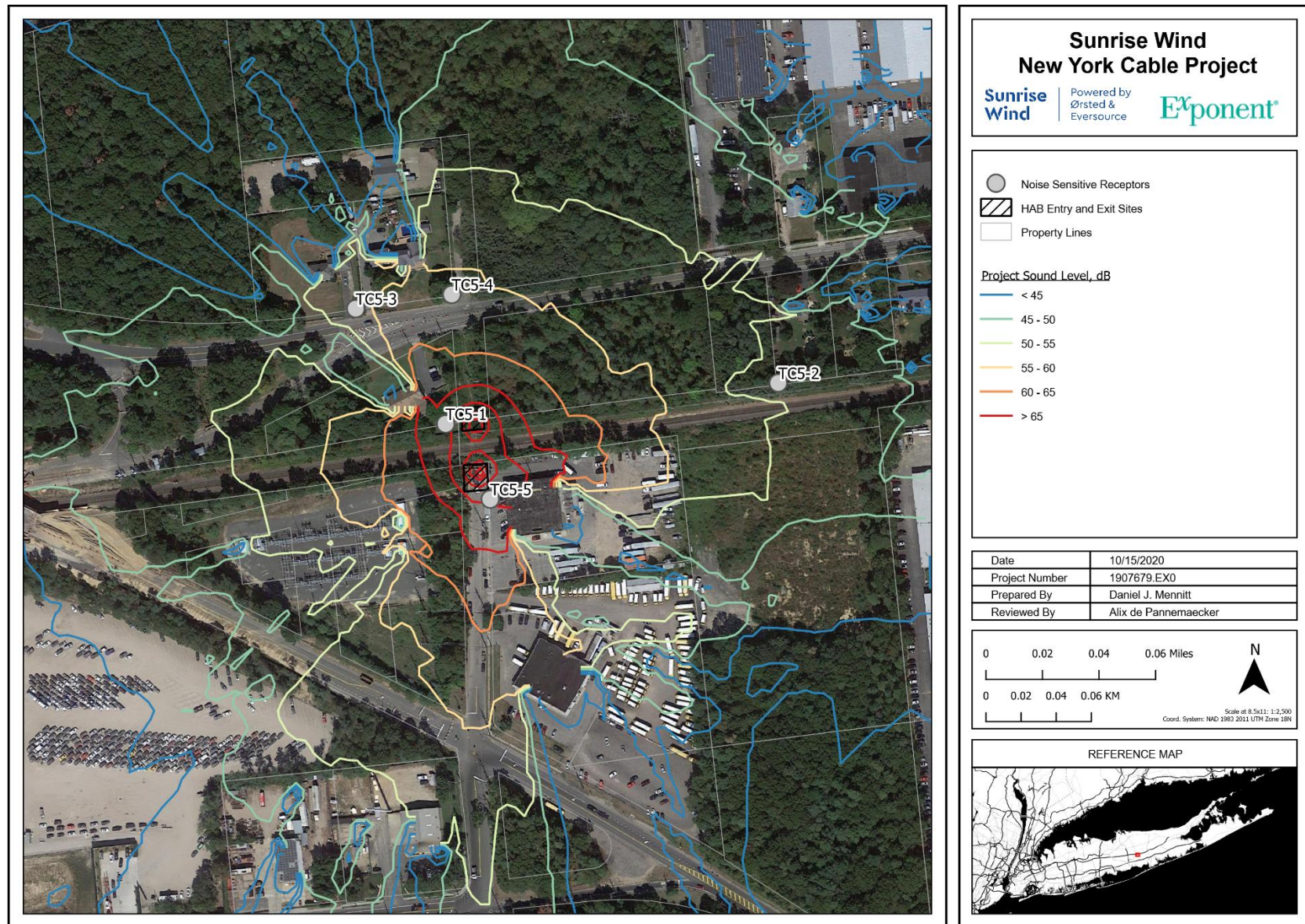


Figure 21. TC5 HAB daytime construction noise contours.

