Empire Offshore Wind LLC

Empire Wind 1 Project

Article VII Application

Exhibit 4

Environmental Impact

June 2021

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TABLES

FIGURES

ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
ac	acre
AMSL	Above Mean Sea Level
APE	area of potential effects
ASMFC	Atlantic States Marine Fisheries Commission
AVEHP	analysis of visual effects on historic properties
BLM	Bureau of Land Management
BOEM	Bureau of Ocean Energy Management
CBRA	Cable Burial Risk Assessment
CFR	Code of Federal Regulations
CO	carbon monoxide
ConEdison	Consolidated Edison Company of New York, Inc.
COP	Construction and Operations Plan
CPT	cone penetration test
CRIS	Cultural Resource Information System
CSO	combined sewer overflow
CWA	Clean Water Act
dBA	decibel, A scale
DMA	Dynamic Management Area
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
EM&CP	Environmental Management & Construction Plan
EMF	electric and magnetic fields
Empire, the Applicant	Empire Offshore Wind LLC
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESPreSSO	Experimental System for Predicting Shelf and Slope Optics
EW 1	Empire Wind 1
EW 1 Project	Empire Wind 1 Project
FEMA	Federal Emergency Management Agency
FHA	Flood Hazard Area
FIRMs	Flood Insurance Rate Maps

FMC	Fishery Management Council
FMP	Fishery Management Plan
ft	foot
GHG	greenhouse gas
ha	hectare
HAPC	Habitat Area of Particular Concern
HDD	horizontal directional drilling
HEP	Harbor Estuary Program
HRG	high resolution geophysical
HVAC	high-voltage alternating-current
Hz	hertz
IBA	Important Bird Area
ICES	International Committee on Electromagnetic Safety
ICNIRP	International Commission on Non-Ionizing Radiation
IMO	International Maritime Organization
IPaC	Information for Planning and Consultation
km	kilometer
km/h	kilometer per hour
knot	nautical mile per hour
KOP	Key Observation Point
kV	kilovolt
kV/m	kilovolts per meter
L_{90}	noise level exceeded 10 percent of the time
lbs	pounds
L_{dn}	day-night sound level
Lease	Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf OCS-A 0512
Lease Area	BOEM-designated Renewable Energy Lease Area OCS-A 0512
L_{eq}	equivalent sound level
L_P	sound pressure level
m	meter
m^3	cubic meter
MAFMC	Mid-Atlantic Fisheries Management Council
MFE	mass flow excavation
mG	milliGauss

mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mi	mile
MLLW	Mean Lower Low Water
MMPA	Marine Mammal Protection Act
MSFCMA	Magnuson-Stevens Fisheries Conservation and Management Act
MSL	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
NAVD88	North American Vertical Datum of 1988
NEFMC	New England Fisheries Management Council
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act
NLCD	National Land Cover Dataset
nm	nautical mile
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Oceanic and Atmospheric Administration's National Marine Fisheries Service
NO_X	nitrogen oxides
NRHP	National Register of Historic Places
NSA	Noise Sensitive Area
NSR	New Source Review (EPA)
NWI	National Wetlands Inventory
NY SHPO	New York State Historic Preservation Office
NYCEDC	New York City Economic Development Corporation
NYCRR	New York Codes, Rules and Regulations
NYNHP	New York Natural Heritage Program
NYSDEC	New York State Department of Environmental Conservation
NYSDOS	New York State Department of State
NYSERDA	New York State Energy Research and Development Authority
NYSPSC or Commission	New York State Public Service Commission
O&M	operations and maintenance
OCS	Outer Continental Shelf
OPRHP	New York State Office of Parks, Recreation and Historic Preservation
OSRP	Oil Spill Response Plan

PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PM_{10}	particulate matter 10 micrometers or less in diameter
$PM_{2.5}$	particulate 2.5 micrometers or less in diameter
POI	Point of Interconnection at the Gowanus 345-kV Substation
Project	EW 1 Project transmission facilities in New York
Project Area	The submarine export cable corridor, onshore cable corridor and onshore substation facilities within New York State jurisdiction
PSL	New York Public Service Law
ROW	right-of-way
SBMT	South Brooklyn Marine Terminal
SCFWH	Significant Coastal Fish and Wildlife Habitat
SGV	sediment guidance value
SHPO	State Historic Preservation Office
SMA	Seasonal Management Area
SO_2	sulfur dioxide
SPCC	Spill Prevention, Control and Countermeasure
SPDES	State Pollutant Discharge Elimination System
SPI	sediment profile imagery
SRHP	State Register of Historic Places
SSBMT	Sustainable South Brooklyn Marine Terminal
SWPPP	Stormwater Pollution Prevention Plan
TOGS	Technical and Operational Guidance Series
tpy	tons per year
U.S.C.	United States Code
ULSD	ultra low-sulfur diesel
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UXO	unexploded ordnance
VIA	Visual Impact Assessment
VOC	volatile organic compound
WHO	World Health Organization
WRP	Waterfront Revitalization Program

EXHIBIT 4: ENVIRONMENTAL IMPACT

4.1 Introduction

Empire Offshore Wind LLC (Empire, or the Applicant) proposes to construct and operate the Empire Wind 1 (EW 1) Project as one of two separate offshore wind projects to be located within the Bureau of Ocean Energy Management (BOEM) designated Renewable Energy Lease Area OCS-A 0512 (Lease Area). The proposed transmission system for the EW 1 Project will connect the offshore wind farm to the point of interconnection (POI), and will include 230-kilovolt (kV) export and 345-kV interconnection lines traversing a total of approximately 17.5 miles (mi) (15.2 nautical miles [nm], 28.2 kilometers [km]) within the State of New York. An electric transmission line with a design capacity of 125 kV or more, extending a distance of one mile or more, is subject to review and approval by the New York State Public Service Commission (Commission or NYSPSC) as a major electric transmission facility. This application is being submitted to the Commission pursuant to Article VII of the New York Public Service Law (PSL) for the portions of the EW 1 Project transmission system that are located within the State of New York (collectively, the Project).

The Project will interconnect to the New York State Transmission System operated by the New York Independent System Operator, Inc. at the Gowanus 345-kV Substation (the point of interconnection, or POI). The Gowanus 345-kV Substation is owned by the Consolidated Edison Company of New York, Inc. (ConEdison). The Project's onshore facilities, including the onshore cable route, onshore substation, and the POI, are located entirely within Brooklyn, Kings County, New York.

The Article VII components of the EW 1 Project include:

- Two three-core 230-kV high-voltage alternating-current (HVAC) submarine export cables located within an approximately 15.1-nm (27.9-km)-long, submarine export cable corridor from the boundary of New York State waters 3 nm (5.6 km) offshore to the cable landfall in Brooklyn, New York;
- A 0.2-mi (0.3-km)-long onshore cable route and substation including:
  - Two three-core 230-kV HVAC EW 1 onshore export cables buried underground from the cable landfall either directly to the cable terminations or to a vault within the onshore substation;
  - An onshore substation located at the South Brooklyn Marine Terminal (SBMT), which will increase the voltage to 345 kV for the onshore interconnection cables; and
  - Two 345-kV cable circuits, each with three single-core HVAC onshore interconnection cables, buried underground from the onshore substation to the POI.

This Exhibit addresses the requirements of 16 New York Codes, Rules and Regulations (NYCRR) § 86.5, and describes the studies that have been conducted regarding the potential impacts of the Project on the environment. This Exhibit also describes the methodologies used to investigate existing environmental conditions, as well as the potential impacts or changes that the Project's construction and operation could have on physical or biological resources and processes, and cultural and societal resources. The Applicant's efforts to avoid, minimize, and mitigate potential impacts to environmental resources are also described. The existing conditions and potential impacts to these environmental resources are described in greater detail throughout Exhibit 4, based on the results of desktop assessment work, field surveys and studies, and agency and stakeholder engagement. The assessment methodology for each resource is described in detail within each section of this Exhibit.

Table 4.1-1 indicates where specific requirements of 16 NYCRR § 86.5 are addressed within this Exhibit.

Table 4.1-1 Location of 16 NYCRR § 86.5 Requirements

16 NYCRR § 86.5 requirement	Exhibit Section(s)
(a) The applicant shall submit a statement describing any study which has been made of the impact of the proposed facility on the environment. That statement shall include a description of the methods employed in making that study and a summary of its findings.	Exhibit 4 (all)
(b) The applicant shall state: (1) what changes, if any, the construction and operation of the proposed facility might induce in the physical or biological processes of plant life or wildlife through any permanent or significant temporary change in the hydrology, topography or soil of the area;	Section 4.2 (Marine Physical and Chemical Conditions) Section 4.3 (Topography, Geology, Soils, and Groundwater) Section 4.4 (Wetlands and Waterbodies) Section 4.5 (Terrestrial Vegetation and Wildlife) Section 4.6 (Fisheries and Benthic Resources) Section 4.7 (Important Habitats and Protected Species)
(2) what efforts, if any, have been made to assure: (i) that any right-of-way avoids scenic, recreational and historic areas;	Section 4.8 (Cultural and Historic Resources) Section 4.9 (Visual and Aesthetic Resources) Section 4.10 (Land Use)
(ii) that any right-of-way will be routed to minimize its visibility from areas of public view;	Section 4.9 (Visual and Aesthetic Resources)
(iii) that any right-of-way has been planned to avoid heavily timbered areas, high points, ridge lines and steep slopes; and	Section 4.3 (Topography, Geology, Soils, and Groundwater) Section 4.5 (Terrestrial Vegetation and Wildlife)
(iv) that the selection of any proposed right-of-way preserves the natural landscape and minimizes conflict with any present or future planned land use;	Section 4.10 (Land Use)
(3) what, if any, plans have been formulated to keep any right-of-way clearing to the minimum width necessary to prevent interference of vegetation with the proposed facility;	Section 4.5 (Terrestrial Vegetation and Wildlife)
(4) what, if any, schedule or method of clearing the right-of-way has been formulated to take into account soil stability, protection of natural vegetation, and the protection of adjacent resources (including the protection of any natural habitat for wildlife);	Section 4.5 (Terrestrial Vegetation and Wildlife)

16 NYCRR § 86.5 requirement	Exhibit Section(s)
(5) what, if any, plans have been made to protect vegetation and topsoil not cleared, from damage from construction and operation of the facility;	Section 4.3 (Topography, Geology, Soils, and Groundwater) Section 4.5 (Terrestrial Vegetation and Wildlife)
(6) what, if any, provision has been made to protect fish and other aquatic life from harm from the use of explosives or pollutants in or near streams and other bodies of water;	Section 4.4 (Wetlands and Waterbodies) Section 4.6 (Fisheries and Benthic Resources)
(7) what, if any, pesticide or herbicide will be used in construction or maintenance of the proposed facility (including the volumes and manner of use);	Section 4.5 (Terrestrial Vegetation and Wildlife)
(8) what, if any, plans have been made to locate and design appurtenant structures to minimize the environmental impact of the structures (including visual and noise disturbance); and	Section 4.5 (Terrestrial Vegetation and Wildlife) Section 4.9 (Visual and Aesthetic Resources) Section 4.10 (Land Use) Section 4.11 (Noise) Section 4.12 (Air Quality)
(9) what, if any, provisions have been made for cleanup and restoration of the project area after construction.	Section 4.1 (Introduction) Section 4.5 (Terrestrial Vegetation and Wildlife)
(c)(1) If any portion of the proposed facility is to be constructed underground, the applicant shall state what, if any, provisions have been made to avoid clearance of the entire right-of-way. If the clearance proposed will go to the mineral soil, the applicant shall state:	Section 4.1 (Introduction)
(i) the width of the clearance;	Section 4.1 (Introduction)
(ii) what, if any, provisions have been made for the replacement of topsoil removal during construction;	Section 4.1 (Introduction) Section 4.3 (Topography, Geology, Soils, and Groundwater)
(iii) what, if any, provisions have been made for removing excess soil excavated during construction; and	Section 4.1 (Introduction) Section 4.3 (Topography, Geology, Soils, and Groundwater)
(iv) what, if any, plans have been made for stabilizing the cleared area with vegetation and erosion control devices.	Section 4.1 (Introduction) Section 4.3 (Topography, Geology, Soils, and Groundwater)
(2) If any underground portion of the proposed facility will be constructed in or adjacent to a stream or other body of water, the applicant shall state:	Section 4.4 (Wetlands and Waterbodies)
(i) what, if any, plans have been made to prevent erosion of the banks;	Section 4.2 (Marine Chemical and Physical Conditions) Section 4.4 (Wetlands and Waterbodies)

16 NYCRR § 86.5 requirement	Exhibit Section(s)
(ii) what, if any, techniques (such as cofferdams) will be used; and	Section 4.1 (Introduction)
(iii) what, if any, plans have been made to use the water from such streams or other bodies of water for pipe-testing or other purposes (including volumes of water involved and methods for release of water once used).	Section 4.4 (Wetlands and Waterbodies)

4.1.1 Impact Assessment Methodology

In accordance with 16 NYCRR § 86.5, the Applicant has assessed the potential impacts of the construction and operation of Project facilities on the environment. For the purposes of this document, the potential impacts associated with construction and operation of the Project are characterized by their nature (i.e., direct or indirect), duration (i.e., short-term or long-term), and intensity (i.e., negligible, minor, moderate, or significant).

The nature of the potential impacts is characterized as either direct or indirect. Direct impacts occur as a direct result of a proposed Project, such that the cause and effect occur simultaneously (or near simultaneously) during construction or operation of the Project. Indirect impacts are caused by the Project and are later in time or farther removed from the Project but are still reasonably foreseeable.

The duration of the potential impacts is characterized as either short-term or long-term. Short-term impacts occur during construction and may occur for a short period of time after construction, but will be eliminated once the activity causing the impact ceases to occur and the resource is restored and recovers. Long-term impacts occur when a resource is not expected to recover or be fully restored following construction activities, or when impacts are associated with the facility operations for the life of the Project.

The intensity of impacts is characterized within this document as negligible, minor, moderate or significant. Impacts are considered to be negligible if they will not be noticeable or measurable. Minor impacts are noticeable, but typically are localized in extent and/or will be avoided or significantly reduced with mitigation measures. Moderate impacts are those that may still result in some noticeable effects to resources after the employment of mitigation measures. Significant impacts occur over a large area and the resource may not recover or be restored, even with the implementation of mitigation measures. No impact is used to describe situations where a resource is entirely avoided by the Project routing and/or when there is no impact-producing activity associated with the Project that has the potential to affect the resource.

4.1.1.1 Impact Assessment Area

The Project Area includes the areas that may be used for the build-out of the Project, including the submarine export cable corridor within New York State boundaries, the onshore cable corridors, and the onshore substation, including areas to be temporarily used for onshore construction. The submarine export cables in New York State waters will be installed in a 15.1-nm (27.9-km)-long corridor that extends from the federal/New York State water boundary to the cable landfall. The submarine export cable corridor is variable in width to allow the Applicant flexibility to micro-site the cables based on environmental and seabed conditions identified prior to installation (see figures provided in **Exhibit 2: Location of Facilities**). The submarine export cable corridor in New York State waters is 500 feet (ft) (153 meters [m]) in width to allow the Applicant flexibility to micro-site the cables based on environmental and seabed conditions identified prior to installation. This submarine export cable siting corridor is expanded to a maximum of approximately 1,600 ft (488 m) wide in the area to the west of Coney Island, to allow for additional assessment of seabed features, stakeholder input and maintenance constraints to inform cable routing. Throughout the submarine export cable corridor, the two 230-kV submarine export cables are anticipated to be spaced approximately 98 ft (30 m) apart; cable spacing is subject to further refinement in the Environmental Management and Construction Plan (EM&CP). Direct disturbance for installation will be up to approximately 26 ft (8 m) wide per cable, including approximately 5 ft (1.5 m) for the width of the burial tool penetrating the seafloor, plus the additional width of seafloor contact and sediment sidecast.

In addition, a width of up to 1,250 ft (381 m) on either side of the submarine export cable corridor may be used for anchoring of the submarine export cable installation vessel in support of installation activities. This anchoring corridor width may vary where site constraints exist.

Since the submarine export cables will be buried under the seafloor, the area of operational impact for the submarine cables is considered to be limited to the footprint of the cable protection measures and any long-term bathymetry changes to facilitate installation of the cables (e.g., dredging, see Section 4.1.2). Cable protection, where necessary, would conservatively occupy a width of up to 15 ft (4.5 m) over the submarine export cables, except at existing submarine asset crossings (e.g., cables, pipelines), where the width may be up to 46 ft (14 m). Pre-sweeping and/or dredging will be required in limited areas of the submarine export cable corridor as described further below.

The Project Area also includes a 9.0-acre (ac) (3.6-hectare [ha]) portion of SBMT for cable landfall, the onshore substation and EW 1 onshore export cables, and the temporary construction staging area and laydown area required for onshore construction of the facility. Approximately 4.8 ac (1.9 ha) of this area will be occupied by the onshore substation and associated infrastructure during the operation of the Project. The 9.0 ac (3.6 ha) also includes a separate temporary laydown area within SBMT that is approximately 1.2 ac (0.5 ha). The onshore substation will be equipped with monitoring equipment and will be regularly inspected during operations. Inspections may periodically result in routine maintenance activities, such as replacement of and/or updates to electrical components/equipment.

In order to contribute to the development and build-out of the offshore wind industry in the State of New York, the Sustainable South Brooklyn Marine Terminal (SSBMT) is also proposing to conduct upgrades to the SBMT port facility that would allow offshore wind developers to utilize the facility as a construction and staging area. Planned upgrades by SSBMT are separate from the Project and may include bulkhead replacements, foundation and groundwork, and dredging.