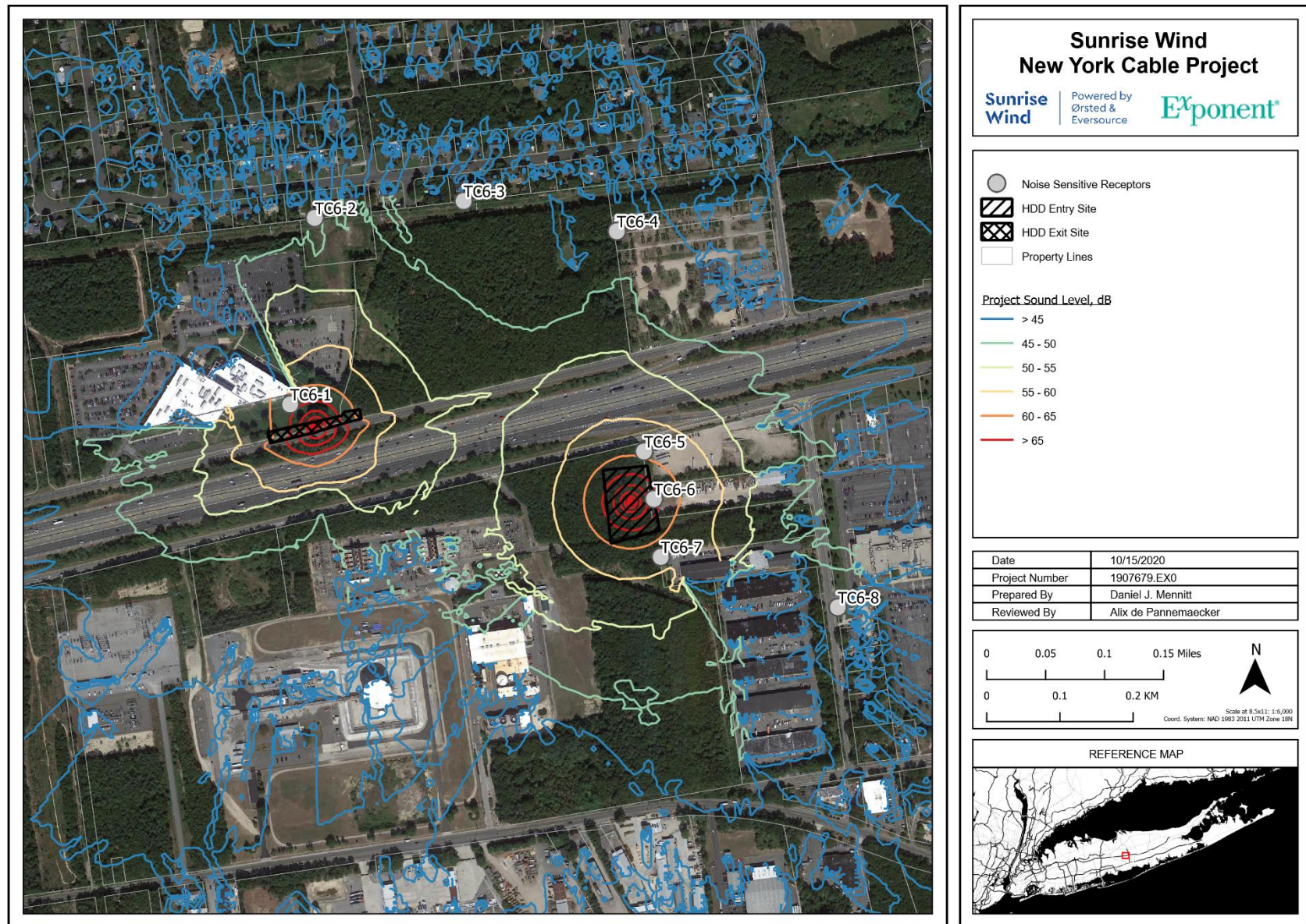


Figure 22. TC6 HDD daytime construction noise contours.

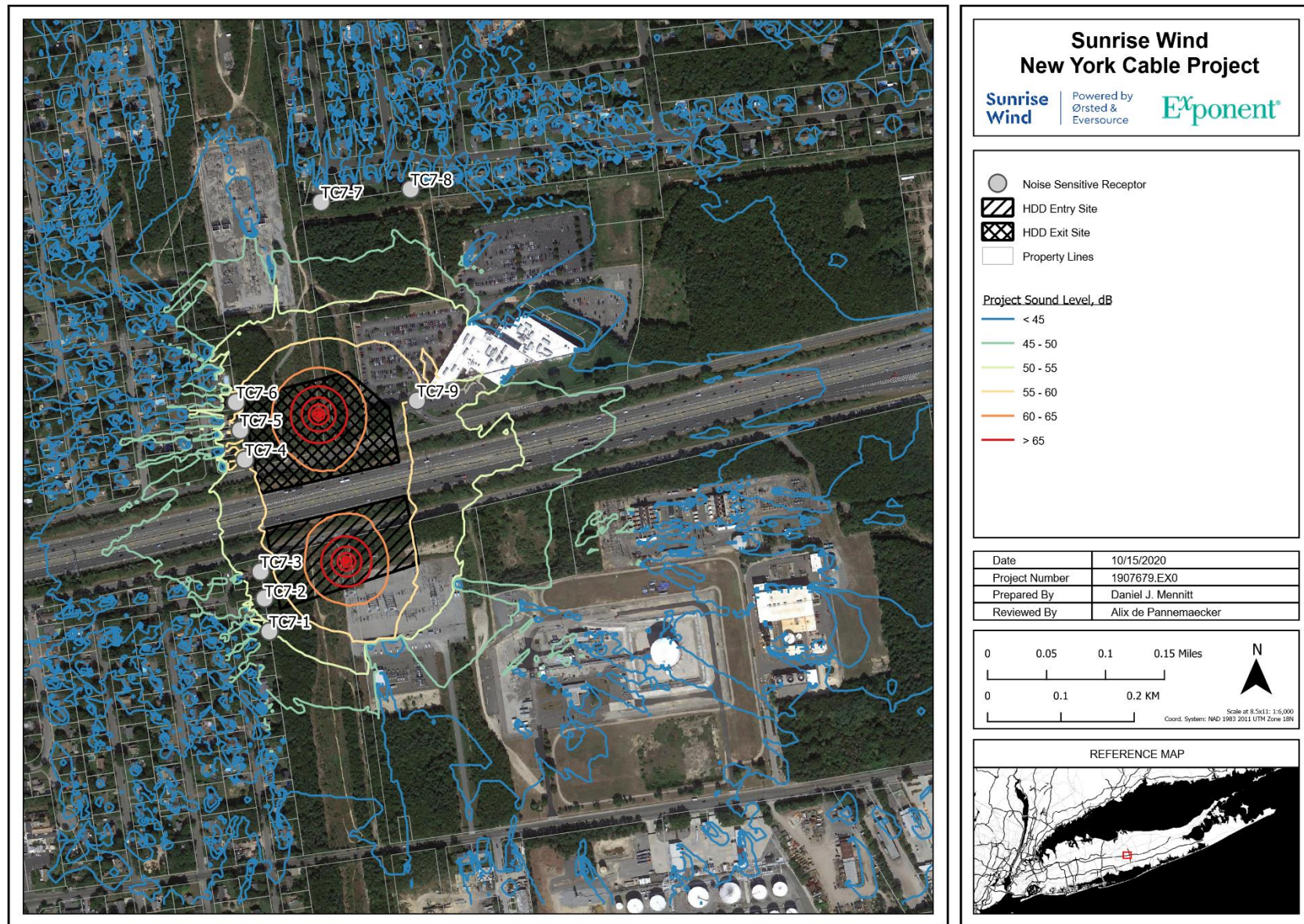


Figure 23. TC7 HDD daytime construction noise contours.

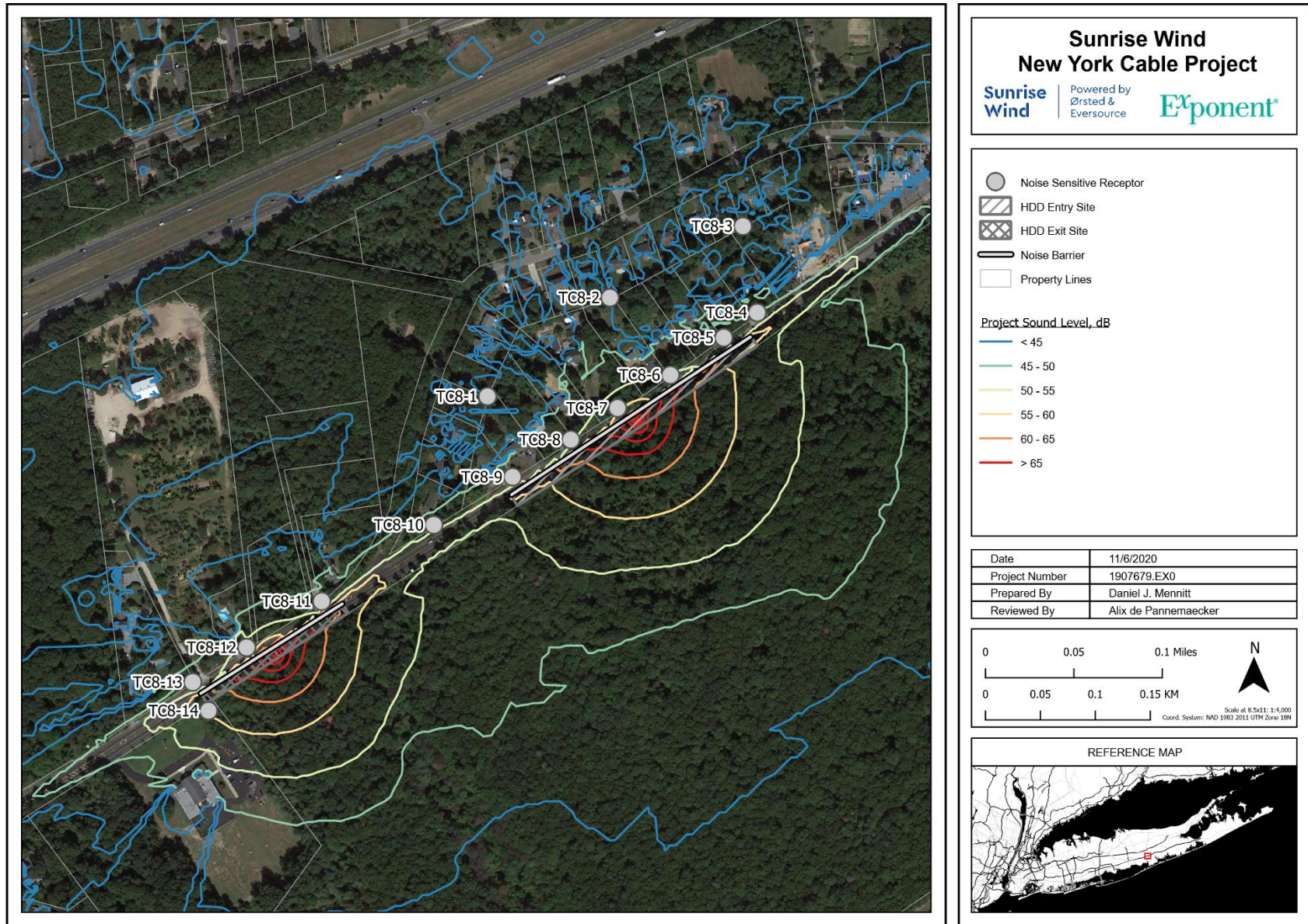


Figure 24. TC8 HDD daytime construction noise contours.