The EW 1 onshore export cables are not expected to differ from the submarine export cables, and will extend from the shoreline either directly to the cable terminations or to a vault within the onshore substation. From the cable landfall, the EW 1 onshore export cables will extend approximately 263 ft (80 m) to the vault or cable terminations, within the proposed onshore substation at SBMT. The onshore substation workspace will include the workspace needed for trenching, equipment operation, and EW 1 onshore export cable installation.

The onshore interconnection cables will be installed primarily within SBMT and the roadway corridor of 2nd Avenue, from the onshore substation to the POI, within a 0.2-mi (0.3-km)-long and 50-ft (15-m)-wide cable corridor. Following construction, the Applicant will maintain a 25-ft (8-m)-wide operational corridor for the onshore interconnection cables.

The Project Area used for the environmental assessment is summarized in **Table 4.1-2**. For certain resources with potential indirect impacts beyond the direct Project Area, a resource-specific study area is described in applicable sections.

Table 4.1-2 Summary of the Article VII Project Area

Project Component	Total Project Area (acres)	Temporary Construction Disturbance Area (acres)	Permanent Operational Disturbance Area (acres)
Submarine Export Cable Corridor a/	1,141 a/	109.0 b/	6.29 c/
Cable Landfall and Onshore Substation	9.01	9.01	4.76
Onshore Interconnection Cable Corridor	0.0.41 d/	0.0.41d/	0.17 e/

Notes:
a/ Based on the total area within the submarine export cable corridor (cable siting corridor) in New York; this also includes the offshore workspace associated with the cable landfall activities.
b/ Based on an estimated 26-ft (8-m)-wide disturbance corridor for submarine export cable lay activities per cable.
c/ Based on a cable protection width of up to 15 ft (4.5 m) along each cable for up to 10% of the 17.3-mi (27.9-km)-long cable route.
d/ Based on the footprint of the 50-ft (15-m)-wide corridor during construction, not including temporary workspace within the SBMT site that is included as part of the onshore substation workspace.
e/ Based on a 25-ft (8-m)-wide corridor along the interconnection cable route during operations, not including area along the interconnection cable route within SBMT.

4.1.2 Impact-Producing Factors - Construction

The following section details the construction activities that provide the basis for the impact-producing factors discussed in this Exhibit. Additional detail and discussion of underground construction methods, including installation of the submarine export cables and onshore cables, is provided in **Exhibit E-3: Underground Construction.**

4.1.2.1 Installation of Offshore Components

Impact-producing factors associated with the installation of offshore components within New York State waters include cable pre-lay activities such as a pre-installation grapnel run, route clearance and boulder removal, pre-sweeping, dredging, and pre-trenching; laying and burial of submarine export cables; installation of cable protection measures; and the anchoring/positioning of working vessels for installation. Transportation and installation of Project-related components can also produce impacts associated with increased vessel traffic.

The typical key stages of submarine cable installation are:

1. Unexploded ordnance (UXO) clearance and pre-installation activities[1];
2. Pre-sweeping and pre-trenching activities (if needed);
3. Cable lay and burial;
4. Cable and pipeline crossings;
5. Post-installation survey; and
6. Post-crossing or remedial cable protection (if needed).

[1] A separate pre-survey and route clearance may be performed prior to the pre-installation grapnel run and survey if there are expected to be large quantities of debris along the route.

Once pre-installation activities are completed, the installation of the submarine export cables is expected to take less than one month per cable for the submarine export cable route in New York. The actual installation schedule will be subject to seabed characteristics, installation vessel availability, other vessel traffic, and weather. The cable-laying and burial methods for the Project may include jetting, mechanical plowing and/or trenching to allow flexibility during installation for site-specific seabed conditions. In certain areas, mass flow excavation or dredging may also be required to prepare for cable installation.

In addition to pre-sweeping and pre-trenching activities, an area along the submarine export cable corridor approaching the cable landfall at SBMT is anticipated to require dredging because of the required cable burial depth and draft requirements of the installation vessel. In this area, dredging to the required depth will be performed prior to cable lay activities. Additional details on submarine export cable installation methods are provided in **Exhibit E-3**. The subsections below summarize construction methods as they relate to the environmental impact assessment.

The potential impacts from the installation of submarine export cables and the related vessel support are primarily associated with the direct, short-term seafloor disturbance within the submarine export cable installation corridor. Seafloor disturbance during construction may result in a short-term impact to water quality from sediment disturbance; disturbance to benthic habitats and species; injury and mortality of sedentary benthic species; harm and mortality of plankton and ichthyoplankton; temporary displacement of mobile marine species such as fish, squid, and marine mammals; and the potential disturbance of submerged archaeological resources. There is also the potential for short-term impacts to water quality due to accidental spills and/or releases of oil or petroleum products offshore. Risks include the potential for damage to existing infrastructure such as buried cables and pipelines from pre-installation surveys and clearance, cable installation, or Project-related vessels (e.g., anchor snags or jack-up footings). Localized underwater noise levels will temporarily increase during the installation of the offshore components. Visual impacts may be caused by the short-term presence of construction-related vessels and lighted work areas at night.

Marine transportation impacts associated with offshore construction activities are addressed in **Exhibit E-6: Effects on Transportation**.

Construction Vessels and Anchoring

The submarine export cables will be installed from specialized installation vessels/barges, which will install the cables from a turntable on the lay vessel/barge. Submarine export cable installation will typically require a pre-lay grapnel run vessel, a cable lay vessel, a cable lay support vessel, and one or more guard vessels. Construction of the proposed route may also require a shallow water barge/vessel and will typically use three or four support vessels. Installation of cable protection measures may additionally require a mattress installation, rock installation or fall pipe vessel. Supply vessels will also transport Project-related components from ports and staging areas to the offshore construction areas.

Dredging along the submarine export cable corridor in certain areas and approaching the cable landfall location will require 7 to 11 vessels. The Applicant anticipates that one main dredge will be used to excavate materials, along with 3 to 5 support vessels and 3 to 5 hopper barges. Dredging can be completed through clamshell dredging, suction hopper dredging, and/or hydraulic dredging.

Direct, short-term seafloor disturbance from construction vessels could arise from jack-up vessel footings, barge spuds, or anchors from construction vessels. During construction, vessel traffic could also result in a short-term increase in both in-air and underwater noise, air pollutant emissions, and visual impacts. Vessels also may pose a risk to marine mammal and sea turtle species from collision or entanglement; measures to minimize this risk are discussed further in Section 4.7. Debris has the potential to be introduced to the marine environment during construction activities from Project-related construction vessels; however, Project-related personnel and vessel contractors will be required to implement appropriate debris control practices and protocols. Vessel operators, employees, and contractors actively engaged in activities in support of the Project will be briefed on marine trash and debris awareness elimination, in accordance with the conditions of Lease OCS-A 0512 with BOEM. The Applicant will ensure that these vessel operators, employees, and contractors are made aware of the environmental and socioeconomic impacts associated with marine trash and debris, and their responsibilities for ensuring that trash and debris are not intentionally or accidentally discharged into the marine environment. As such, the release of marine debris into Project Area waters is not anticipated. Project-related vessels will operate in accordance with laws regulating the at-sea discharges of vessel-generated waste. **Exhibit E-6** addresses potential short-term impacts from increased marine traffic due to Project-related construction vessels.

UXO Clearance and Pre-Installation Activities

Prior to the installation of cables, survey campaigns including debris clearance, UXO clearance, a pre-lay grapnel run, and pre-installation surveys may be completed. This is to ensure that the submarine export cable and burial equipment will not be impacted by any debris or hazards, either natural or artificial, during the cable lay and burial process and to avoid the potential for equipment damage and/or delays. The pre-installation work also serves to ensure sufficient cable burial depth. In some areas, existing, out-of-service cables and pipelines may be cut away and removed in order to install the submarine export cables.

Any removed debris from the cable corridor will be handled and disposed of in accordance with applicable regulations. Direct seabed disturbance and suspension of sediment resulting from these survey activities are anticipated to be short-term, minor, and localized. Route clearance, pre-installation surveys, and pre-lay grapnel runs are expected to require less than one month.

Pre-Sweeping

In certain limited areas of the submarine export cable corridor, where underwater megaripples and sandwaves are present on the seafloor, pre-sweeping activities may be necessary prior to cable lay activities in order to achieve cable burial to the target depth. Additional discussion of pre-sweeping methods is provided in **Exhibit E-3.** Pre-sweeping and other pre-installation activities are expected to require approximately one to two months. Pre-sweeping activities would ideally occur immediately prior to cable installation, schedule permitting, but may be conducted up to approximately a year prior to the start of cable installation activities.

Where required, pre-sweeping activities will occur in an area up to approximately 164-ft (50-m) in width along the length of the megaripples and sandwaves; the length of clearance will vary along the submarine export cable route, ranging from approximately 197 ft (60 m) to 5,577 ft (1,700 m). Megaripple and sandwave heights vary depending on localized seabed and current characteristics. Approximately 119,262.2 cubic yards (91,182.5 cubic meters) of sediment is anticipated to be sidecast as a result of these pre-sweeping activities.

Should a suction hopper dredge vessel or similar equipment be used to complete this activity, the Applicant anticipates that dredged material will either be sidecast near the site of installation or removed for reuse or proper disposal. The actual method of dredged material management will be based on sediment sampling and consultation with regulatory agencies. Additional information on dredged material management and/or disposal will be provided as part of the Applicant's EM&CP.

Mass flow excavation equipment, if used for pre-sweeping, will not generate dredge material requiring disposal; rather, the material will be sidecast. Within areas subject to pre-sweeping by either dredging or mass flow excavation, the submarine export cables will be installed to the target depth via jetting or other cable burial techniques (e.g., jetting, plowing, etc.).

Impacts of pre-sweeping will be predominantly short-term. Underwater currents will facilitate the natural return of pre-construction conditions in areas subject to pre-sweeping or pre-trenching. Pre-sweeping and pre-trenching may result in potential impacts to water quality by suspending sediment, which in areas of contamination, could include the contaminants. Benthic impacts on the seafloor could result in temporary behavioral, physiological, or physical harm to demersal and deep pelagic species of fish, mobile species such as crabs, and some shellfish such as scallops that occur in the vicinity of construction activity. Additionally, a localized, long-term change to seafloor bathymetry will result from removal of sediment material associated with sandwaves and megaripples; however, based on the small footprint of pre-sweeping, this is not expected to result in impacts to large-scale physical or chemical conditions.

Pre-Trenching

Pre-trenching activities may also be required in select locations along the submarine export cable route where deeper burial may be required and/or where seabed conditions are not suitable for traditional cable burial methods without seabed preparation. Pre-trenching involves running the cable burial equipment over portions of the route in order to soften the seabed prior to cable burial and/or the use of a suction hopper dredge to excavate additional sediment. The impacts associated with this pre-trenching method are anticipated to be the similar to those described below for cable lay and burial.

Localized Dredging

Dredging is used to excavate, remove, and/or relocate sediment from the seabed in order to increase water depth and alter existing conditions; this can be completed through clamshell dredging, suction dredging, and/or hydraulic dredging. The dredging of sediment allows deep draft vessels to safely navigate over shallow areas, as well as allowing for adequate burial of the submarine export cables in areas where deeper burial depths are required.

At locations where the submarine export cable crosses other assets, local dredging may be needed in order to reduce the shoaling of the crossing design (see “Cable and Pipeline Crossings” below). Additionally, for cable installation along the submarine export cable corridor approaching the landfall at SBMT, depths below the existing bathymetry are expected to be required because of the need for deeper cable burial within Bay Ridge Channel and cable installation vessel draft requirements. Additional information on areas where dredging may be required and the potential dredge depths is provided in **Exhibit E-3**.

The Applicant anticipates that dredged material generated from the Project will be removed for either reuse or proper disposal at a licensed facility. The actual method of dredged material management will be based on sediment sampling and consultation with regulatory agencies. Additional information on dredged material management and/or disposal will be provided as part of the Applicant’s EM&CP.

Potential short-term impacts from dredging may include an increase in suspended sediment during construction from direct seabed disturbance, decanting, or dewatering activities. In areas of existing contamination, contaminants could additionally impact water quality. Additionally, a localized, long-term change to lower seafloor bathymetry will result from the removal of seabed sediment. In order to avoid thermal impacts to the cable, dredging may be required during operations to maintain the post-construction dredge depth.

Cable Lay and Burial

Following the pre-burial activities, the submarine export cables will be brought to the appropriate section of the cable corridor. From there, the submarine export cables will be installed via jetting, plowing or trenching methods, as described below. The final cable burial method selection will be made prior to the Applicant's filing of the EM&CP.

- **Jetting**: Jetting will be the primary method for cable installation. Jetting may be conducted via a towed device that travels along the seafloor surface. Jetting may also be conducted with a vertical injector fixed to the side of a vessel or barge. These methods inject high pressure water into the sediment through a blade that is inserted into the seafloor to create a trench. Simultaneously, the cable is fed from the cable vessel down through the device and laid into the trench. Post-lay burial with a jetting tool may also be utilized. With this method, the cable would first be laid along the seafloor, and then the post-lay jetting tool would follow and may attempt multiple passes of the area for burial.

  The high-pressure water from the jetting tool sufficiently softens the seafloor sediment such that the cable can be pushed down through the sediment to the desired burial depth. The adjacent sediment and displaced sediment then resettles into the trench. Jetting with simultaneous cable lay, using either a jet plow or vertical injector is considered the most efficient method of submarine cable installation in many soil types, as it minimizes the extent and duration of bottom disturbance given the significant length and water depths along the submarine export cable route.

  Disturbance caused by either jetting method can result in impacts to benthic infauna and epifauna from physical forces associated with the high-pressure jetted water; this can also occur from the skids of a jet sled riding on the seafloor surface. Jetting can also cause impacts to water quality by suspending sediment (which in areas of contamination could include re-suspension of the contaminants). Suspended sediment closest to the installation can indirectly cause behavioral, physiological, or physical harm to demersal and deep pelagic species of fish, mobile species such as crabs, and some shellfish such as scallops that occur in the vicinity of jetting activity. Due to the transport and redeposition of finer grain sediment away from jetting, particularly where there are tidal currents, the seafloor may experience a thickness gradation of deposited sediment (see **Appendix B Sediment Transport Analysis**), which could affect benthic species as well as certain life stages of fish species. These impacts are discussed in more detail in Section 4.2. In addition, plankton and ichthyoplankton that are entrained into the water pumped through the jets will be harmed and most likely suffer mortality.

- **Plowing, or mechanical plowing:** Plowing is conducted with a "mechanical" (i.e., non-jetting) cable plow that is pulled along the seabed, creating a narrow trench. Simultaneously, the cable is fed from the cable vessel down to the plow, with the cable laid into the trench by the plow device. Gravity causes the displaced sediment to return to the trench, covering the cable. In general, material backfills naturally under wave action and tidal currents, but if necessary, additional sediment can be mechanically returned to the trench using a backfill plow. Similar to a jet plow, the cable is installed and buried in a single pass. Plowing also results in direct seafloor disturbance, with the potential to impact benthic infauna and epifauna from the action of the plowing machine and to impact water quality from suspended sediment. Plowing is generally less efficient than jetting methods, but may be used in limited site-specific conditions. These impacts are discussed in more detail in Section 4.2.

- **Trenching (cutting):** Trenching is used on seabed containing hard materials not suitable for jetting or plowing. For those areas containing hard materials, the trenching machine mechanically cuts through the hard materials using a chain or wheel cutter fitted with picks or teeth. The cutter creates a trench that the submarine export cable is laid into and backfill is mechanically returned to the trench using a backfill plow. Trenching produces direct seafloor disturbance similar to jetting and plowing, with the potential to impact benthic infauna and epifauna from the action of the trenching machine, and to impact water quality from suspended sediment.

The intensity of potential impacts will vary based on several factors, including the installation method, seabed sediment properties, burial depth, and hydrographic conditions (e.g., tidal currents) at the time of installation. The proposed cable installation methods will also result in variable levels and frequencies of underwater noise, depending on the equipment operational modes and the nature of the seafloor sediment/geology.

The submarine export cables will be buried to a minimum target depth of 6 ft (1.8 m), or in federally maintained channels and anchorages, to a minimum of 15 ft (4.6 m) below authorized depths or the depth of the existing seabed (whichever is deeper), if feasible (see **Exhibit E-3** for additional information on anticipated cable burial depths). The burial depth may vary from the target depth due to a variety of factors, including seafloor conditions, previously installed utilities, other existing uses, and planned and future uses. The achievement of adequate burial depth of the submarine export cables will de-risk conflicts with the heavy vessel traffic within New York Harbor, and will minimize impacts to benthic resources during operations, to the extent practicable. In the event that the minimum burial depth is not achieved, cable protection measures will be proposed.

Cable Protection Installation

Cable burial is the preferred protection technique, and the submarine export cables will be buried to the target burial depth wherever it is technically and commercially feasible to do so. Additional or alternative protection measures will only be used if determined to be necessary after an assessment of cable burial risk. In areas where burial of the cable is not feasible, or where sufficient burial depth is not achieved, remedial cable protection will be installed to protect the cables. The locations requiring protection, the type of protection selected, and the amount placed around each submarine export cable will be based on a variety of factors, including water flow and substrate type (hydrodynamic scour modeling), and potential other uses (e.g., commercial fishing or other maritime activities). Alternative measures to burial may include:

- Rock: the installation of crushed rock or boulders over a cable;
- Rock Bags: the placement of pre-filled bags containing crushed rock over a cable;
- Concrete Mattress: the placement of concrete blocks, or mats, made of connected segments over a cable; and/or
- Geotextile Mattress: filled with rock or similar material.