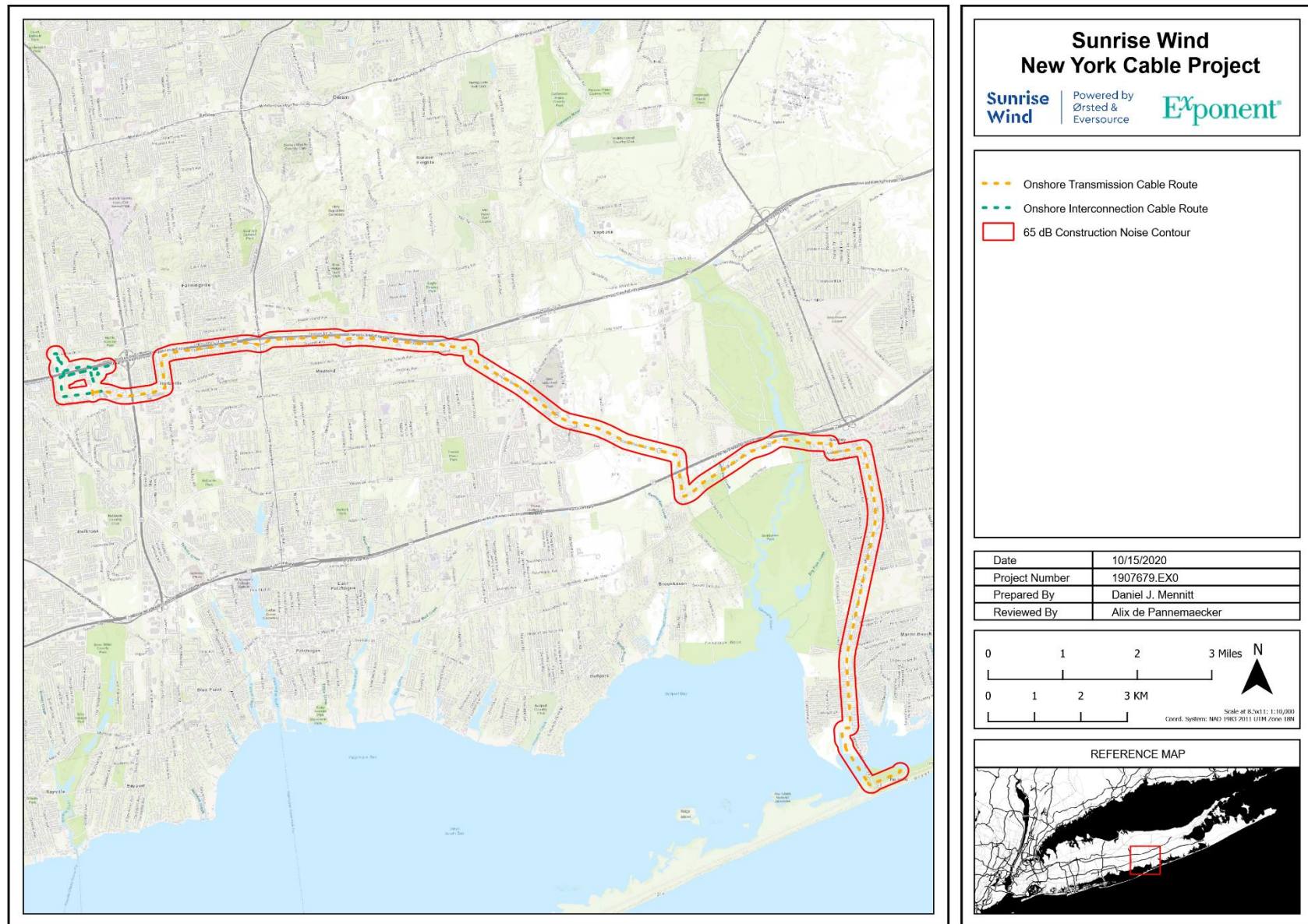


Figure 25. Onshore cable routes and 65 dB construction noise contours.

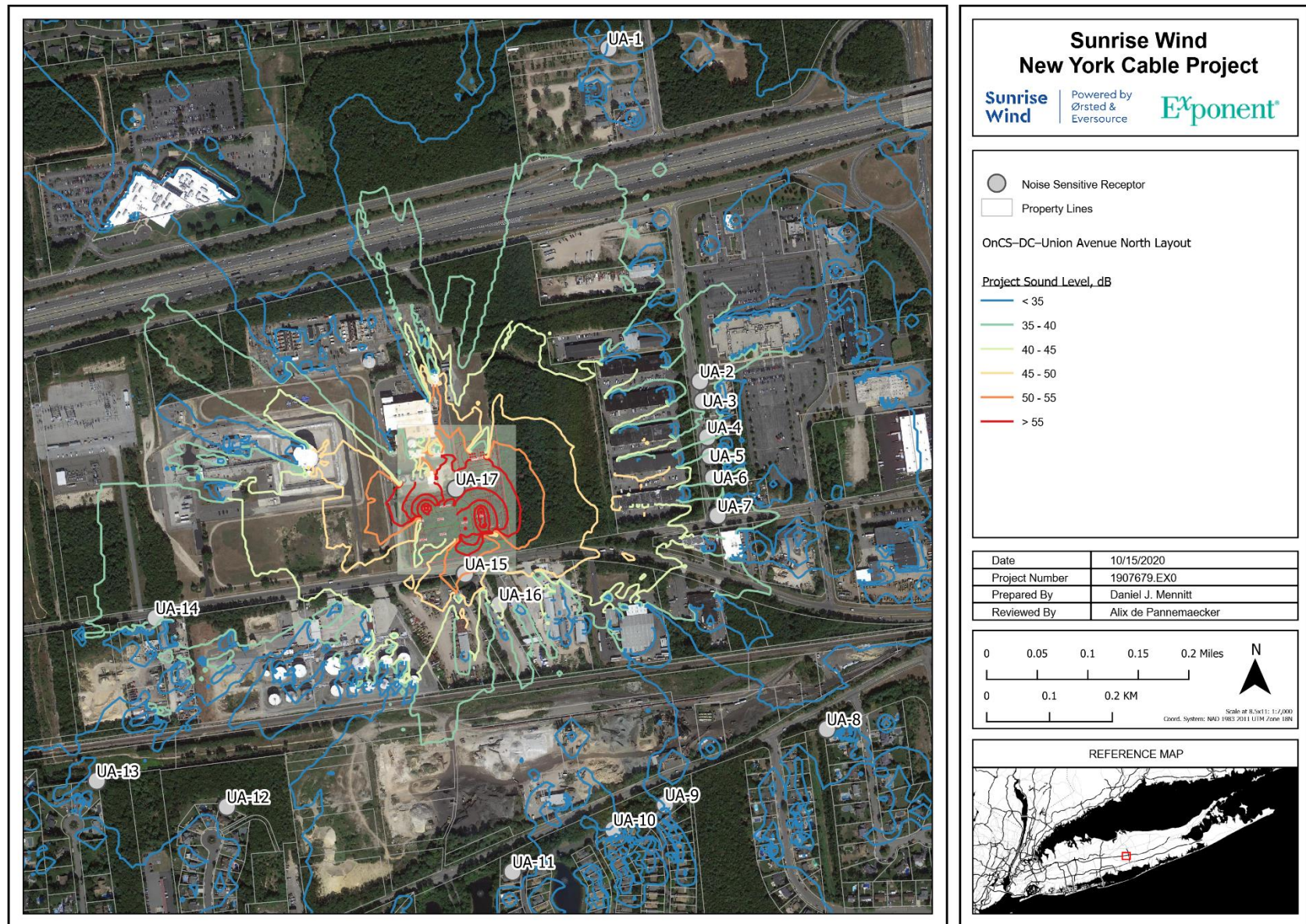


Figure 26. OnCS-DC-Union Avenue North operational noise contours.