In addition, at certain cable and pipeline crossings, tubular sections may be installed on the submarine export cable as a protection layer prior to the placement of the cable protection measures. Cable protection may also be placed around appropriate sections of exposed or at-risk cables.

With the exception of certain asset crossings, discussed below, surficial use of concrete mattresses is not a preferred method of cable protection; therefore, this approach will be utilized to the least extent practicable for cable protection in areas where cable burial is not feasible or target burial depth cannot be achieved. It is estimated that up to 10 percent of the length of the submarine export cable route will require cable protection. Installation of cable protection measures is estimated to take approximately one month per cable for the submarine export cable route within New York State waters.

Direct seabed disturbance associated with the cable protection installation is expected to be long-term but limited to the local footprint of the cable protection. The magnitude of these potential impacts will be based on several factors, including the installation method, seabed sediment properties, and the cable protection footprint. Direct impacts associated with the suspension of sediment are anticipated to be negligible, short-term, and limited to the installation area.

Cable and Pipeline Crossings

Within New York Harbor, there are a number of existing cables and pipelines, both in-service and out-of-service (see **Exhibit E-6** for detailed information on locations of asset crossings). Where the submarine export cable route requires the crossing of such assets, specific crossing designs will be developed and engineered. The Applicant has evaluated a variety of submarine export cable crossing methods for cable and pipeline assets, and traditional crossing methods, with either rock or mattress protection have been identified as the preferred asset crossing methods. **Exhibit E-3** provides detailed information on these traditional asset crossing methods. These crossing methods will be detailed further in the EM&CP.

For the installation of cable and pipeline crossings, once the precise location of the infrastructure to be crossed is determined, usually by survey, a layer of protection is installed on the seabed (if needed). Localized dredging before the cable protection is installed may be required in order to minimize potential shoaling on the seabed. A layer of external protection may be installed on the submarine export cable prior to placement, and the submarine export cable is laid over the first layer of protection. A second layer of protection is installed over the submarine export cable. If needed, a final layer of protection may be installed over the crossing and any remaining voids in the seabed at the installation site will be allowed to backfill naturally.

If excavation of material at crossings is needed, the crossing design could include the removal of approximately the top 4 ft (1.2 m) of seabed within a 33-ft by 52.5-ft (10-m by 16-m) area at each crossing; utilizing a 3:1 side slope, the upper bounds of this area will be approximately 59 ft by 79 ft (18 m by 24 m). Approximately 679 cubic yards (519 cubic meters) of material is anticipated to be removed by suction hopper dredge at each crossing. The final depth of the dredged area will be governed by the vertical distance between the natural seabed and the assets to be crossed. Additional information on asset crossing methods is provided in **Exhibit E-3**, and additional detail will be provided in the EM&CP.

Impacts at cable and pipeline asset crossings will result from the placement of the protection material and the resulting conversion of the seafloor substrate from sediment to hard material in the small area occupied by the cable protection material. The placement of hard material will be a potential long-term impact and will be limited to the areas of each individual cable crossing. The magnitude of the potential impact will vary based on several factors, including the installation method, seabed sediment properties, and footprint of the cable protection material. Impacts from the suspension of sediment during cable protection installation are anticipated to be minor, short-term, and limited to the installation area.

Post-Installation Surveys

After submarine export cable burial, a post-installation survey will be completed to determine the as-built conditions of the submarine export cables and the levels of burial achieved. At this time, any areas requiring additional cable protection will be identified. No impacts to the seafloor are anticipated as a result of the post-installation survey. Additional inspections during the operation of the submarine export cables are detailed in Section 4.1.3.

4.1.2.2 Installation of the Cable Landfall

Construction of the cable landfall is considered an impact-producing factor resulting in the potential for both nearshore and onshore impacts. The transportation of Project-related components for landfall installation activities can also produce impacts associated with increased marine vessel traffic and onshore traffic to ports and staging areas. Based on the limitations associated with horizontal directional drilling (HDD) installation for the Project cable landfall (see **Exhibit 3: Alternatives**), the proposed method for cable landfall installation is to pull the cable through conduits in the bulkhead along the shoreline at SBMT (see **Exhibit E-3** and **Exhibit 5: Effect on Communication**).

The Applicant will replace the currently existing bulkhead at the landfall as part of site preparation activities, and will install vertical conduits (or J-tubes) through the bulkhead for cable landfall. New sheet pile will be installed in front of the existing wall. A distance of approximately 60 ft (18 m) behind the existing bulkhead will be temporarily excavated for the installation of a sheet pile anchor wall and perpendicular tie-backs to support the pipe and sheet pile bulkhead wall at the shoreline. Pile driving will be conducted along the length of the bulkhead and the anchor wall behind it. Temporary sheet piling will also be installed in the water at conduit openings during the bulkhead replacement activities, which will stay in place until cable pull and then be removed after installation of the cable landfall is complete.

Conduit openings will be installed at the bottom of the bulkhead, with approximately 4 ft (1.2 m) depth of cover below the mudline. A temporary dredge pit will be excavated at the base of the bulkhead adjacent to the conduit openings. Following the installation of any supports at the conduit openings, the temporary sheet piles in the water will be removed. Export cable installation will then commence by pulling the end of each cable from the cable-laying vessel through the conduits and temporarily anchoring them on shore. The jet plow will then be lowered to the seabed in the area of the former cofferdam, each cable will be placed within the jet plow, and the cable-laying vessel would start installing the cable through jetting as described in Section 4.1.2.1, moving out from the inter-pier space and into the inner harbor.

After the cable lay, the temporary dredge pit will be backfilled. Backfill will consist of native dredged material if suitable; otherwise, dredged material will be taken to an authorized facility for disposal, and suitable, clean backfill material will be used. Once the cables are in place, scour protection will be installed at the toe of the bulkhead, around the end of the conduit. On the landside above the bulkhead, upland excavation will be conducted along the EW 1 onshore export cable route to create a transition trench for the conduit and EW 1 onshore export cables.

To support the installation, both onshore and offshore work areas will be required. The onshore work area for cable landfall will be located within the substation construction workspace at SBMT; therefore, potential impacts associated with the onshore side of the cable landfall are the same as those described in Section 4.1.2.3 for the installation of onshore components in general.

The offshore work will be located within the submarine export cable corridor adjacent to the bulkhead. Installation of the submarine export cables to the cable landfall, including dredging, will result in impacts described in Section 4.1.2.1. Direct impacts associated with the suspension of sediment are anticipated to be minor with appropriate best management and mitigation measures, short-term, and limited to the installation footprint and immediately adjacent areas. Seafloor disturbance may result in a short-term impact to water quality from sediment suspension, which could affect plankton, ichthyoplankton, and prey species for larger aquatic species. It also could cause longer-term impacts, including the alteration of benthic habitats where dredging removes sediment and deepens the water column, displacement of mobile marine species such as fish and mortality of sedentary benthic species within the footprint of dredging and jetting. There is also the potential for short-term impacts to water quality due to accidental spills and/or releases of oil or petroleum products from construction vessels. Localized underwater noise levels will temporarily increase during the installation of the landfall components, particularly during the sheet pile driving and removal associated with the temporary cofferdam. Impacts associated with the shoreline interface will additionally include a short-term increase in noise and vibration from the installation of shoring and the cofferdam via pile driving. The increased noise associated with pile driving has the potential to harm fish, squid, or other species that may be in close proximity to the activity. Given the location of this activity between two piers and near the shore, these impacts are likely to be minor, localized and short-term. Noise and vibration due to landfall activities are not likely to impact marine mammals, sea turtles, or sturgeon, given that these species are unlikely to occur within the confined space between the piers.

4.1.2.3 Construction of Onshore Components

The construction of onshore Project components includes construction of the onshore substation and onshore cables. Impact-producing factors for onshore construction also include the transportation of Project-related components to the Project port, staging areas, and work sites. Based on the existing conditions, both trenched (open cut) and trenchless (jack and bore) methods are proposed for the installation of the onshore cables. The Applicant anticipates that ground-disturbing activities for onshore cable installation will take approximately 3 months.

The construction of onshore components will require ground disturbance associated with excavation, soil stockpiling, and backfilling, which have the potential to result in short-term increases in sediment-laden stormwater run-off. For both the onshore substation and onshore cable installations, dewatering of trenches and excavations may be necessary, and may impact localized water quality and quantity of groundwater resources in the short-term during dewatering activities. There is also the potential for a short-term impact to water quality due to accidental spills and/or releases of oil or petroleum products from onshore construction vehicles or equipment. Localized noise, vibrations, and air pollutant emissions from construction vehicles and equipment will temporarily increase during construction. Onshore construction may also result in short-term visual impacts and in traffic impacts along the construction corridor. Although unlikely, given the nature of the area as developed and previously disturbed, excavation could uncover archaeological resources (Section 4.8). The Applicant will develop an Unanticipated Discoveries Plan to address the unlikely potential to uncover previously unknown cultural resources.

Open Cut Cable Installation

The onshore cables will be installed utilizing open-cut trench as the primary installation method, except where trenchless methodologies are necessary. Open-cut installation will typically include the following main activities:

1. Preparing the construction corridor, including safety and traffic management as necessary
2. Excavating a trench
3. Installing ducting
4. Establishing jointing bays
5. Pulling onshore cables through the ducts
6. Joining the cables
7. Restoring the construction corridor

The preparation of the construction corridor typically includes survey and corridor marking, clearing, and grading. However, clearing and grading activities are anticipated to be minimal or unnecessary because of the highly-developed nature of the onshore cable corridor, which is located primarily in existing road rights-of-way (ROWs) and existing paved areas in an urban environment.

To install the ducting using the open-cut method, a trench will be excavated along the onshore cable route. Typically, the trench will be 5 to 10 ft (1.5 to 3 m) deep and 10 ft (3 m) wide, within a 50-ft (15-m)-wide construction corridor, including duct banks for both circuits. During excavation activities, the material will be stockpiled next to the trench, or in some cases, cut pavement and other materials may be placed immediately in a container or truck for off-site disposal. Erosion and stormwater controls will be installed adjacent to work areas and around stockpiled material when left within the cable corridor; additional details will be provided as part of the EM&CP.

The onshore electrical components, including the duct banks and onshore cables, will then be installed within the trench. Once installation is complete, the trench will be backfilled, typically using the excavated soil, if it is suitable and approved for reuse by permitting authorities. Unsuitable or contaminated soils will be disposed of offsite in an approved manner and location and suitable soil will be brought in and used as backfill. The area is then restored to pre-construction conditions by stabilizing with a seeding mix or re-paving, as applicable.

Jack and Bore Cable Installation

The Applicant is proposing to use trenchless construction in limited areas along the onshore interconnection cable route in order to cross the existing New York City Economic Development Corporation (NYCEDC) railroad within SBMT, and the sheet pile around the existing Gowanus 345-kV Substation. Additional trenchless crossings may be required in areas of buried utilities and infrastructure.

The Applicant anticipates using the jack and bore trenchless installation methodology for the NYCEDC railroad and the sheet pile crossings. The jack and bore method is completed by installing a steel pipe or casing under existing roads, railways, or other infrastructure. This is done by excavating a bore (entry) pit and a receiving (exit) pit on either side of the crossing. An auger boring machine is then placed in the entry pit to jack a casing pipe through the earth, while at the same time removing spoil from the casing by means of a rotating auger inside the casing. The onshore interconnection cables are then pulled through the casing.

The jack and bore crossing installation typically requires an extra work area of approximately 50 ft by 50 ft (15 m by 15 m) alongside the onshore cable corridor. Within the cable corridor, the crossing requires a 60-ft by 20-ft (18-m by 6-m) bore pit to be excavated on one side and a 30-ft by 20-ft (9-m by 6-m) receiving pit on the other side. In the case of the railroad crossing at SBMT, these work areas will be located within the onshore substation construction workspace limits at SBMT. Excavated soil will be stockpiled next to the pits or in some cases may be placed immediately into a container or truck for disposal. Depending on groundwater levels, it is also possible that either or both pits will need dewatering. The rate of dewatering and the quality of the water will determine whether the water may be placed into frac tanks for off-site disposal, or, if permissible, discharged into the storm drain system or onsite. Impacts on water quality will be minor and short-term from dewatering, assuming dewatering best management practices are employed. Erosion and stormwater controls will be installed around stockpiled material when left within the cable corridor. Additional details for sediment and erosion control, soil stockpiling, and dewatering will be provided as part of the EM&CP. Once the installation is complete, the entry and exit pits will be returned to pre-construction conditions.

Other Trenchless Installation

Additional trenchless crossings may be required, as the Applicant continues to gather buried utility and infrastructure information from the utility owners and/or municipalities in which the Project's onshore components are located. If currently unknown utilities or other infrastructure are determined to be present, the onshore cables may also be installed using HDD or other trenchless technologies. The Applicant will consider use of the HDD method in the event that jack and bore and open cut trench methodologies are not technically or commercially feasible to complete installation activities. Onshore HDD crossings utilize a drilling rig that drills a borehole underneath the ground's surface. A bentonite and water-based drilling fluid is used to lubricate the drill bit, return the cuttings to the bore pit, and maintain the borehole during drilling. Depending on the size of the borehole required, a pilot hole is advanced, followed by one or more reaming passes in order to enlarge the hole. Once the desired size borehole is achieved, a duct is pulled back within the drilled borehole and the onshore cables are pulled through the installed duct. Onshore HDD crossings require two extra onshore work areas (on the drill entry side and exit side) to support these activities. The work areas for HDD installation, if conducted, will be approximately 200 ft by 200 ft (61 m by 61 m) on each side of the HDD.

Impacts associated with an HDD installation could occur in the form of an inadvertent release of bentonite drilling fluid if natural fractures or sediment allow drilling fluid to reach the soil surface. An inadvertent release of drilling fluid can result in short-term impacts to water quality (when released to surface waters) and/or terrestrial habitats. Prior to any use of the HDD installation method for construction, the Applicant will develop an Inadvertent Returns Plan that addresses prevention, control, and clean-up of potential inadvertent releases. If applicable, based on the planned use of this installation method, the Inadvertent Returns Plan will be included in the Project's EM&CP. Depending on subsurface conditions and the size and length of the borehole, HDD equipment operation may last anywhere from a few days to a few weeks, resulting in short-term, localized noise impacts, and night-time lighting impacts.

Onshore Substation Construction

For the onshore substation, the construction and installation methodology will comply with local and state regulations and guidelines. General construction and installation methodology is as follows:

1. Site preparation, including clearing, cutting, and/or filling (if necessary), grading, and excavation;
2. Construction of a stormwater management system;
3. Installation of the foundations;
4. Installation of the electrical infrastructure and other associated structures and services including connection to local utilities; and
5. Land restoration, including re-paving.

The Applicant is anticipating that site conditions at the start of construction will require minimal site preparation, other than the bulkhead replacement. Because the site is relatively flat and predominantly unvegetated, minimal or no clearing, grading, or cut/fill are expected to be required. Site preparation activities within the onshore substation site will likely include the excavation and removal or relocation of existing utilities and/or infrastructure. The site will be surveyed and staked prior to the start of construction activities, and site controls, access, and security for construction will be installed. Construction will begin with the excavation and installation of stormwater management controls, followed by excavation for building foundations, columns, footings and slabs. Excess spoil and materials excavated for the facility foundations and infrastructure will be properly managed and disposed off-site, unless suitable for re-use onsite. After pouring and setting foundations, electrical infrastructure, structures and buildings will be installed. Finally, site restoration (including any temporary staging or workspaces), painting, permanent fencing, and security controls will be completed at the site.

Impacts associated with the onshore substation construction will generally be similar to the installation of other onshore components, and will include ground disturbance associated with excavation, soil stockpile, and backfilling, which have the potential to result in short-term increases in erosion and stormwater run-off. Dewatering of excavations is anticipated to be required at SBMT, including the possibility of dewatering and treatment of contaminated groundwater, which has the potential to result in a localized impact to the water quality and quantity of groundwater resources in the short-term during dewatering activities. As described in Section 4.1.4.1, a Stormwater Pollution Prevention Plan (SWPPP) will be implemented to minimize impacts due to erosion, stormwater run-off, and dewatering activities.

Construction of the onshore substation may require nighttime work and lighted work areas in the case of an extended work schedule due to the need to complete critical activities, scheduling certain activities to minimize personnel onsite for safety reasons, and/or to reduce impacts, such as traffic impact from deliveries. Nighttime lighting would represent an additional short-term visual impact during construction. Noise impacts may also include short-term pile driving activities for the foundation installation and supports, as well as the use of construction equipment such as cranes, cement trucks, and bucket trucks. Spoil from excavations at the onshore substation site, including any potentially contaminated soils, will be properly managed and disposed in an approved manner in order to minimize impacts.

4.1.3 Impact-Producing Factors – Operations

Impact-producing factors during operations are associated with the presence, operation, and maintenance of the new permanent infrastructure for the life of the Project, including the offshore infrastructure, such as the submarine export cables and cable protection, and the onshore infrastructure, such as the onshore substation and onshore cables.

The Project will be designed to operate with minimal day-to-day supervisory input, with key systems monitored remotely 24 hours a day. During operations, the Project will require both planned and unplanned inspections and maintenance, which will be carried out by qualified engineers, technical specialists, and associated support staff. The Applicant will ensure that all components are maintained and operated in a safe and reliable manner, compliant with regulatory conditions, and in accordance with commercial objectives. Remote monitoring and maintenance activities will be based out of the Applicant's operation and maintenance (O&M) facility for the offshore wind farm, on the SBMT site.

An O&M Plan will be developed and finalized prior to the commencement of construction. Based on the Applicant's previous O&M experience in offshore wind, a brief summary of the anticipated offshore and onshore activities is provided. An Oil Spill Response Plan (OSRP) (for offshore facilities); Spill Prevention, Control and Countermeasures (SPCC) Plan (for onshore facilities); and Safety Management System will also be developed and implemented during O&M activities.

4.1.3.1 Operation of Offshore Components

The presence of the new buried submarine export cables and associated cable protection are impact-producing factors for the life of the Project. The new buried submarine export cables have the potential for Project-related electric and magnetic fields (EMF), discussed in Section 4.13. Based on the results of the EMF analysis, impacts to both human and biological resources are expected to be negligible for the submarine export cables.

Submarine export cables may become exposed in mobile seabeds, putting them at risk of being impacted or snagged by anchors or fishing gear. The permanent presence of cable protection measures also has a localized, long-term effect on the substrate and modification of benthic habitat. It creates a short, linear, raised, hard substrate surface at known crossings of existing cables and pipelines, as well as potentially at locations where the desired burial depth cannot be achieved.

Impacts associated with vessel traffic for operations and maintenance of the Project are similar to potential impacts described in Section 4.1.2.1 for construction vessels. A smaller number of vessels and a reduced frequency of vessel trips are anticipated; however, vessel traffic will occur throughout the 35-year lifespan of the Project. During routine operations, seafloor disturbance is not anticipated. Minor increases in Project O&M vessel traffic will result in in-air and underwater noise, emissions, and visual impacts; it may also pose a risk to marine mammal and sea turtle species from collision or entanglement. However, these potential impacts are anticipated to be negligible in the Project Area. Project-related vessels will operate in accordance with laws regulating the at-sea discharges of vessel-generated waste to minimize the introduction of waste or debris to the marine environment during O&M activities. As is typical for vessel operations, there is the potential for short-term impacts to water quality in the case of accidental spills of oil or petroleum products offshore. These impacts will be minimized through the use of measures similar to those used during construction, described in Section 4.1.2.1. Marine transportation impacts associated with offshore operations are addressed in **Exhibit E-6**.

The submarine export cables will be monitored during operations through Distributed Temperature and Distributed Vibration Sensing equipment. The Distributed Temperature Sensing system will be able to provide real-time monitoring of temperature along the submarine export cable route, alerting the Applicant should the temperature change, which often is the result of scouring of material and cable exposure. The Distributed Vibration Sensing system will provide real-time vibration monitoring close to the cables, indicating potential dredging activities or anchor drag occurring close to the cables. Upon receiving any such alert, the Applicant will investigate the cable condition and identify and implement corrective actions, if necessary.

Should one of the submarine export cables fault, the portion of the cable will be spliced and replaced with a new, working segment. If the submarine export cables or cable protection measures require repair, or if new cable protection is required, impacts associated with repair activities will be similar to those described for construction activities, but with a much shorter duration and a more limited area of the cable corridor. Impacts will include localized direct, short-term seafloor disturbance that may result in short-term impacts to water quality from sediment disturbance and disturbance to benthic habitats. Potential impacts from the disturbance of habitat are expected to be minimal, and the risk of encountering submerged archaeological resources will be negligible because repair activities will be located within the previously surveyed and disturbed cable corridor.

During operations, maintenance dredging could be required in the vicinity of SBMT to ensure that sedimentation over time does not exceed the cable burial depth limitations. The dredge level will need to be maintained to at least 27 ft below mean lower low water (MLLW) over the cables. Excessive depth of the cable could cause thermal impacts affecting the submarine export cable rating. The Applicant is currently evaluating whether periodic maintenance dredging may be required for portions of the submarine export cable. If maintenance dredging is anticipated, additional information will be included in the Project's O&M Plan.

4.1.3.2 Operation of Onshore Components

New onshore components include the onshore substation and onshore cables. The presence of this new onshore infrastructure is an impact-producing factor for the life of the Project. Onshore operations will also include access and maintenance activities associated with the onshore components and the O&M facility, with associated minor increases in vehicle traffic in the area.

The presence of onshore electrical infrastructure, including the onshore substation and onshore cables, has the potential for Project-related EMF, as discussed in Section 4.13. Based on the results of the EMF analysis, impacts to both human and biological resources are expected to be negligible.

Onshore Substation Operations

The onshore substation will incorporate new, visible, aboveground Project components within SBMT, including new lighting fixtures. As such, potential visual and aesthetic impacts, including potential visual impacts to nearby sensitive receptors (including historic properties) could occur. The onshore substation has been designed to be consistent with the visual character and land use of the surrounding area, and will incorporate measures to reduce strong visual contrast to the extent practicable (e.g., selection of visually appealing materials and building colors). Visual impacts will be long-term and will vary in significance based upon the location of a particular sensitive receptor. Due to the location of the onshore substation within SBMT, a previously developed site, the presence of the onshore substation is not expected to result in habitat conversion or otherwise impact vegetation or wildlife. The presence of the onshore substation will not result in impacts to recreation or land use since recreation does not currently occur at the site and the proposed facility is compatible with current land use.

Operations of the onshore substation will also result in the generation of long-term, elevated noise levels associated with the operations of the equipment. The onshore substation has been designed to be consistent with the New York City octave band limits and will incorporate measures to reduce noise levels to the extent practicable (e.g., placement of high-noise-generating equipment away from sensitive noise receptors, and installation of sound barriers). Impacts to nearby sensitive receptors will vary in significance based on the location of the sensitive receptor (see Section 4.11).

The presence of the onshore substation would also result in air emissions from the emergency generator, when operating. The onshore substation also has the potential to cause greenhouse gas emissions of sulfur hexafluoride from gas-insulated switchgear, as well as vehicles used by operations personnel. Emissions impacts for onshore operations are expected to be minimal and well below regulatory limits.

Stormwater runoff from the onshore substation will be managed with the implementation of a properly designed stormwater management system associated with State Pollutant Discharge Elimination System (SPDES) approvals; therefore, no long-term impacts to water quality are anticipated from the presence of the onshore substation.

While the onshore substation will be equipped with monitoring equipment, it will also be regularly inspected during operations in accordance with applicable design standards and manufacturer recommendations. These inspections may result in routine maintenance activities, including the replacement or upgrading of electrical components/equipment. Impacts associated with these routine maintenance activities are expected to be short-term and negligible, with the primary potential impacts being the from accidental spills or releases and small areas of ground disturbance if exposure or repair of underground components is required. Accidental releases during maintenance activities will be minimized through implementation of an SPCC plan.

Onshore Cable Operations

As the new onshore cables will be installed below ground, the primary potential impact during normal operations from the presence of new infrastructure is Project-related EMF, discussed in Section 4.13. Based on the results of the EMF Analysis, impacts to both human and biological resources are expected to be negligible.

The onshore cables should not require regular maintenance, but occasional repair activities may be required should there be a fault or damage caused by a third party. In the case of fault or damage, cable repair impacts are expected to be similar in nature to those experienced during construction, but over a much shorter duration and involving a smaller, localized area. If required, minor ground disturbance will result from excavation to repair damaged cables, with the potential for erosion and stormwater run-off. Similar to other construction activities, there could be a short-term impact to water quality in the case of accidental spills and/or releases of oil or petroleum products from onshore construction vehicles or equipment, as well as localized increases in noise, vibrations, emissions, and traffic from construction vehicles and equipment. Due to the localized, temporary nature of typical repair activities, these impacts are anticipated to be short-term and negligible.

4.1.3.3 Decommissioning

Decommissioning activities will be detailed in a Decommissioning Plan, which is subject to approval by BOEM, which includes public comment and agency consultation. The Decommissioning Plan will be developed with a factor-based approach, utilizing the environmental and socioeconomic factors to determine a strategy and methodology that is appropriate at the time. As part of this plan, the Applicant will compile an inventory of Project components and detail the methods proposed to decommission the Project components. As Project components are decommissioned, the Applicant will record and remove them from the inventory list to facilitate confirmation that Project components have been properly removed from the seafloor and that the Project Area is cleared of obstructions.

Likely removal methods and assumptions that would be applicable, based on the present day understanding of available decommissioning approaches include:

- The submarine export cables are assumed to be lifted out and cut into pieces or reeled in;
- Removal of all buildings and equipment associated with the onshore substation, unless suitable for future use; and
- Removal of the onshore cables is assumed to be limited to disconnecting and cutting, with remaining belowground cable to be capped off and earthed, and removal of termination points.

The Applicant intends to prepare the Decommissioning Plan near the end of commercial operations, pursuant to 30 Code of Federal Regulations (CFR) § 585.905. Onshore components will be decommissioned in accordance with a plan developed with and approved by the appropriate parties (i.e., landowners, local and state agencies). Environmental impacts are anticipated to be similar to those experienced during construction and installation activities, as described in Section 4.1.2.

4.1.4 Proposed Avoidance, Minimization and Mitigation Measures

The Applicant will employ various measures to avoid, minimize, and mitigate the potential impacts resulting from the construction and operation of the Project. Resource-specific avoidance, minimization, and mitigation measures are provided in detail within the applicable resource subsections of this Exhibit; however, this section provides a summary of the types of measures that will be implemented through the development, design, construction, and operation of the Project. The EM&CP will capture these efforts and requirements and will be implemented by construction and operations personnel.

4.1.4.1 Construction

Project Siting

The Project has been sited to avoid and minimize potential impacts during construction. Offshore components, including the submarine export cables and cable protection measures, have been sited to avoid challenging geological or seabed conditions and natural or anthropogenic hazards during construction, and additional micro-siting of the submarine export cables will be conducted prior to construction. Additionally, siting of the submarine export cables has considered the avoidance of direct and indirect impacts to sensitive benthic habitats and habitats of high value to protected species. To the extent possible, cable route planning has also avoided areas of high fishing activity.

Onshore, components have been sited to maximize the use of previously disturbed areas, existing roadways, and/or ROWs to the extent practicable, in order to preserve areas of natural landscape and minimize land use conflict; avoid or minimize potential impacts to scenic, recreational, and historic areas; and avoid or minimize potential visual impacts from areas of public view. The Project ROW does not traverse any heavily timbered areas, high points, ridgelines, or steep slopes. ROW vegetation clearing for the Project has been minimized by Project siting, with little or no clearing anticipated.

Sensitive Resource Buffers

Where sensitive resources have been identified along the Project submarine and onshore cable route, the Applicant has assessed establishing resource buffers to avoid potential impacts. The Applicant plans to implement a horizontal buffer of at least 164 ft (50 m) for identified potential submerged cultural resources, unless further investigation and/or consultation with the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) warrants the revision of that plan.

Stormwater and Erosion Control Measures

Soil erosion and sediment control measures will be employed for onshore construction activities. The Applicant will develop and implement a soil erosion and sediment control plan that complies with the requirements detailed in the New York State Standards and Specifications for Erosion and Sediment Control (Blue Book). The Applicant will develop a SWPPP and will obtain coverage under the SPDES System General Permit for Stormwater Discharges from Construction Activity. The SWPPP will identify the measures that will be employed at the site to control the release of erosion and pollutants to the water and will outline an implementation and maintenance schedule. The soil erosion and sediment control plan and SWPPP will be provided as part of the Project's EM&CP.

Excavation dewatering activities, especially in areas of pre-existing groundwater contamination, may have the potential to introduce sediment and other contaminants to adjacent surface waters via discharge. Final engineering design will determine if groundwater will need to be managed during construction activities that require digging of pits or trenches for the Project's onshore facilities. As designs for the onshore cable corridor and the onshore substation develop, the Applicant will determine through site-specific tests pits whether groundwater is expected to be encountered during construction activities. If dewatering is expected to occur, the Applicant will develop a site-specific dewatering plan to protect groundwater and nearby surface water resources in accordance with a Project-specific SWPPP, as necessary.

Spill Prevention, Control, and Countermeasures

In the unlikely event of a release of oil or petroleum products from construction equipment or vehicles, the Applicant will manage releases through an SPCC Plan for construction as part of its SWPPP, which will be included in the Project's EM&CP. The SPCC Plan will include, among other things, the requirement for spill response kits to be present at construction sites, the use of secondary containment for oils and greases in accordance with state and federal regulations, measures for securing construction equipment within fenced work areas, and the requirement to transport hazardous materials in water-tight containers.

During offshore construction activities, the Applicant will use appropriate measures for vessel operation and implement an OSRP, which will include measures to prevent, detect, and contain an accidental release of oil and petroleum products. Project personnel will be trained in accordance with relevant laws, regulations, and Project policies.

Emissions Controls

Construction emissions impacts will be minimized by using appropriate emissions controls on vehicles and equipment where practicable. For onshore construction activities, equipment that is diesel-powered will use ultra-low sulfur diesel fuel, per the requirements of 40 CFR § 80.510(b)(2). The Applicant will implement measures to reduce idling and will ensure that Project-related vehicles, diesel engines, and/or nonroad diesel engines comply with applicable state regulations regarding idling. In New York State, 6 NYCRR § 217-3 prohibits all on-road diesel-fueled and non-diesel-fueled heavy-duty vehicles from idling for more than five minutes.

During offshore construction activities, vessels constructed on or after January 1, 2016 will meet Tier III nitrogen oxides (NO_X) requirements when operating within the 200-nm (370.4-km) North American Emission Control Area established by the International Maritime Organization (IMO). Project-related vessels will also use low sulfur diesel fuel where possible and be at or below the maximum fuel sulfur content requirement of 1,000 parts per million (ppm) established pursuant the requirements of 40 CFR § 80.510(k), and will comply with applicable U.S. Environmental Protection Agency (EPA), or equivalent, emission standards.

Time of Year and Time of Day Restrictions

To reduce impacts to onshore noise sensitive areas, onshore construction will be limited to daytime hours to the extent practicable; however night-time work may be required in the case of an extended work schedule due to the need to complete critical activities, scheduling certain activities to minimize personnel onsite for safety reasons, and/or to reduce impacts, such as traffic impact from deliveries. The Applicant will consult with local government and where feasible, plan the location and timing of construction activities to minimize overlap with areas or times of high activity.

For offshore construction, the Applicant is committed to continued work with the fishing industry and fisheries agencies to identify sensitive spawning and fishing periods to actively avoid or reduce interaction with receptors during construction, where feasible. In order to further minimize the potential impacts of submarine export cable installation on fish and invertebrate resources, including winter flounder spawning and Atlantic Sturgeon (see Sections 4.6 and 4.7), the Applicant will restrict seabed-disturbing activities for submarine export cable installation to the period from July 1st to September 30th.. This will avoid the sensitive time-of-year for winter flounder and Atlantic Sturgeon.

HDD Inadvertent Returns

The Applicant will implement appropriate measures during any HDD activities in order to minimize the potential release of HDD fluid. Prior to any use of the HDD method for construction, the Applicant will develop and implement an agency-approved Inadvertent Return Plan. If HDD is proposed, the Inadvertent Return Plan will be provided as part of the Project's EM&CP.

Noise Controls

To minimize noise during onshore construction activities, construction equipment will be well-maintained and vehicles using internal combustion engines will be equipped with mufflers, which will be routinely checked to ensure that they are in good working order. Where feasible, the Applicant will employ quieter adjustable backup alarms, and locate noisy equipment as far as possible from Noise Sensitive Areas (NSAs). Additionally, the Applicant will set up and monitor a noise complaint hotline for the public and will actively address noise-related issues.

Vessels employed for nearshore construction activities and those transiting between Project work areas will comply with applicable IMO noise standards.

Vegetation and Wildlife Measures

During construction, the Applicant will employ measures to reduce direct and indirect impacts to vegetation, terrestrial wildlife, and marine species. The Project ROW has been sited in an urban environment, minimizing any vegetation clearing and wildlife habitat impacts, as well as any impacts to adjacent vegetation or soils. Along the onshore cable routes, areas temporarily disturbed for construction will be restored to pre-construction conditions to the extent possible. Along the submarine export cable route, the nature of the soft sediment and the minimal disturbance associated with jetting, coupled with the reproductive, dispersal, recruitment, and colonization attributes of many soft-bottom benthos, will result in the recovery of temporarily disturbed habitats along most of the cable corridor.

Onshore, the Applicant will minimize wildlife impacts by limiting lighting associated with construction vehicles and work zones to the extent practicable, except as required by regulation and for safety, in order to reduce the attraction of insect prey for wildlife species such as bats and insectivorous birds.

During offshore construction, above-water Project-related vessels will employ anti-perching devices where appropriate to minimize the introduction of perching structures to the offshore environment and associated impacts on avian wildlife. Lighting not required by the Federal Aviation Administration and the U.S. Coast Guard (USCG) during offshore construction will be limited to reduce attraction of birds, where practicable.

The Applicant will reduce collision risk by implementing vessel strike avoidance measures as advised by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries), and by ensuring that Project-related vessels comply with NOAA Fisheries speed restrictions within the Mid-Atlantic U.S. Seasonal Management Area (SMA) for right whales of 10 nautical miles per hour (knots, 18.5 kilometers per hour [km/h]) or less for vessels 65 ft (20 m) or greater during the period of November 1 through April 30. Project-related vessels will also comply with the 10 knots (18.5 km/h) or less speed restrictions in any dynamic management area (DMA).

Unanticipated Discoveries Plan

The Applicant will develop and implement an Unanticipated Discoveries Plan in coordination with federal and state agencies and the Tribes. The Unanticipated Discoveries Plan will be in accordance with state laws and will outline the procedures to follow if archaeological materials or human remains are discovered during construction activities, including contact information and reporting protocols.

4.1.4.2 Operations

Project Siting

The Project has been sited to avoid areas of challenging construction and areas that could result in longer term challenges to the safety and integrity of the facilities, which in turn could result in increased maintenance, repair, and/or operational efforts and costs. Offshore components, including the submarine export cables and cable protection measures, have been sited to avoid anomalous and challenging geological and seabed conditions, and additional micro-siting the submarine export cables will be conducted prior to construction.