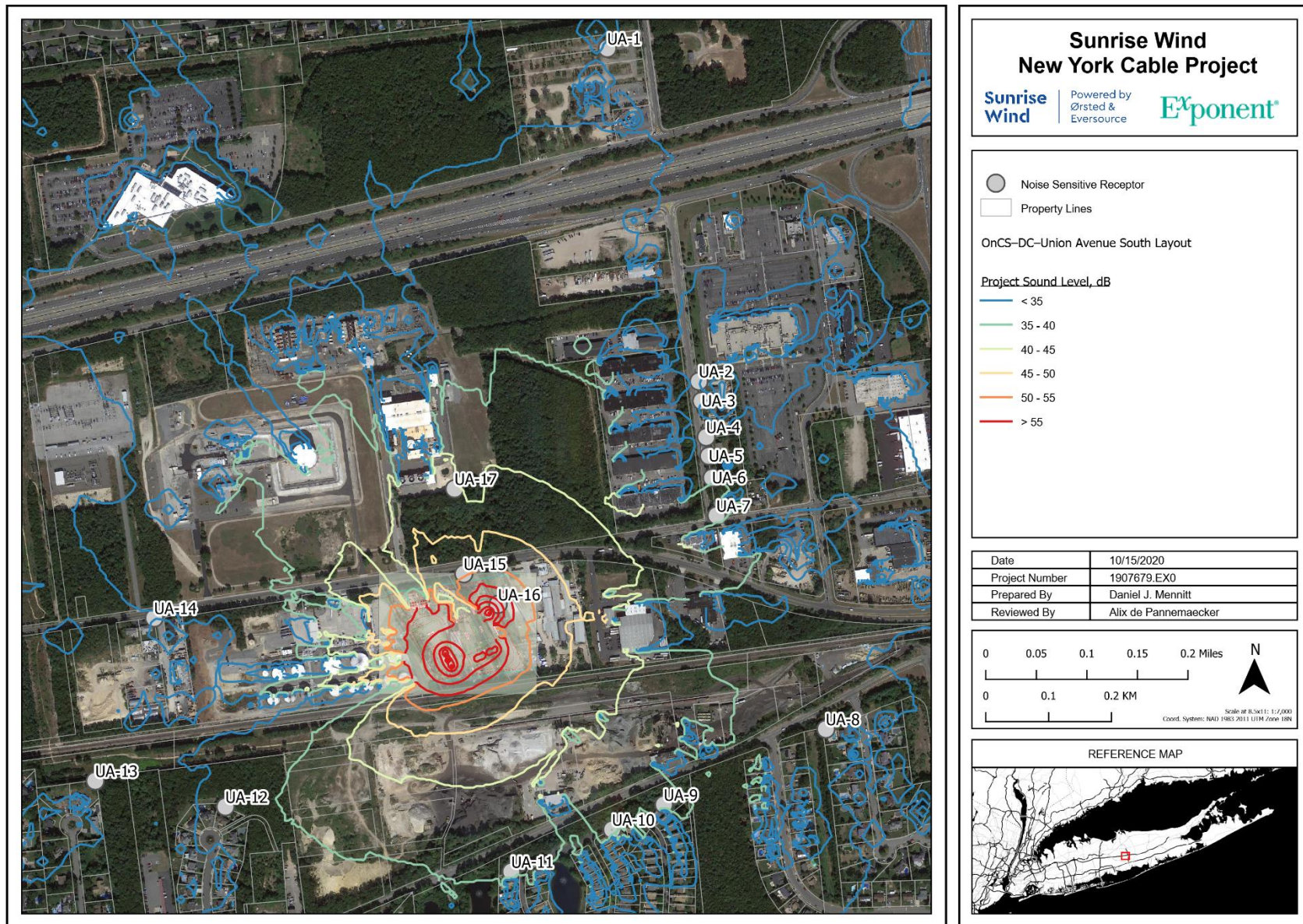


Figure 27. OnCS–DC–Union Avenue South operational noise contours.

8.0 Literature Cited

American National Standards Institute (ANSI). 2004. American National Standard – Procedures for Outdoor Measurement of Sound Pressure Level: ANSI/ASA S12.18-2004.

American National Standards Institute (ANSI). 2005. American National Standard – Measurement of Sound Pressure Levels in Air: ANSI/ASA S1.13-2005.

American National Standards Institute (ANSI). 2014a. Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas: ANSI/ASA S3/SC1.100-2014/ANSI/ASA S12.100-2014.

American National Standards Institute (ANSI). 2014b. American National Standard Electroacoustics – Sound Level Meters: ANSI/ASA S1.4-2014/IEC 61672.

American National Standards Institute (ANSI). 2018. American National Standard - Quantities and Procedures for Description and Measurement of Environmental Sound: ANSI/ASA S12.9-2018.

Bureau of Transportation Statistics (BTS). 2017. National Transportation Noise Mapping Tool. https://maps.bts.dot.gov/noise/BTSNoiseMappingToolDocumentation_March2016.pdf

Burge, P. and Kiteck, P. 2009. Methods for predicting and evaluating noise from horizontal directional drilling (HDD) equipment. INTER-NOISE and NOISE-CON Congress and Conference Proceedings. 2: 4741-4748.

CIGRÉ Working Group 14.26. 2002. HVDC Stations Audible Noise. CIGRÉ Technical Brochures Reference 202.

Cornell University Geospatial Information Repository (CUGIR). 1995. Digital Elevation Models of New York State. <https://cugir.library.cornell.edu/catalog/cugir-008186?xml=36dea.xml>.3

Crocker, M.J. (Ed.). 2007. Handbook of Noise and Vibration Control. John Wiley & Sons.

Federal Highway Administration (FHWA). 2006. Roadway Construction Noise Model – RCNM. https://www.fhwa.dot.gov/environment/noise/construction_noise/rcnm/

Federal Transit Administration (FTA). 2018. Transit Noise and Vibration Impact Assessment Manual, FTA Report No. 0123. John A. Volpe National Transportation Systems Center. https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf

International Organization for Standardization (ISO). 1996. Acoustics: Attenuation of sound during propagation outdoors: ISO 9613:1996.

Norton, M.P. and Karczub, D.G. 2003. Fundamentals of noise and vibration analysis for engineers. Cambridge University Press.

New York State Department of Environmental Conservation (NYSDEC). 2001. Assessing and Mitigating Noise Impacts. https://www.dec.ny.gov/docs/permits_ej_operations_pdf/noise2000.pdf.

Open Street Map (OSM). 2020. Building locations and dimensions. <https://osmbuildings.org/documentation/viewer/>.

Rules and Regulations of the State of New York (NYCRR). Public Service Law, Title 16, Part 86.5, Exhibit 4: environmental impact. New York Department of Public Service.

Schomer, P. et. al. 2011. A re-analysis of Day-Night Sound Level (DNL) as a function of population density in the United States. Noise Control Engineering Journal. 59: 290-301.