Onshore components have been sited to maximize the use of previous disturbed areas, existing roadways, and/or ROWs to the extent practicable, in order to preserve areas of natural landscape and minimize land use conflict; potential impacts to scenic, recreational, and historic areas; and potential visual impacts from areas of public view. In addition, siting of onshore facilities has taken into consideration soil, geologic, climatic, and other factors that influenced the Project's design, relative to the safety and integrity of the facilities, and that minimized potential difficulties associated with maintenance or repair during the operation of the Project.

Cable Burial Depth and Cable Protection

The Applicant has committed to a minimum 6-ft (1.8-m) target burial depth for the submarine export cables, and deeper burial of the submarine export cables in areas within certain identified navigation channels, subject to ongoing discussions with the U.S. Army Corps of Engineers (USACE) and other applicable stakeholders, to reduce the potential for cable exposure and conflicts with existing and future navigation. In federally maintained channels and anchorages, the target burial depth will be a minimum of 15 ft (4.6 m) below authorized depths or depth of existing seabed (whichever is deeper), if feasible. The submarine export cables will also be installed at a deeper burial depth in areas identified as having seabed-penetrating fishing activity. The Applicant will determine through a Cable Burial Risk Assessment (CBRA) the appropriate target burial depth for submarine cables, informed by engagement with regulators and stakeholders (including commercial fisheries stakeholders), extensive experience with submarine assets, and based on an assessment of seabed conditions and activity (including fishing) in the area.

Proper cable burial and protection will account for areas of mobile seabed, will plan for the possibility of sandwave removal during any future repairs to the cables, and will prevent snagging by commercial fishing operations. The Applicant is committed to sufficiently burying electrical cables where feasible to minimize seabed habitat loss and reduce the potential effects of EMF. Where deep burial is not technically feasible, rock armoring or concrete mattresses will shield the cable from the overlying water. The Applicant will provide as-built information to the National Oceanic and Atmospheric Administration (NOAA) to support necessary updates to navigation charts in coordination with NOAA Fisheries and other stakeholders as needed.

In considering cable burial depth, cable protection measures and asset crossing methods described in Section 4.1.2, the Applicant is evaluating design with the goals of maintaining cable protection and minimizing shifting, preventing cable exposure, minimizing shoaling or the creation of a discernable berm on the seafloor, and minimizing impacts to fishing activity.

Sensitive Resource Buffers

The Applicant has assessed establishing resource buffers to avoid potential operational impacts to sensitive resources along the Project's submarine export and onshore routes. The Applicant plans to implement a horizontal buffer of at least 164 ft (50 m) for identified potential submerged cultural resources unless further investigation and/or consultation with the OPRHP warrants the revision of that plan.

Stormwater and Erosion Control Measures

Permanent stormwater and erosion control measures for operations will be installed, as needed, as part of the onshore substation design. Stormwater control features will be routinely inspected and cleaned to remove debris or excess vegetation that may impede its functionality. The inspection schedule will be detailed in the SWPPP, if required, for operations and/or the substation SPCC Plan, which will be part of the EM&CP.

Spill Prevention, Control and Countermeasures

The Applicant will manage accidental spills or releases of oils or petroleum products onshore through an SPCC Plan for operations. The SPCC Plan will include, among other things, the requirement for spill response kits to be available, the use of secondary containment for equipment containing oils and greases in accordance with all state and federal regulations, and the requirement to transport hazardous materials in water-tight containers during operations.

Similar to offshore construction activities, the Applicant will implement an OSRP during operations, which includes measures to prevent, detect, and contain an accidental release of oil or petroleum products. Project personnel will be trained in accordance with relevant laws, regulations, and Project policies, as described in the OSRP.

Emissions Controls

As described in Section 4.1.4.1, vessels constructed on or after January 1, 2016 that are used during the operational phase of the Project will meet Tier III NO_X requirements when operating within the 200-nm (370.4-km) North American Emission Control Area established by the IMO. Project-related vessels will also use low sulfur diesel fuel where possible and will be at or below the maximum fuel sulfur content requirement of 1,000 ppm established per the requirements of 40 CFR § 80.510(k), and will comply with applicable EPA, or equivalent, emission standards.

If onshore maintenance is required, diesel-powered equipment will use ultra-low sulfur diesel fuel, per the requirements of 40 CFR § 80.510(b)2, and the Applicant will comply with applicable state regulations, including 6 NYCRR § 217-3, which prohibits all on-road diesel-fueled and non-diesel-fueled heavy duty vehicles from idling for more than five minutes.

Vegetation and Wildlife Measures

The Project ROW on land has been sited in an urban environment, limiting any vegetation maintenance and wildlife habitat impacts during operations. To reduce impacts to wildlife species such as bats and birds, for permanent aboveground structures, the Applicant will employ lighting reduction measures such as downward projecting lights and lights triggered by motion sensors and will limit artificial light to what is required for safety.

As during construction activities, vessels employed during operations will employ anti-perching devices where appropriate and limit lighting that is not required by the Federal Aviation Administration and the USCG or for safety. Project-related vessels will comply with NOAA Fisheries speed restrictions within the Mid-Atlantic U.S. SMA for right whales of 10 knots (18.5 km/h) or less for vessels 65 ft (20 m) or greater during the period of November 1 through April 30. Project-related vessels will also comply with the 10 knots (18.5 km/h) or less speed restrictions in any DMA.

Appropriate Project-related personnel onboard Project vessels will receive marine mammal sighting, reporting procedures, and awareness training, to emphasize individual responsibility for marine mammal awareness and protection, as necessary. Marine mammal observers and/or Project personnel will check NOAA's website for updates on DMAs and will respond accordingly with vessel movement strategies or work hour changes. Any vessel larger than 300 gross tons moving into right whale habitat will report in as part of the right whale Mandatory Ship Reporting System, which will provide updated reports of right whale sightings in the area and will follow safe vessel speeds and movements within the management area.

Visual Impacts

Lighting at the onshore substation site will be designed to reduce light pollution where feasible (e.g., downward lighting, motion-detecting sensors), and will meet the applicable design standards set forth in the Waterfront Revitalization Program policies. Screening walls have been incorporated into the design of the substation to place the outdoor equipment out of sight, and the color and design of buildings will be consistent with the working waterfront nature of SBMT.

Noise Controls

The noise from the submarine and onshore cables is negligible, and the onshore substation design incorporates buildings and/or barrier walls that will serve to reduce the sound levels at off-site locations. The vessels used for nearshore work and vessels transiting between Project ports and the Lease Area will comply with IMO noise standards, as applicable.

Floodplain Development

Changes in elevations and grades and the placement of structures within coastal floodplains have the potential to impact flood flows; however, these impacts will be minor and mitigated through appropriate facility design. Impacts due to the long-term presence of structures will be avoided, minimized, and mitigated by siting onshore components in previously disturbed areas, existing roadways, and road ROWs, and by ensuring that the onshore substation design satisfies New York State Department of Environmental Conservation (NYSDEC) requirements governing construction within mapped floodplains, including locating aboveground structures at base flood elevation plus 2 ft (0.6 m). The Applicant has avoided siting the onshore facilities within the Federal Emergency Management Agency (FEMA)-designated Zone VE that is subject to high velocity wave action.

4.2 Marine Physical and Chemical Conditions

This section describes the marine physical and chemical environment in the Project Area, including a discussion of bathymetry, tides and currents, sediment transport and suspension, water temperature, and chemical conditions. Potential impacts to marine physical and chemical conditions resulting from construction, operation, and maintenance of the Project are discussed. This section also describes the Project-specific measures adopted by the Applicant to avoid, minimize, and/or mitigate potential impacts. This section addresses the requirements of 16 NYCRR § 86.5(b) relative to offshore hydrology along the submarine export cable route. Wetlands and waterbody impacts associated with the onshore Project Area are described in Section 4.4, and fisheries and benthic resources are described in Section 4.6.

4.2.1 Marine Physical and Chemical Studies and Analysis

Marine physical and chemical conditions in the Project Area were assessed using a combination of desktop analysis of publicly available data and the Applicant's surveys. The following resources were reviewed as part of the desktop analysis:

- GROW2012 hindcast model operated by Oceanweather Inc. (Oceanweather Inc. 2018);
- NOAA Tides & Currents Database (NOAA 2020a);
- United Kingdom Hydrographic Office (UKHO 2009); and
- Experimental System for Predicting Shelf and Slope Optics (ESPreSSO) hydrodynamic model.

The Applicant conducted several site-specific geophysical and geotechnical survey campaigns for the EW 1 Project, including along the submarine export cable corridor. The Applicant contracted Gardline Limited (Gardline, which became Gardline and Alpine Ocean Seismic Survey Inc [Alpine] during acquisition) to conduct geophysical and geotechnical surveys from March 2018 to December 2018 using survey vessels *RV Shearwater* and *RV Ocean Researcher*; additional surveys were conducted by Alpine and Fugro in spring 2019 using the *RV Shearwater*, *RV Henry Hudson* and *M.V Conti* to fill data gaps in the submarine export cable siting corridor Geophysical and geotechnical surveys were conducted in accordance with BOEM's "Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information Pursuant to 30 CFR Part 585" as well as the "Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585")[2] The high resolution geophysical surveys during these campaigns included the following: gridded survey lines; depth sounding (multibeam echosounder) to determine site bathymetry and elevations; magnetic intensity measurements (gradiometer); seafloor imaging (side-scan sonar survey) for seabed sediment classification purposes; shallow penetration sub-bottom profiler to map the near-surface stratigraphy (from seabed surface to 16.4 ft [5 m] below seabed) of soils below the seabed; medium penetration sub-bottom profiler to map deeper subsurface stratigraphy as needed (soils down to 246–328 ft [75–100 m] below seabed); cone penetrometer tests; and sediment grab samples and drop-down video images along the submarine export cable route in New York State waters.

The completed geotechnical surveys included the following:

[2] Both Guidelines are available at https://www.boem.gov/newsroom/notes-stakeholders/updated-geophysical-geotechnical-geohazard-and-archaeological.

- Vibracores to a target depth of 10 ft (3 m) to determine the geological, geotechnical, and chemical characteristics of the sediments along the submarine export cable route below the target penetration depth of the submarine export cables; and
- Seabed cone penetration tests (CPTs) to a maximum penetration of 65.6 ft (20 m) or until the unit reached refusal to determine stratigraphy and in-situ conditions of the sediments.

Vibracore samples and CPTs were collected at approximately 1.2-mi (2-km) intervals along the submarine export cable route, alternating such that a sample was collected at 0.6-mi (1-km) intervals along the submarine export cable routes.

Additional geophysical and geotechnical surveys were conducted along the Project's proposed submarine export cable siting corridor and potential anchoring corridor in 2020 and 2021. Alpine conducted high-resolution geophysical (HRG) surveys in 2020 and 2021 along the submarine export cable route modifications and potential anchoring corridor using research vessels *RV Shearwater* and *RV William*, including multibeam echosounder, sidescan sonar, gradiometer, sub-bottom profiler, and single channel ultra-high resolution seismic surveys. Additional geotechnical investigations were conducted in 2020 along the submarine export cable corridor by Fugro, including cone-penetrometer and borehole tests, and vibracores, on the vessels *M.V. Fugro Explorer* and *L.B. Brazos*. Vibracores were conducted to a target depth of 20 ft (6 m) below the target penetration depth of the submarine export cable; seabed CPTs to a maximum penetration of 33 ft (10 m) or until the unit reaches refusal to determine stratigraphy and in-situ conditions of the sediments; and wireline coring in shallower water depths up to 33 ft (10 m) to fill the gap between small coastal and large offshore survey platforms.

4.2.2 Existing Marine Physical Characteristics

Marine physical conditions include characteristics of the seafloor, bathymetry, currents, tides, wave heights, sea level elevation, water temperature, and sediment transportation. In many cases, these physical characteristics interact in complex ways throughout the Project Area.

4.2.2.1 Bathymetry

Bathymetric conditions within New York State waters along the submarine export cable route were determined by using primarily geophysical and geotechnical survey campaign data. Conditions along the submarine export cable route trend with shoaling towards the shore and with more significant variation in the bathymetry closer to shore where dredging patterns influence the seabed. Water depths vary along the route from 15 ft (4.6 m) to 107.6 ft (32.8 m) North American Vertical Datum of 1988 (NAVD88). Several channels exist, both natural and man-made. While the general gradient along the submarine export cable route is less than one degree, isolated gradients of up to five degrees exist along the nearshore portion of the route. The nearshore portion of the submarine export cable route traverses an area where depth and bathymetry are heavily influenced by dredging. The Applicant also identified certain natural and anthropogenic seafloor features, such as channels and anchorage areas, that may potentially occur along the submarine export cable route. An overall depiction of bathymetry in the study area can be found in **Figure 4.2-1**.

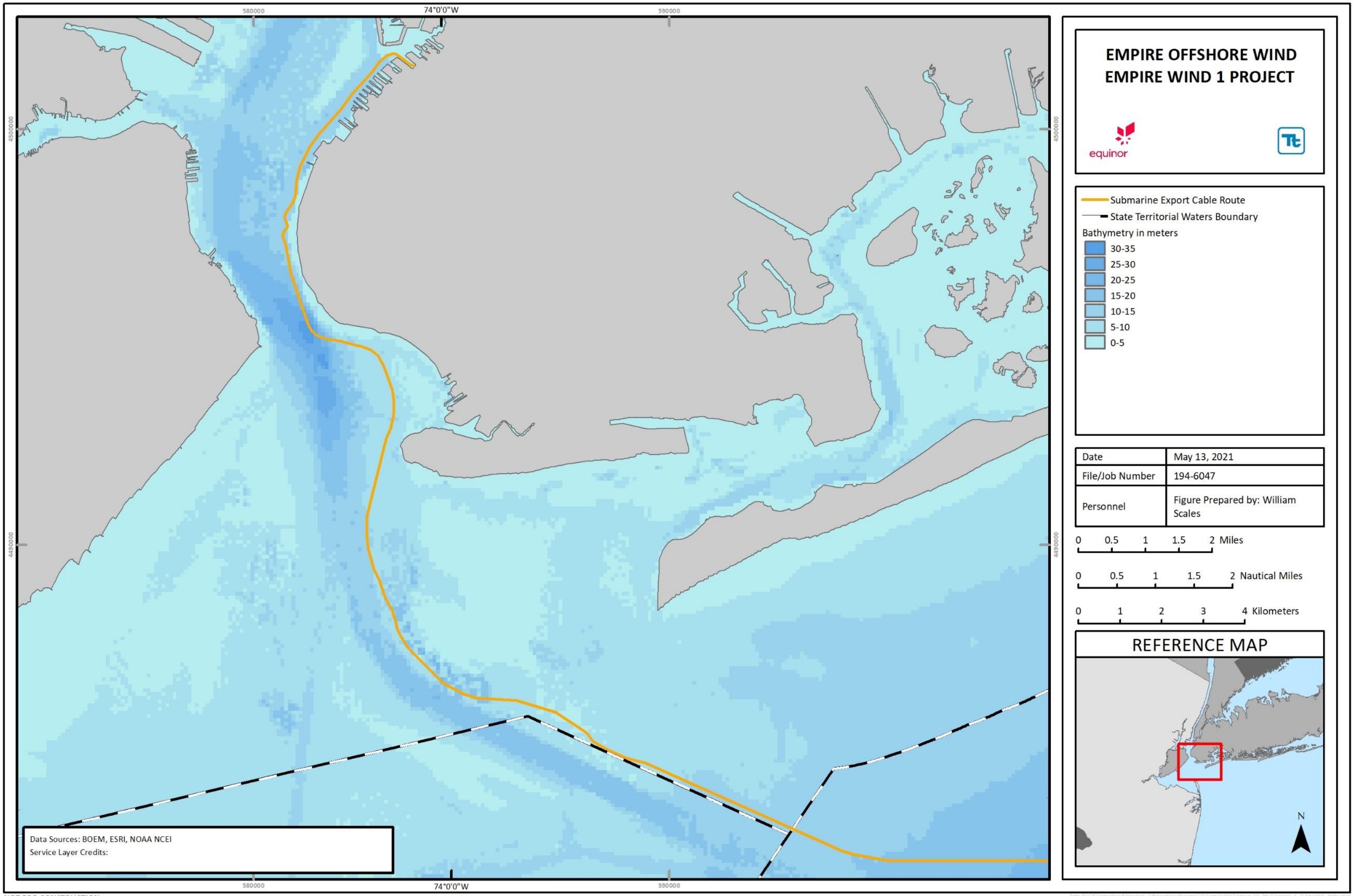


Figure 4.2-1 Bathymetry along the Submarine Export Cable Route

A variety of bathymetric features are within New York State waters along the submarine export cable corridor. The primary features influencing the bathymetry of the area include scarps (exposed faces caused by abrupt drop-offs in depth, often related to a geological feature such as a subsea landslide, severe erosion, channel incision, or potentially man-made dredging), channels, boulders, sediment bedforms, and mobile seabed. Near the entrance to New York Bay, there is a scarp of a maximum height of 16 ft (5 m) within the survey corridor, which represents the edge of the Ambrose Navigation Channel (see **Exhibit 3**). The Ambrose Navigation Channel is a well-defined navigation channel which is regularly dredged to maintain water depth for shipping leading into New York Harbor. Dredging effects from previous efforts adjacent to Ambrose Channel are seen along the route as it approaches and enters New York Bay. Within New York Harbor, dredging of the main deep-water navigation channels (i.e., Ambrose Channel and Anchorage Channel) modifies and enhances a natural channel. As a result, the natural channel exceeds the maintained width and depth of the navigation channels, exhibiting a maximum depth of 105.6 ft (32.3 m).