Suffolk County (Suffolk). 1999. Suffolk County Code, Chapter 618 Noise. <https://ecode360.com/14948702>

Suffolk County. 2016 (Suffolk). GIS Data describing land use and property lines. <https://suffolkcountyny.gov>.

Suffolk County. 2019 (Suffolk). Population and Density by Town. <https://www.suffolkcountyny.gov/Departments/Economic-Development-and-Planning/Planning-and-Environment/Research-and-Statistics/Statistics>

Town of Brookhaven (Brookhaven). 1987. Town of Brookhaven Code, Chapter 50 Noise Control. <https://ecode360.com/8593764>

United States Environmental Protection Agency (USEPA). 1974. Information on levels of environmental noise requisite to protect public health and welfare with an adequate margin of safety, EPA 550/9-74-004. Office of Noise Abatement and Control, Washington, D.C.

9.0 Limitations

At the request of TRC Environmental Corporation (TRC) and Sunrise Wind, Exponent P.C. (Exponent) conducted an environmental sound survey of ambient conditions, modeled anticipated noise levels from the proposed Project, and assessed potential noise impacts from the Project. The scope of services performed during this investigation may not adequately address the needs of other users of this report, and any re-use of this report or its findings, conclusions, or recommendations presented herein for purposes other than intended for Project permitting are at the sole risk of the user.

This report summarizes the analysis performed to date and presents the findings resulting from that work. In the analysis, we have relied on geospatial data, specifications, usage, and various other types of information describing the anticipated construction and operation activities of the Project provided by TRC and Sunrise Wind. Although Exponent has exercised usual and customary care in the conduct of this analysis, the responsibility for the design and operation of the Project remains fully with Sunrise Wind. Sunrise Wind has confirmed to Exponent that the data contained herein are not subject to Critical Energy Infrastructure Information restrictions.

The findings presented herein are made to a reasonable degree of engineering and scientific certainty. Exponent reserves the right to supplement this report and to expand or modify opinions based on review of additional material if it becomes available.

10.0 Appendix A

Certificate of Calibration and Conformance

This document certifies that the instrument referenced below meets published specifications per Procedure PRD-P263; ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 0; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 0; 61252-2002.

Manufacturer:	Larson Davis	Temperature:	72.4 °F
Model Number:	831		22.44 °C
Serial Number:	3005	Rel. Humidity:	38.8 %
Customer:	TMS Rental	Pressure:	992.4 mbars
Description:	Sound Level Meter		992.4 hPa

Note: As Found/As Left: In Tolerance

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 18-Mar-20

Calibration Due:

Calibration Standards Used:

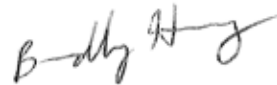
Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	5/6/2020

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of The Modal Shop.

Technician: Bradly Haarmeyer

Signature:




3149 East Kemper Road
Cincinnati, OH. 45241
Phone: (513) 351-9919
(800) 860-4867
www.modalshop.com

Certificate of Calibration and Conformance

This document certifies that the instrument referenced below meets published specifications per Procedure PRD-P263; ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 0; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 0; 61252-2002.

Manufacturer:	Larson Davis	Temperature:	68.5 °F
Model Number:	831		20.28 °C
Serial Number:	3327	Rel. Humidity:	21.2 %
Customer:	TMS Rental	Pressure:	990.5 mbars
Description:	Sound Level Meter		990.5 hPa

Note: As Found/As Left: In Tolerance

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 3-Feb-20

Calibration Due: _____

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	5/6/2020

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of The Modal Shop.

Technician: William Kellner

Signature: _____




3149 East Kemper Road
Cincinnati, OH. 45241
Phone: (513) 351-9919
(800) 860-4867
www.modalshop.com

Certificate of Calibration and Conformance

This document certifies that the instrument referenced below meets published specifications per Procedure PRD-P263; ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 0; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 0; 61252-2002.

Manufacturer:	Larson Davis	Temperature:	69.2 °F
Model Number:	831		20.67 °C
Serial Number:	3556	Rel. Humidity:	16.2 %
Customer:	TMS Rental	Pressure:	990.5 mbars
Description:	Sound Level Meter		990.5 hPa

Note: As Found/As Left: In Tolerance

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 5-Feb-20

Calibration Due: _____

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	5/6/2020

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of The Modal Shop.


Technician: William Kellner

Signature: _____

William Kellner



3149 East Kemper Road
Cincinnati, OH. 45241
Phone: (513) 351-9919
(800) 860-4867
www.modalshop.com



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INC.
APCB GROUP CO.

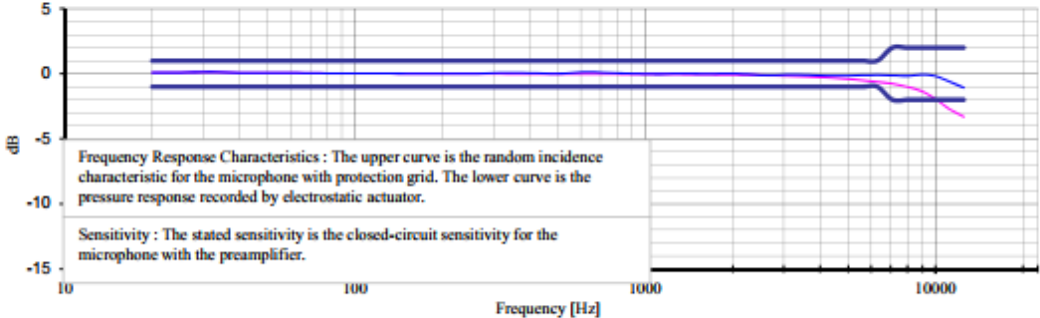
~Certificate of Calibration~

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Fax: 513-458-2172
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Manufacturer: PCB	PCB	Customer: TMS Rental
Model Number: 377C20	426E01	Address:
Serial Number: 172574	41101	
Asset ID:		Calibration Date: Dec 11, 2019 12:52:33
Description: Random Microphone with Preamplifier		Due Date:

Sensitivity: 250 Hz 1 kHz		Temperature: 70 (21) °F (°C)
-26.74 -26.77 dB re. 1V/Pa		Humidity: 28 %
46.04 45.86 mV/Pa		Ambient Pressure: 1009.8 mbar
		Polarization Voltage: 0 VDC

Cal. Results: In Tolerance



Frequency Response Characteristics: The upper curve is the random incidence characteristic for the microphone with protection grid. The lower curve is the pressure response recorded by electrostatic actuator.