Due to the proximity to a highly-trafficked shipping channel, the Applicant identified potential risks to the submarine export cables that could be caused by anchor dragging, which is evident in this area based on the existing scars seen on the seabed. The Applicant will bury cables to a required depth, based on agency requirements and full cable burial risk assessment (to be completed), in order to mitigate potential risks caused by anchors and fishing activities. Additional information on target cable burial will be provided with the Project's EM&CP. The Project will also avoid the steep slopes and scarp to the extent practical, including those directly associated with the maintained areas of Ambrose Channel, in order to minimize risks to the cables from the potential instability of those features.

Bedforms are features that develop due to the movement of sediment by the interaction of flowing water along the seabed. In the area of the Project, the primary bedforms observed are megaripples, seen in intermittent locations along the submarine export cable route. Megaripples are typically associated with slightly gravelly areas of lower elevations, especially manmade depressions related to dredging and removal of seabed material. These areas cause changes to the bathymetry, which modify and concentrate currents, resulting in scour and deposition of mobile bedforms. Megaripples along the submarine export cable route are typically 1.6 to 4.9 ft (0.5 to 1.5 m) in height with wavelengths between 16 to 197 ft (5 to 60 m). The cables will be micro-sited around areas of mobile seabed to the extent practical. In addition to bedforms, the cables will also be micro-sited around boulders identified along the route, unless boulders are removed prior to cable installation. Boulders are present intermittently along the submarine export cable route in areas of glacial till and are typically between 3.3 and 7.2 ft (1 and 2.2 m) in height. Boulder removal, if necessary, will be completed during pre-installation cable operations (see Section 4.1).

Areas of mobile seabed must also be considered while determining a submarine export cable route, as the existence of highly mobile seabed in a particular area may cause the submarine export cables to become either exposed or buried too deeply. Areas of mobile seabed have been observed near areas of exposed glacial till. This is interpreted to be a result of the bathymetry modifying local bottom currents and from the erosion of finer sediment sourced from glacial till. Additionally, Bay Ridge Channel, the Narrows, and the area around the Rockaway Sandbank have previously been identified as areas of mobile seabed (Coch 2016).

4.2.2.2 Tides, Currents, and Waves

The NOAA Tides & Currents database provides tidal predictions and observations at a number of stations in New York Harbor. The closest station to the Project's cable landfall is located at The Battery, New York; data from this station was analyzed (Station Number 8518750) and indicated that tidal predictions throughout the year in this area remain fairly consistent, with no significant variation monthly or seasonally (NOAA 2020a). Observed and predicted water levels at The Battery have an annual range of approximately 7 ft (2 m), from 1 ft (0.3 m) below MLLW at the lowest annual tide to 6 ft (1.8 m) above MLLW at the highest annual tide. The daily tidal range at this location is typically 3 to 5 ft (0.9 to 1.5 m) (NOAA 2020a).

The currents within the Project Area depend on a number of varying factors, including wind, weather, and chemical ocean conditions (temperature and salinity). Generally, large scale current patterns offshore of New York include the Gulf Stream Eddy Current, which trends southward, and the Longshore Drift, which trends towards the west along the Long Island barrier islands (USGS, n.d.). Northeast storms appear to dominate the regional currents and sediment mobility during the winter months (Ashley et al. 1986).

In the New York Harbor area, the predominant factor is tidal phase. During flood tides, the current flows through the Narrows northwest towards New York Harbor, and during ebb tides the current flows southeast towards the Atlantic Ocean. Data at the NOAA Tides & Currents Station at The Narrows (Station Number 03020) from April 2019 to March 2020 were analyzed to determine the average speed of currents (NOAA 2020a). Current speeds at this station remain fairly consistent, with little variation seasonally. Monthly current averages at The Narrows range from 17.2 inches per second (inches/s) (43.68 centimeters (cm) per second [cm/s]) to 21.47 inches/s (54.53 cm/s), with the slowest current averages occurring from August through September, and the fastest current averages occurring in April and May. Overall, the current average speed at The Narrows is around 20.25 inches/s (51.44 cm/s).

A study using the publicly available ESPreSSO hydrodynamic model was undertaken for the Project to develop information regarding current velocity and flow direction in the Project Area, which was used as part of the Project's Sediment Transport Analysis as described further in Section 4.2.2.5. The locations of velocity stations in the vicinity of the Project that were used in the model are depicted in **Figure 4.2-2**. The results of this model within the study area are shown in **Table 4.2-1**. The results of this study identify faster moving currents located closer to the mouth of the Narrows and slower currents further offshore.

Table 4.2-1 Maximum Flood and Ebb Current Velocity from the ESPreSSO Model

Station ID	Longitude (W)	Latitude (N)	Depth (ft)	Flood Velocity (ft/s)	Ebb Velocity (ft/s)
1	-74.06	40.60	16	1.27	1.27
2	-74.02	40.56	20	1.20	1.19
3	-73.97	40.52	23	0.90	0.82
4	-73.92	40.48	34	0.58	0.66

Wave data was taken from the Global Reanalysis of Ocean Wave GROW2012 hindcast archive by Oceanweather Inc. (2018) and consist of data from January 1979 to December 2012 (34 years). The annual average of wave heights recorded within federal waters of the EW 1 Project is less than 2.6 ft (0.8 m), with maximum significant wave heights averaging less than 26 ft (8 m). These values are expected to be conservative for the Project Area, as wave heights are expected to decrease with closer proximity to the shoreline and within inshore harbor waters.

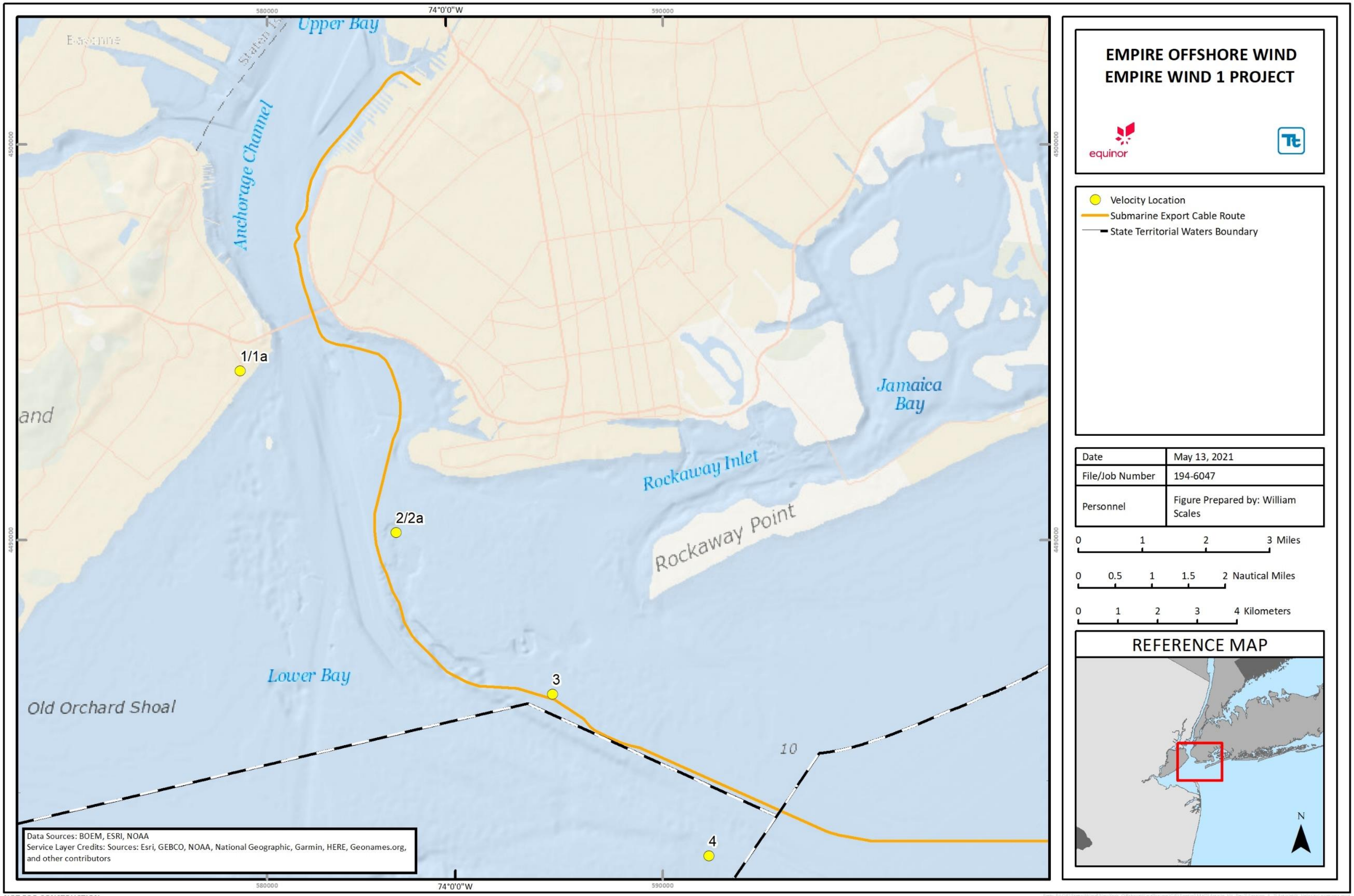


Figure 4.2-2 Velocity Station IDs

4.2.2.3 Sea Level

Historical data of sea level rise along the shoreline and coastal regions of the Project Area does not indicate significant rates of sea level rise in the past. According to NOAA's Tides & Currents database, sea level at the New York Battery location has risen approximately 1.5 ft (0.5 m) since 1856 (NOAA 2020a). This rise has occurred at a rate of approximately 0.11 inches/year (2.87 mm/yr.), based on monthly mean sea level data from 1856 to 2019. The sea level rise at this location over that time period is equal to a change of 0.94 ft (0.28 m) in 100 years.

The New York City Climate Resiliency Design Guidelines version 4.0 (NYC 2020) presents climate change sea level rise projections based on a report from the New York City Panel on Climate Change (NPCC 2015). Each projection estimate has a probability associated with it based on the outcome likelihood; the 75th percentile is defined as the value where 75 percent of outcomes have the same value or lower. Projected sea level rise for New York City in the 25th to 75th percentile range is 11 to 21 inches (0.28 to 0.53 m) by the 2050s, or approximately by the end of the Project's expected lifespan (NPCC 2015). Similarly, 6 NYCRR Part 490 adopts sea level projections for New York City with a medium projection of 16 inches for the 2050s (a range of 8 inches at the lowest estimate to 30 inches as the most conservative estimate). Future predictions of potential sea level rise over the lifespan of the Project have been considered in the design basis for the Project facilities, including the onshore substation elevation, which has assumed a two ft sea level rise over the lifespan of the Project.

Extreme weather events, such as tropical storms and hurricanes, have historically caused storm surges along coastal New York. Most recently (2012), Hurricane Sandy created a storm surge higher than a 100-year storm model. Storm surges during Hurricane Sandy reached heights up to 11 ft (3.5 m) relative to mean sea level. Additional discussion of floodplains relative to the onshore Project components and flood mapping is provided in Section 4.4.

4.2.2.4 Water Temperature

Water temperatures in the Project Area vary based on seasonal trends, with warmer water temperatures during the warmest months of the year, and colder water temperatures during the coldest months of the year. Although significant weather events can bring seasonally unusual temperatures, the warmest months in the New York Harbor region are typically late summer and into early fall, and the coldest months are typically late winter and into early spring. Typically, warmest temperatures can be found at surface waters, and temperatures decrease with depth. However, during the coldest months, deeper waters can retain slightly warmer temperatures than the surface waters. Average surface water temperatures in the region range annually by approximately 40 degrees Fahrenheit (°F, (22 degrees Celsius [°C]), with warmest temperatures in the August averaging 74° F, and coldest temperatures in February averaging 36° F (NOAA 2020b).

4.2.2.5 Sediment Transport, Suspension and Deposition

Sediment data, such as density and grain size distribution, were derived from Project-specific geotechnical, geophysical, and sediment transport studies of the Project Area, as well as publicly available data. Sediment in the Project Area along the submarine export cable route is typically comprised of sands, gravels, and slightly gravelly sand.

Sediment transport, suspension, and deposition in New York State is regulated by the NYSDEC under delegated authority through Section 401 of the Clean Water Act. The New York State Technical and Operational Guidance Series (TOGS) 5.1.9 of the *In-Water and Riparian Management of Dredged Material* (NYSDEC 2004) provides typical water quality standards for the mixing zone for dredging, dredged material placement, and effluent discharge. The mixing zone is defined by the NYSDEC as the area in a waterbody in which the temporary exceedances of water quality standards resulting from short-term disruptions to the water body (caused by dredging or the management of dredged material) may be acceptable. The typical mixing zone is considered to be 1,500 ft (157 m) in open water areas or 10 percent of the waterway width, whichever is less. The threshold for toxicity typically applied at the edge of the mixing zone for suspended sediments is 100 parts per million over ambient conditions, absent toxicity testing (NYSDEC 2004).

An analytical sediment transport model was developed for the EW 1 Project to assess the suspended sediment water column concentrations and sediment deposition characteristics that would result from the submarine cable installation activities. The Sediment Transport Analysis is provided in **Appendix B**. The Applicant is proposing jetting as the primary submarine export cable installation methodology, with options for mechanical plowing and mechanical trenching (cutting) as needed (see Section 4.1). In areas where these methods cannot be employed due to deeper burial requirements or other challenges such as vessel draft requirements, dredging or mass flow excavation (MFE) may be employed.

The sediment transport analysis completed for the EW 1 Project characterizes the potential maximum sediment transport and deposition scenario for jet plowing, the installation method proposed for most of the submarine export cable installation area. The use of jet plowing would result in greater disturbance of marine sediments than mechanical plow or mechanical trenching (cutting) installation; however, in several locations in the Project Area, jet plowing may not be feasible or desired due to sediment materials or the presence of other submarine assets. In other limited areas, underwater megaripples and sand waves are present on the seafloor, and pre-sweeping may be necessary prior to cable lay activities. In these locations, the model simulated MFE. Pre-trenching activity was not modeled separately in the Sediment Transport Analysis, due to the fact that sediment transport from pre-trenching is expected to be the same as jet plowing, but will occur separately before cable installation activities. It is assumed that pre-trenching will occur as a separate activity such that impacts will not be cumulative and sediments will settle out of the water column prior to cable installation.

Jet plowing utilizes high-pressured water jets to fluidize sediment as the machine traverses along a submarine cable route. The cable descends into a temporary trench incised by the jetting blades and is subsequently buried as the fluidized sediment resettles inside the trench. During jet plow operations, monitoring of burial allows the operator to adjust the angle of the jetting blades and the water pressure to obtain desired burial depth, while also minimizing sediment mobilization into the water column. By design, coarser sediment settles immediately to fill the trench and bury the cable, or settles in the immediate vicinity (typically within a foot) (Tetra Tech 2012, 2015; Vinhateiro et al. 2013). Earlier studies have shown that sediment coarser than 0.2 millimeters (mm) settles immediately over the trench (Tetra Tech 2015). In order to conservatively assess potential impacts associated with transport and deposition, the analysis assumes that sediment finer than 0.25 mm (fine sand) would be mobilized into the water column and transported by the ambient currents varying distances, depending on a number of factors.

The MFE tool generates a large volume column of water that travels vertically down to the seabed, fluidizing the sediments. MFE uses a device that draws in seawater from side pipes and produces a downwards flow from a nozzle suspended a couple of meters above the seabed. The bed material is shifted and trenched with the force of the jet and flushed away. The overall volume of material released for each clearance operation varies, based on the site-specific conditions.

The height of the sediment plume above the seabed for either method is dependent on local hydrodynamics, sediment size distribution, and the operating parameters. Previous studies have shown that the plume of sediment released during jet plowing reaches heights of roughly 7 ft (2 m) above the seabed (Tetra Tech 2012, 2015). The suspended sediment plume is then dispersed by local tidal currents and moves in the direction of the dominant current, which for the Project could be northward during flood tides and southwards during ebb tides. Tidal conditions and currents will be dependent on weather conditions at the time of the jet plow operation. The analytical sediment transport model simulated transport for both the maximum flood and ebb conditions to better estimate potential transport in both directions.

According to Stokes Law, settling velocity determines the time it takes for a fine grain sediment to settle down. Based on the sediment grain size distribution, representative sediment classes were selected and settling velocities assigned to those classes (USGS 2005). However, in many instances, the fine clay and silt sediment particles become cohesive when they are forced into resuspension by the jet plow, causing them to have settling velocities similar to larger-sized particles (Swanson et al. 2015; Van Rijn 2019). The settling velocities determine the duration for which the resuspended sediment stays in the water column before eventually settling to the seabed. These velocities have been assigned to each sediment class based on a United States Geological Survey (USGS) study (USGS 2005). **Table 4.2-2** lists the different sediment classes, and the associated settling velocities used for the modeling.

Table 4.2-2 Project Sediment Particle Diameter Classes and Settling Velocity

Sediment Class	Settling Velocity (cm/s)
Fine Sand	3.00
Very Fine Sand	1.00
Silt	0.126
Clay	0.023

The sediment transport analysis was conducted based on the current velocity locations identified in **Figure 4.2-2**. Stations 1-3 within New York waters are considered Riverine stations with 80 percent concentration of fines in the Sediment Transport Analysis report. For these stations, the submarine export cables had two target burial depths: 8 ft (2.5 m) (Stations 1 through 3) and 18 ft (5.5 m) (Stations 1a and 2a). Stations 1a and 2a utilized the same location as stations 1 and 2; however, 1a and 2a assumed the deeper target cable burial depth. Station 4 was considered Non-Riverine with 53 percent concentration of fines. Sediment Transport Analysis Results are summarized in Section 4.2.4.

4.2.3 Existing Marine Chemical Characteristics

Marine chemical conditions include the sediment and water quality characteristics of the Project Area. The Applicant has assessed chemical conditions based on a Project-specific sediment sampling program conducted in 2019, and publicly available data for the New York Harbor area.

4.2.3.1 Sediment Quality

Sediment quality is degraded in several areas along the submarine export cable route. Levels of contaminants, such as heavy metals, pesticides, polycyclic aromatic hydrocarbons (PAHs), and dioxins/furans are elevated in Upper New York Bay and the East River. However, sediment in Lower New York Bay, Raritan Bay, and the New York Bight is generally much less contaminated (Douglas et al. 2005).

The Project cable landfall is located south of the Gowanus Canal, a designated National Priority List Superfund site. For over 100 years industrial wastewater dischargers, combined sewer overflows (CSOs), and stormwater have discharged to the Canal, which in turn discharges into the commercial and industrial waterfront area in Gowanus Bay (EPA 2012a). Because circulation and tidal flushing to Gowanus Bay is limited, so has been the dilution and dispersion of contaminants (EPA 2012a).

The Gowanus Canal is contaminated with high levels of a variety of organic carbons and metals, including PAHs, polychlorinated biphenyls (PCBs), mercury, lead, and copper (EPA 2019). Most of the organic contaminants are substantially higher in the Gowanus Canal than in Gowanus Bay and New York Bay. Concentrations of PCBs in the Gowanus Bay range from noncarcinogenic hazard to carcinogenic risk levels (EPA 2012a). In Gowanus Bay surface sediment, PAHs are approximately 5.8 milligrams/kilogram (mg/kg), barium 67 mg/kg, cadmium 2.31 mg/kg, copper 81 mg/kg, lead 93 mg/kg, mercury 1.12 mg/kg, nickel 32 mg/kg, and silver 2.15 mg/kg (EPA 2012a).

Sediment sampling programs were initiated in 2019 and 2021[3] as part of the geophysical and geotechnical surveys along the submarine export cable route undertaken by the Applicant, developed in consultation with the USACE and the NYSDEC. New York-specific sediment sampling programs were conducted in 2019 in order to properly assess the finer sediment found in New York waters. Sediment sampling surveys consisted of vibracore samples that were collected with a 4-inch diameter core, with a target penetration depth of 19.7 ft (6.0 m) below the sediment-water surface at all sampling locations. Eighteen locations were sampled in 2019 at approximately 2-km intervals along the submarine export cable route (**Figure 4.2-3**). Data from 2020 and 2021 sampling campaigns is pending. Each sample, from all areas, was analyzed for the physical parameters including grain size with hydrometer (ASTM D 422), moisture, ash and organic matter (ASTM D 2974), Atterberg Limits (ASTM D 4318) and Specific Gravity (ASTM D 854). Samples with a combined sand and gravel content of less than 90 percent, based on the ASTM D 422 analysis, were analyzed for the following chemicals of concern, consistent with NYSDEC TOGS 5.1.9:

- Volatile Organic Compounds (VOCs), using EPA Method 8260;
- PAHs, using EPA Method 8270D-Selective Ion Monitoring;
- PCB Aroclors using EPA Method 8082A;
- Antimony, arsenic, cadmium, total chromium, copper, iron, lead, nickel, selenium, silver, thallium, and zinc, using EPA Method 6020;
- Total mercury, using EPA Method 7474;
- Pesticides, using Method 8081;
- Total solids, using EPA Method SM2540;
- Dioxins, using EPA Method 1613;
- PCB Aroclors, using EPA Method 8082;
- PCB congeners, using EPA Method 1668B; and
- Two runs of total organic carbon, using EPA Method 9060.

Additionally, samples were screened against saltwater Sediment Guidance Values (SGVs) (NYSDEC 2014a). The purpose of these screening values is to support the assessment of potential risks to aquatic life from contaminants in marine sediment. Only sampling locations with combined sand and gravel concentrations below 90 percent (by weight) were analyzed for chemical parameters; sediment with combined sand and gravel content above 90 percent was precluded from chemical analysis, as detailed in NYSDEC's TOGS 5.1.9 (2004) and *Screening and Assessment of Contaminated Sediments* (2014) guidance. Sands and gravels are less likely to hold contaminants of concern, especially compounds such as dioxins, furans, PAHs, or PCBs. Using the saltwater SGVs as comparison values, detected concentrations of contaminants in sediment from each of the vibracore sampling locations have been classified as Class A, B, or C pursuant to NYSDEC TOGS 5.1.9. These classifications are associated with the following potential risks to aquatic life:

[3] The results of the 2021 sampling will be made available once received from the lab.

Figure 4.2-3 Locations of Vibracore Samples Collected along the Submarine Export Cable Route (2019)

- Class A – Little or no potential for risk to aquatic life;
- Class B – The potential for risk to aquatic life cannot be ascertained from contaminant concentration data alone; additional information is needed to determine the potential risk to aquatic life; and
- Class C – High potential for the sediment to be toxic to aquatic life (NYSDEC 2014).

While some VOCs were detected during the laboratory analysis, none of them were present in concentrations above their respective Class A SGVs. Semi-volatile organic compounds were sometimes present, and many sample locations showed concentrations of total PAHs greater than the Class A SGV. An additional PAH screening step showed that in these instances, the total corrected toxic units for PAHs were above 1.0. Dioxins/Furans, total endosulfan, endosulfan sulfate, endrin, PCBs, arsenic, cadmium, chromium, copper, lead, nickel, silver, zinc and mercury were detected at multiple locations along the proposed cable route at concentrations that exceeded their respective Class C or Class B SGVs. The results of these comparisons show that several sediment core locations along the submarine cable route are classified as Class C or Class B under the NYSDEC guidance, which is an indication that contaminant concentrations in this sediment may be harmful or toxic to aquatic life that are exposed to it directly or indirectly. NYSDEC recommends certain restrictions and conditions for material management, dredging or in-water placement activities for Class B and C materials.

4.2.3.2 Water Quality

New York State Water Quality Standards, promulgated under 6 NYCRR Part 703, set the required water quality criteria to support the best use indicated. Waterbodies that do not meet the criteria associated with their use classification are considered to be impaired. State water quality classifications of tidal waterbodies fall into the following five categories, based on the best uses assigned by NYSDEC:

- Classification SA: assigned to waters used for shell fishing for market purposes along with primary and secondary contact recreation and fishing.
- Classification SB: assigned to waters used for primary and secondary contact recreation and fishing.
- Classification SC: assigned to waters used for fishing and primary and secondary contact recreation, although other factors may limit the use for these purposes.
- Class I: assigned to waters used for secondary contact recreation and fishing. Class I waters may be suitable for primary contact recreation, other factors may limit the use for this purpose.
- Class SD: assigned to waters used for fishing. All of the defined water quality classifications are suitable for fish, shellfish, and wildlife propagation and survival; however, Class SD waters cannot meet the requirements for fish propagation due to natural or man-made conditions.

Water quality classifications for waters crossed by the Project are depicted in **Figure 4.2-4**. The status of waterbodies crossed by the Project, based on the most recent NYSDEC WI/PWS reports, is provided in **Table 4.2-2**.

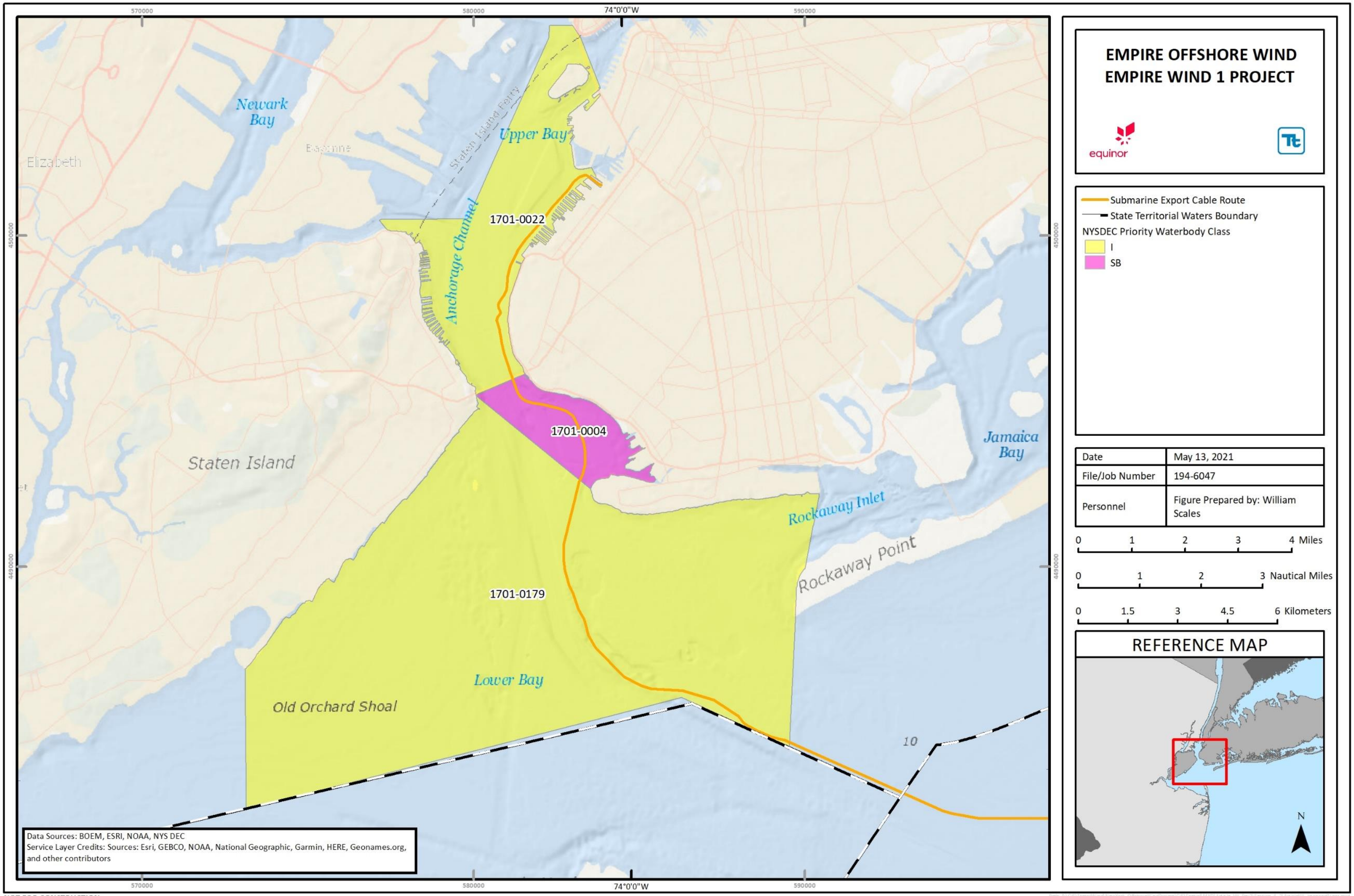


Figure 4.2-4 Water Quality Classifications of Waters Crossed by the Project

Table 4.2-2 Summary of Marine Waterbody Classes Potentially Crossed by the Submarine Cable Route

NYSDEC Segment	NYSDEC Classification	Best Usage (per 6 NYCRR 701)	Impairment	Impairment Sources
Upper New York Bay (1701-0022)	I	Public bathing and general recreation use	PCBs, dioxin, floatable debris, pathogens	Toxic/contaminated sediment, CSOs, urban/storm runoff, migratory species, municipal discharges
Lower New York Bay / Gravesend Bay (1701-0004)	SB	General recreation use	PCBs, pathogens, floatable debris	Toxic/contaminated sediment, CSOs, urban/storm runoff, municipal discharges
Lower New York Bay (1701-0179)	I	Public bathing and general recreation use	PCBs, pathogens, floatable debris	Toxic/contaminated sediment, CSOs, urban/storm runoff, migratory species, municipal discharges

The Lower Bay (10-digit Hydrologic Unit Code [HUC 10] 0203010404) and the Upper Bay (0203010402) are collectively referred to as the Sandy Hook/Staten Island Sub-Basin. These waterbodies are designated by NYSDEC as impaired, due to impairment of fish consumption by PCBs and dioxin in contaminated sediment, resulting in a health advisory for some species. Public bathing and other recreational uses may also experience minor impacts from pathogens, floatable debris and various other pollutants from urban/storm runoff, combined sewer outfalls, and other such sources. Lesser fish consumption impacts for additional species are due to contaminated sediment, but may not be reflective of a specific waterbody or known source of contamination, considering that fish species with a wide migratory range and a high lipid/fat content are more likely to accumulate contaminants (NYSDEC 2017).

New York Bay is located adjacent to one of the highest population density areas and greatest percent of impervious surface areas in the United States (USACE and PANYNJ 2016). Stormwater runoff from the area contributes large amounts of non-point source pollution, and there are 14 major wastewater treatment facilities in New York City and 11 in New Jersey that discharge to the bay (Harbor Estuary Program [HEP] 2011). Sediment loads to New York Harbor are high due to overland runoff, poor land management practices, tributary channel erosion, and shoreline modification, primarily from upriver portions of the Hudson River watershed (USACE and PANYNJ 2016). Increased stormflow, due to urbanization, has further modified the natural environment and causes increased scour, and thus increased sediment loads, in some areas (USACE and PANYNJ 2016).

A study completed by the New York-New Jersey HEP combined and analyzed data from New York and New Jersey as part of a long-term assessment project. This study analyzed samples from 68 locations in New York and New Jersey Harbor waters (HEP 2011). Overall, concentrations of contaminants, bacteria, nutrients, and metals have been decreasing in the region due to the implementation and enforcement of regulations under the Clean Water Act (CWA) over 45 years ago (HEP 2012). Despite improvements in water quality, legacy chemicals in the sediment, including mercury, PCBs, dichlorodiphenyltrichloroethane, and dioxin, still exceed acceptable levels, and these contaminants can be resuspended in the water column during major storm events or from activities such as dredging (Steinberg et al. 2004).

Bacterial trend data show that most areas within New York Harbor remain below the best use primary contact standards, which for most waterbodies is a monthly geometric mean of 200 colonies/100 milliliters (mL). Over the last several decades, summer geometric means of bacteria have decreased from more than 2,000 colonies/100 mL to around 20 colonies/100 mL (NYCDEP 2009). In 2018, the fecal coliform concentrations in lower New York Bay were some of the lowest in the area, and summer geometric means were below the NYS Standard of 200 colonies/100 mL (NYCDEP 2018). However, sampling for the latest WI/PWS reports from 2017 still showed elevated bacteria concentrations, specifically following rain events, which allows stormwater and CSO discharge to enter the harbor (NYCDEP 2017).

Dissolved oxygen levels throughout New York Harbor have experienced an upward trend from 1970 to 2009 (HEP 2012). Summertime dissolved oxygen concentrations were greater than 5 mg/L in the New York Bay (in both surface and bottom waters) in a study during that period (HEP 2011).

Nitrogen levels are low in the lower New York Bay compared to other regions in New York Harbor, although summer means of inorganic nitrogen have remained greater than 0.30 mg/L (NYCDEP 2017). Annual average total nitrogen concentrations in New York Harbor have ranged from 1 mg/L to 0.5 mg/L from 1990 to 2017 (Stinnette et al. 2018). Dissolved inorganic phosphorus generally ranged between 0.02 mg/L and 0.05 mg/L from 2003 to 2006 (EPA 2012b).

Levels of metal pollutants in the water column vary considerably, but generally decrease with distance from New York Harbor. Because most of these pollutants are associated with freshwater flows from the contributory rivers (Hudson, Raritan, Passaic, etc.), they may also vary with vertical position in the water column where a vertical gradient in salinity develops. Metals tend to be found in higher concentrations in lower salinity surface waters flowing out of the rivers (USACE 2008).

4.2.4 Potential Marine Chemical and Physical Impacts and Proposed Mitigation

4.2.4.1 Construction

No significant impacts to tides, currents, bathymetry, or water temperatures are anticipated from Project-related construction activities. Long-term bathymetry changes are discussed in Section 4.2.4.2**.** During construction, the potential impact-producing factors to water quality may include:

- Construction of submarine export cables and cable protection; and
- Construction of onshore components, including the onshore cable system and associated onshore substations.

The following are potential impacts to marine sediment and chemical characteristics that may occur as a consequence of the above-referenced Project construction activities:

- Short-term, minor disturbance of seabed sediment;
- Short-term, minor increase in erosion and run-off;
- Short-term, minor impacts due to dewatering trenches and excavations; and
- Short-term, minor potential for accidental spills and/or releases offshore or onshore.

Disturbance of Seabed Sediment. Disturbance of seabed sediment during offshore construction and installation activities could increase the total suspended solids in the water column resulting from sediment resuspension and dispersal; however, impacts on water quality are expected to be short-term and localized (Latham et al. 2017). To evaluate the impacts of Project submarine export cable installation, the Applicant developed a conservative analytical sediment transport model using publicly available data to quantify potential maximum plume dispersion, sediment concentrations and potential maximum sediment deposition thicknesses. The sediment transport analysis characterizes the potential maximum sediment transport and deposition scenario for jet plowing activities, the installation method proposed for most of the submarine export cable installation area, which would result in greater disturbance of marine sediments than mechanical plow or mechanical trenching (cutting) installation. Additionally, the model simulated MFE at several locations in the Project Area, where jet plowing may not be feasible or desired due to sediment materials or the presence of other submarine assets, or where pre-sweeping may be necessary due to underwater megaripples and sand waves present on the seafloor.