Sensitivity: The stated sensitivity is the closed-circuit sensitivity for the microphone with the preamplifier.

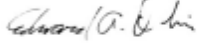
Traceability: The calibration is traceable through NIST Project A1801.

Notes: Calibration results relate only to the items calibrated.
This certificate may not be reproduced, except in full, without written permission.
This calibration is performed in compliance with ISO 9001, ISO 17025 and ANSI Z540.
Measurement uncertainty (250 Hz sensitivity calibration) at 95% confidence level: 0.30 dB
Calibrated per procedure PRD-P204.

User Note: As Found / As Left: In Tolerance.


Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)
20	0.08	630	0.12	4500	-0.15		
25	0.08	800	0.04	5000	-0.16		
31.5	0.13	1000	-0.01	5600	-0.12		
40	0.07	1120	-0.02	6300	-0.10		
50	0.07	1250	0.00	7100	-0.13		
63	0.06	1400	0.01	8000	-0.16		
80	0.03	1600	-0.01	9000	-0.07		
100	0.03	1800	0.00	10000	-0.18		
125	0.02	2000	0.01	11200	-0.61		
160	0.01	2240	-0.04	12500	-1.07		
200	0.00	2500	-0.11				
250	0.00	2800	-0.11				
315	0.06	3150	-0.07				
400	0.05	3550	-0.09				
500	0.01	4000	-0.14				

Technician: Ed Devlin

Approval: 

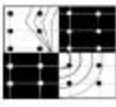
Reference Equipment Used:

Manuf.	Model	Serial	Cal. Date	Due Date
GRAS	40AG	58094	2/11/2019	2/11/2020



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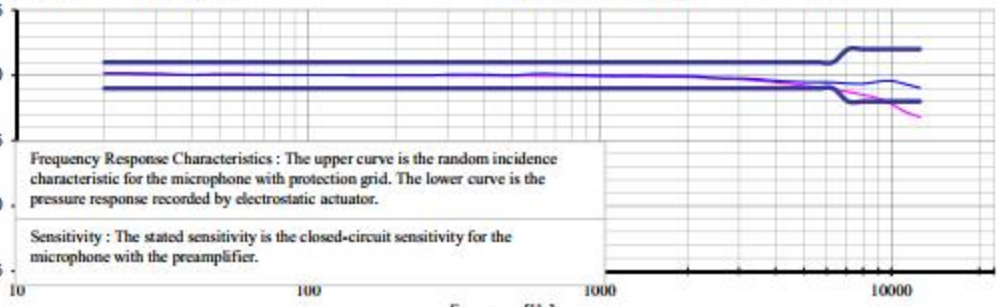
Manufacturer: PCB	PCB	Customer: TMS Rental
Model Number: 377C20	426E01	Address:
Serial Number: 164999	41114	
Asset ID:		Calibration Date: Dec 11, 2019 12:59:00
Description: Random Microphone with Preamplifier		Due Date:

Sensitivity:	250 Hz 1 kHz -26.44 -26.49 dB re. 1V/Pa 47.63 47.39 mV/Pa	Temperature: 70 (21) °F (°C) Humidity: 28 % Ambient Pressure: 1009.8 mbar Polarization Voltage: 0 VDC
---------------------	---	--

Cal. Results: In Tolerance

5
0
-5
-10
-15

dB



Frequency [Hz]

Frequency Response Characteristics : The upper curve is the random incidence characteristic for the microphone with protection grid. The lower curve is the pressure response recorded by electrostatic actuator.

Sensitivity : The stated sensitivity is the closed-circuit sensitivity for the microphone with the preamplifier.

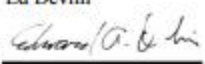
Traceability: The calibration is traceable through NIST Project A1801.

Notes: Calibration results relate only to the items calibrated.
 This certificate may not be reproduced, except in full, without written permission.
 This calibration is performed in compliance with ISO 9001, ISO 17025 and ANSI Z540.
 Measurement uncertainty (250 Hz sensitivity calibration) at 95% confidence level: 0.30 dB
 Calibrated per procedure PRD-P204.

User Note: As Found / As Left: In Tolerance.


Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)
20	0.14	630	0.12	4500	-0.48		
25	0.13	800	0.04	5000	-0.52		
31.5	0.08	1000	-0.03	5600	-0.53		
40	0.03	1120	-0.04	6300	-0.55		
50	0.06	1250	-0.03	7100	-0.62		
63	0.04	1400	-0.03	8000	-0.64		
80	0.03	1600	-0.06	9000	-0.48		
100	0.02	1800	-0.06	10000	-0.44		
125	0.02	2000	-0.05	11200	-0.68		
160	0.01	2240	-0.12	12500	-0.97		
200	0.01	2500	-0.21				
250	0.00	2800	-0.23				
315	0.06	3150	-0.24				
400	0.05	3550	-0.30				
500	0.00	4000	-0.42				

Technician: Ed Devlin

Approval: 

Reference Equipment Used:

Manuf.	Model	Serial	Cal. Date	Due Date
GRAS	40AG	58094	2/11/2019	2/11/2020



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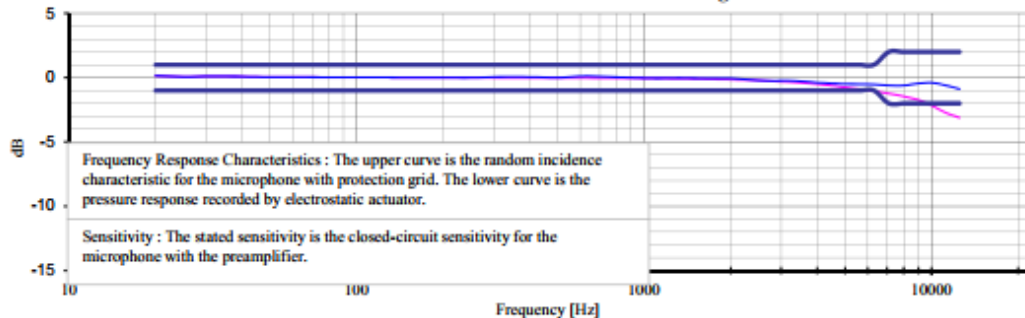
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Manufacturer: PCB	PCB	Customer:	TMS Rental
Model Number: 377C20	426E01	Address:	
Serial Number: 300440	41116	Calibration Date:	Dec 11, 2019 13:26:13
Asset ID:		Due Date:	
Description:	Random Microphone with Preamplifier		
Sensitivity:	250 Hz 1 kHz	Temperature:	70 (21) °F (°C)
	-26.42 -26.47 dB re. 1V/Pa	Humidity:	28 %
	47.78 47.50 mV/Pa	Ambient Pressure:	1009.8 mbar
Cal. Results:	In Tolerance	Polarization Voltage:	0 VDC



Traceability: The calibration is traceable through NIST Project A1801.

Notes: Calibration results relate only to the items calibrated.

This certificate may not be reproduced, except in full, without written permission.

This calibration is performed in compliance with ISO 9001, ISO 17025 and ANSI Z540.

Measurement uncertainty (250 Hz sensitivity calibration) at 95% confidence level: 0.30 dB

Calibrated per procedure PRD-P204.

User Note: As Found / As Left: In Tolerance.

Frequency Response with reference to level at 250 Hz

Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)
20	0.15	630	0.12	4500	-0.45		
25	0.07	800	0.04	5000	-0.49		
31.5	0.11	1000	-0.03	5600	-0.50		
40	0.08	1120	-0.04	6300	-0.53		
50	0.04	1250	-0.03	7100	-0.60		
63	0.04	1400	-0.03	8000	-0.61		
80	0.03	1600	-0.06	9000	-0.45		
100	0.02	1800	-0.06	10000	-0.40		
125	0.02	2000	-0.06	11200	-0.60		
160	0.01	2240	-0.13	12500	-0.88		
200	0.00	2500	-0.22				
250	0.00	2800	-0.25				
315	0.06	3150	-0.24				
400	0.05	3550	-0.29				
500	0.00	4000	-0.38				



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Technician: Ed Devlin

Approval: *[Signature]*

Reference Equipment Used:

Manuf.	Model	Serial	Cal. Date	Due Date
GRAS	40AG	58094	2/11/2019	2/11/2020

Calibration Certificate

Certificate Number 2020009399

Customer:

The Modal Shop
10310 AeroHub Boulevard
Cincinnati, OH 45215, United States

Model Number CAL200

Serial Number 18149

Test Results Pass

Initial Condition As Manufactured

Description Larson Davis CAL200 Acoustic Calibrator

Procedure Number D0001.8386

Technician Scott Montgomery

Calibration Date 26 Aug 2020

Calibration Due

Temperature 24 °C ± 0.3 °C

Humidity 41 %RH ± 3 %RH

Static Pressure 101.3 kPa ± 1 kPa

Evaluation Method The data is acquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 µPa.

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2017 ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017. Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Standards Used			
Description	Cal Date	Cal Due	Cal Standard
Agilent 34401A DMM	08/04/2020	08/04/2021	001021
Larson Davis Model 2900 Real Time Analyzer	04/02/2020	04/02/2021	001051
Microphone Calibration System	03/03/2020	03/03/2021	005446
1/2" Preamp	09/17/2019	09/17/2020	006506
Larson Davis 1/2" Preamp 7-pin LEMO	08/06/2020	08/06/2021	006507
1/2 inch Microphone - RI - 200V	12/06/2019	12/06/2020	006511
Pressure Transducer	10/18/2019	10/18/2020	007204

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Certificate Number 2020009399

Output Level

Nominal Level [dB]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
114	101.3	114.01	113.80	114.20	0.14	Pass
94	101.3	94.02	93.80	94.20	0.14	Pass

-- End of measurement results--

Frequency

Nominal Level [dB]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
114	101.3	1,000.28	990.00	1,010.00	0.20	Pass
94	101.3	1,000.25	990.00	1,010.00	0.20	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N)

Nominal Level [dB]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
114	101.3	0.46	0.00	2.00	0.25 ‡	Pass
94	101.3	0.46	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Level Change Over Pressure

Tested at: 114 dB, 24 °C, 36 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
108.0	108.0	-0.03	-0.30	0.30	0.04 ‡	Pass
101.3	101.4	0.00	-0.30	0.30	0.04 ‡	Pass
92.0	91.9	0.03	-0.30	0.30	0.04 ‡	Pass
83.0	82.9	0.03	-0.30	0.30	0.04 ‡	Pass
74.0	74.0	0.00	-0.30	0.30	0.04 ‡	Pass
65.0	65.0	-0.07	-0.30	0.30	0.04 ‡	Pass

-- End of measurement results--

Frequency Change Over Pressure

Tested at: 114 dB, 24 °C, 36 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
108.0	108.0	0.00	-10.00	10.00	0.20 ‡	Pass
101.3	101.4	0.00	-10.00	10.00	0.20 ‡	Pass
92.0	91.9	0.00	-10.00	10.00	0.20 ‡	Pass
83.0	82.9	0.00	-10.00	10.00	0.20 ‡	Pass
74.0	74.0	0.00	-10.00	10.00	0.20 ‡	Pass
65.0	65.0	-0.01	-10.00	10.00	0.20 ‡	Pass

-- End of measurement results--

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Certificate Number 2020009399

Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 24 °C, 36 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
108.0	108.0	0.44	0.00	2.00	0.25 ‡	Pass
101.3	101.4	0.45	0.00	2.00	0.25 ‡	Pass
92.0	91.9	0.46	0.00	2.00	0.25 ‡	Pass
83.0	82.9	0.48	0.00	2.00	0.25 ‡	Pass
74.0	74.0	0.50	0.00	2.00	0.25 ‡	Pass
65.0	65.0	0.53	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Signatory: Scott Montgomery

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