Sediment in the Project Area is characterized as predominantly sands and gravels in New York Bay. This sediment can be released into the water column, temporarily increase total suspended solids near the trench, and cause sediment deposition outside of the trench.

In the Sediment Transport Analysis (**Appendix B**) completed for the Project, suspended sediment concentrations were typically below 500 milligrams per liter (mg/L) at a distance of 1,640 ft (500 m) from the trench centerline during flood and ebb tides. Studies have shown suspended sediment concentrations of anywhere from 50 to 1,000 mg/L at distances approximately 1,000 ft from the centerline (Tetra Tech 2012, Tetra Tech 2015). Maximum concentrations at the trench line are approximately $2.7*10^6$ mg/L for a trench depth of 8 ft (2.5 m) and $6.1*10^6$ mg/L for a trench depth of 18 ft (5.5 m). As noted in Section 4.2.2.5, these maximum concentrations are expected to represent both pre-trenching and cable installation activities, as separate occurrences.

The sediment plume was confined near the substrate layer and is not expected to reach the surface. Data collected in the Riverine Area at Stations 2, 2a and 3, indicated that plume travel distances would be approximately 1,640 ft (500 m) during flood tides and approximately 1,150 ft (350 m) during ebb tides. Stations 1 and 1a had a maximum plume distance of 3,280 ft (1,000 m) during both flood and ebb tides. This is due to the high current velocity at Stations 1 and 1a. At the Non-Riverine stations, such as Station 4, which are composed of sandier bed sediments, maximum plume distances were typically between 328 and 1,640 ft (100 and 500 m).

For Riverine stations, expected maximum suspended sediment concentrations were between 0 and 1,661 mg/L at 1,640 ft (500 m) from the trench centerline. Station 1a and Station 2a had higher suspended sediment concentrations, compared to the other Riverine stations, due to the deeper burial depths (18 ft [5.5 m], as opposed to 8 ft [2.5 m]). For Non-Riverine stations, expected maximum suspended sediment concentrations drop to anywhere between 0 and 268 mg/L at 1,640 ft (500 m) from the trench centerline during ebb tides.

Stations with deeper burial depths or higher percentages of fine sediment particle classes had higher concentrations of suspended sediments, because more particles were suspended due to jet plowing. If a station had a total percent fine sediment composition of 50 percent, half of the disturbed sediments would be mobilized into the water column following resuspension by the jet plow.

Coarse particles (medium sand and larger) would not be suspended in the water column from anticipated Project jet plow activities. The maximum deposition thicknesses of 14.2 in (36.15 cm) and 8.9 in (22.6 cm) for Stations 4, and 2a, respectively, would occur within 16 ft (5 m) of the trench centerline; at a distance of 33 ft (10 m), deposit thickness was less than 2.4 inches (6 cm) at each of the stations. Deposition thickness would decrease rapidly with distance from the jet plow and would be negligible, at less than 0.04 inches (0.1 cm), within 1,150 ft (350 m) of the trench.

For MFE, the initial maximum suspended sediment concentration would be $5.49*10^6$ mg/L. The plume was predicted to travel up to 82 ft (25 m) in the Narrows during flood tide and 164 ft (50 m) during ebb tide. Near Gravesend Bay, the plume was predicted to travel around 16 ft (5 m) during both flood and ebb tide. The plume travels for such a shorter distance (as compared to jet plowing) because of the difference in sediment composition. Fine sand and very fine sand settle out quickly in comparison to silt and clay. The suspended sediment concentration drops by 50 percent within 60 seconds of suspension in the water column.

The highest predicted deposition thickness for MFE was 32.80 in (83.32 cm) during flood tide and 28.5 in (72.39 cm) during ebb tide for the Narrows. The thickness is reduced to 7.18 in (18.26 cm) within 82 ft (25 m) during flood tide and to 6.25 in (15.89 cm) within 82 ft (25 m) during ebb tide. For Gravesend Bay, the highest predicted deposition thickness was 79.25 in (201.31 cm) during flood tide and 86.16 in (218.85 cm) during ebb tide. It dropped down to 24.65 in (62.63 cm) within 16 ft (5 m) during flood tide and to 28.29 in (71.86 cm) within 16 ft (5 m) during ebb tide. For both locations, the deposition thickness fell below 0.004 in (0.01 cm) within 246 ft (75 m) during both flood and ebb tides.

Along the submarine export cable route, cable installation activities would likely disturb areas of contaminated sediment within New York Bay. Sediment core data has been collected and is being tested to determine the concentration of organic and metal contaminants, and the depth they are found along the route. While surface sediment has organic and metal contamination levels below the effects range median impacts thresholds, deeper sediment has higher concentrations that are above these levels (Lodge et al. 2015).

The Sediment Transport Analysis represents a conservative maximum case for jet plowing and, where applicable, MFE for submarine export cable installation. Although suspended sediment modeling indicates the potential for maximum concentrations to be above 100 mg/L at some locations at the edge of the typical mixing zone distance of 1,500 ft (157 m), as provided in NYSDEC TOGS 5.1.9, these maximum values are not expected to represent a typical or average condition during submarine export cable installation. The Applicant will update the Sediment Transport Analysis with site-specific sediment data, when available, to refine the modeling predictions, and will continue to consult the NYSDEC and other applicable agencies.

Results from the Sediment Transport Analysis were also consistent with other sediment transport models completed for wind farm installation projects in the mid-Atlantic region (Swanson and Isaji 2006; Tetra Tech 2012, 2015; Vinhateiro et al. 2018). Data collections and modeling studies of other plowing, trenching, and dredging projects showed that displacement of sediment is low, and suspended sediments are typically dissipated to background levels very close to the site (USACE 2015; BOEM 2013; Burton 1993; Elliot et al. 2017; ESS Group 2008; FHWA 2012). A majority of disturbed sediment, specifically in areas with sandy soils similar to those found in New York Bight, settled immediately to the bed and were not dispersed in the water column (Latham et al. 2017; USACE 2015; Elliot et al. 2017). A Block Island Wind Farm cable study, completed during the 2016 cable installation, found that sediment impacts to water quality were negligible from jet plowing, and that there was no observable sediment plume (Elliot et al. 2017). Material was deposited 23 ft (7 m) outside the jet plow trench and was up to 10 in (25 cm) thick (Elliot et al. 2017). The deposited overspill sediment may have extended beyond 23 ft (7 m), but the deposition was negligible and less than what could be measured (Elliot et al. 2017). A bathymetric survey conducted four months after the initial cable installation found that the deposited materials were redistributed by currents, and the sediment deposits were no longer distinguishable (Elliot et al. 2017).

Thus, the potential water quality impacts of the Project's submarine export cable installation activities with respect to sediment disturbance are expected to be localized and minor (see Section 4.6 for additional discussion of potential impacts to fisheries and benthic resources). Furthermore, the seabed and near-bottom water column are highly dynamic environments, with suspension and redeposition of sediment occurring continuously, due to storms and tidal currents. Water quality impacts from these processes and other anthropogenic processes, such as trawling and commercial vessel anchoring, are similar to or more significant than any potential Project-related effects.

Increase in Erosion and/or Stormwater Runoff. Excavation, soil stockpile, and grading associated with installation of the onshore export and interconnection cables, development of the onshore substation, and supporting infrastructure may have the potential to temporarily impact the water quality and quantity of stormwater runoff from the disturbed construction areas. Impacts to water quality from erosion and run-off during construction are expected to be minor, short-term and localized, as onshore construction areas are generally flat and the soil types are not especially susceptible to erosion. Additional discussion of erosion and stormwater runoff associated with the onshore Project Area is provided in Section 4.2.

Where the potential for an increase in erosion and/or stormwater runoff as a result of Project construction operations exists, the Applicant proposes to implement a soil and erosion sediment control plan, which will satisfy the requirements detailed in the New York State Standards and Specifications for Erosion and Sediment Control. The Applicant will develop a SWPPP and will obtain coverage under the State Pollutant Discharge Elimination System General Permit for Stormwater Discharges from Construction Activity, GP-0-20-001 for land disturbance greater than one acre. The SWPPP will identify the measures that will be employed at the site to control the release of erosion and pollutants to the water and outline an implementation and maintenance schedule.

Accidental Spills and/or Releases Offshore or Onshore. During construction, water quality has the potential to be impacted through the introduction of contaminants, including oil and fuel spills, and releases from Project-related construction vessels. Project-related vessels will be subject to USCG regulations on wastewater and discharges and will operate in compliance with oil spill prevention and response plans that meet USCG requirements. Additionally, all vessels less than 79 ft (24.1 m) will comply with the Small Vessel General Permit issued by EPA on September 10, 2014.

Onshore construction vehicles and equipment will be refueled and potentially serviced within the Project construction area. Short-term, accidental releases from onshore construction or equipment will be minimized and managed through an SPCC plan, which will be included in the Project's EM&CP. The SPCC will contain provisions for the use of secondary containment for oils and greases, where appropriate, and will require the availability of spill response kits. As a result, the potential impacts of any accidental spills and/or releases are anticipated to be minor and localized.

4.2.4.2 Operations and Maintenance

No significant impacts to tides, currents, bathymetry, or water temperature are anticipated from Project-related operations and maintenance activities. During operations, the potential impact-producing factors to marine sediment and water quality may include:

- Presence of permanently-buried submarine export cables, and associated cable protection;
- Operations and maintenance activities associated with the onshore export and interconnection cables and onshore substations.

The following potential impacts may occur as a consequence of the factors identified above:

- Long-term, minor effects due to cable protection on the seafloor;
- Long-term, negligible effects to bathymetry from pre-sweeping activities;

- Short-term, minor effects on water quality from maintenance of the submarine export cables, including maintenance dredging if required;
- Long-term, minor effects due to stormwater run-off; and
- Long-term, minor potential for accidental spills and releases.

Effects Due to Cable Protection. The Applicant may use cable protection in locations where target cable burial depth is not feasible or achieved, due to existing assets, and where assessments deem necessary, to further minimize the effects of local sediment transport. The existence of cable protection on the seabed can result in scouring around the protection. Scouring processes will likely be more prevalent in portions of New York waters with shallower depths, such as within New York Harbor, where tidal current flow can have a greater effect. The Applicant is consulting with the U.S. Army Corps of Engineers and other applicable agencies regarding cable protection measures and minimizing scour to the extent practicable.

Scour protection, which usually consists of a layer of small sized rock and gravel topped with a layer of larger rocks placed immediately after installation, can reduce scour (Peterson 2014, Whitehouse et al. 2011). Edge scour is related to the size of the rock and the depth and tapering of the protection, with smaller rock and shallower protections with more tapering resulting in less edge scour (Peterson 2014). Potential impacts associated with scour protection are anticipated to be long-term during the life of the Project, but minor due to the small footprint and localized nature of the cable protection measures.

Bathymetry Changes Due to Pre-Sweeping. Pre-sweeping may be conducted prior to cable lay, in order to prepare the seabed for trenching and avoid overbending while laying the cables. In areas where sandwaves are present, a long-term impact to bathymetry will result, as the final seabed contours will remove slopes and waves. Given the very localized nature of this activity, bathymetry changes due to pre-sweeping will have a negligible impact and will not affect scour, current, temperature or other ocean processes.

Effects on water quality from maintenance of the submarine export cables, including maintenance dredging. The submarine export cables will be monitored during operations through Distributed Temperature and Distributed Vibration Sensing equipment. The Distributed Temperature Sensing system will be able to provide real-time monitoring of temperature along the submarine export cable route, alerting the Applicant should the temperature change, which often is the result of scouring of material and cable exposure. The Distributed Vibration Sensing system will provide real-time vibration monitoring close to the cables, indicating potential dredging activities or anchor drag occurring close to the cables. Upon receiving any such alert, the Applicant would investigate the cable condition and identify and corrective actions, if necessary.

Should one of the submarine export cables fault, the portion of the cable will be spliced and replaced with a new, working segment. If the submarine export cables or cable protection measures require repair, or if new cable protection is required, impacts associated with repair activities will be similar to those described for construction activities, but with a much shorter duration and a more limited area of the cable corridor. In certain locations, sedimentation or shoaling over the cables may also result in an exceedance of depth limitations over the cable over time. In these locations, especially along the approach to the cable landfall at SBMT, maintenance dredging may be required during operations. Impacts associated with cable repair or maintenance dredging will include localized, direct, short-term seafloor disturbance that may result in short-term impacts to water quality from sediment disturbance.

Effects Due to Stormwater Runoff. Impervious areas prevent rain and snowmelt from infiltrating into the soil, thereby increasing overland flow that may enter adjacent waterbodies. The generated stormwater runoff can carry sediment and pollutants that have built up on site into nearby surface waters, posing a potential risk to water quality and aquatic life. However, the cable landfall and onshore substation are fully developed sites, and there is no increase in impervious area from Project operations expected. Additional discussion of stormwater runoff associated with the onshore Project Area is provided in Section 4.4.

Effects Due to Accidental Spills and/or Releases. During operations, the onshore substation may contain oils, fuels, and/or lubricants. An inadvertent release of oil, fuel or other materials at the onshore facilities is not expected to impact the quality of the surrounding surface water resources. The Applicant will develop an SPCC Plan for operations, which will detail all measures proposed to avoid inadvertent releases and spills and establish a protocol to be implemented should a spill event occur. The Applicant will also have an Oil Spill Response Plan for offshore activities during operations; however, offshore activities for the submarine export cables during operations are expected to be limited to routine inspections, and non-routine cable repairs, when necessary. Potential impacts associated with accidental spills and/or releases therefore are anticipated to be minor and localized.

4.3 Topography, Geology, Soils, and Groundwater

This section describes the existing topography, geology, soils, and groundwater conditions identified within and surrounding the Project Area, as required under 16 NYCRR § 86.5. Potential impacts to topography, geology, soils, and groundwater resulting from construction, operations, and maintenance of the Project are discussed. This section also describes the Project-specific measures that the Applicant will implement to avoid, minimize, and/or mitigate these potential impacts. Marine resources are described in Section 4.2, and onshore wetlands and waterbodies are discussed in Section 4.4.

4.3.1 Topography, Geology, Soils and Groundwater Studies and Analysis

Topography, geology, soils, and groundwater in and surrounding the Project Area, including the submarine export cable corridor, onshore substation, and onshore cable corridor, were initially assessed by reviewing the following resources:

- USGS Mapping (1995a); USGS topographic 7.5-minute quadrangles for New York (Upper Bay, The Narrows, Coney Island, Far Rockaway);
- NOAA's Continually Updated Digital Elevation Model (Cooperative Institute for Research in Environmental Sciences 2014);
- NOAA nautical charts;
- Geologic mapping (NYSMuseum 1999); and
- Soil survey mapping (SoilWeb 2019; USDA 2020).

The Applicant also completed geophysical and geotechnical assessment campaigns along the submarine export cable route in 2018 and 2019, consisting of high-resolution geophysical and shallow geotechnical surveys of the submarine export cable corridor. Additional geophysical and geotechnical survey information was collected in 2020 and 2021, which included route modifications that have been incorporated into the Project. The Applicant is in the process of updating the Marine Site Investigation Report to include analysis of the 2020 and 2021 survey data; the Marine Site Investigation Report is expected to be available in early 2022.

The results and interpretations of the geophysical and geotechnical datasets collected to date have been incorporated into a comprehensive site-specific "ground model." The ground model is a three-dimensional representation of the geological and stratigraphic conditions within the offshore portions of the Project Area, with a focus on the factors that pertain to Project design and engineering. The ground model will be updated as additional surveys and assessments are completed during the development process to provide a comprehensive understanding of geological conditions and support Project siting and design. The model results will also be used to develop additional avoidance, minimization, and mitigation measures where appropriate.

4.3.2 Existing Topography, Geology, Soils, and Groundwater

The affected environment is defined as the offshore areas and onshore areas that have the potential to be directly or indirectly affected by the construction or operation of the Project. Marine conditions are further described in Section 4.2, and onshore wetlands and waterbodies are discussed in Section 4.4.

4.3.2.1 Topography

The onshore Project Area, which includes the onshore substation site and the onshore cable corridor, ranges in elevation from 4.8 ft (1.5 m) to 11.5 ft (3.5 m) elevation NAVD88 (CIRES 2014). Topographic relief is characterized as flat, and slopes are minimal. The onshore Project Area is heavily urbanized and composed of filled land, and any previously existing topographic grades have been leveled for the construction of the many structures in the area.

Bathymetric conditions along the submarine export cable route are described in Section 4.2.

4.3.2.2 Geology

The geology of the Project Area was assessed based on available desktop data, as well as geophysical and geotechnical survey campaigns. The geology and geomorphology in the New York Bight region are diverse, resulting from the deposition and reworking of glacial and marine deposits resulting from a series of sea level changes of the Pleistocene Epoch, and more recent Flandrian transgression of sea level (Messina and Stoffer 1996). The submarine export cable route is located in a boundary region between glaciated and proglacial areas. The most recent glacial period in the U.S., called the Wisconsinan glaciation, stretched from approximately 30,000 to 12,000 years ago. During this time, the Laurentide Ice Sheet covered most of northern North America, its margin terminating just north of Long Island. This is evident in a series of glacial end moraines located on the north side of Long Island, Martha´s Vineyard, and Nantucket. To the north of the moraines are dense basal tills (deposited beneath the glacier) overlying the bedrock. The moraines consist of sandy till with variable sorting and drainage, at times mixed with stratified sands (Cadwell et al. 1989).

The onshore portion of the Project is underlain by Precambrian crystalline bedrock. On Manhattan, bedrock outcrops are at the surface, but they rapidly slope to the south and are overlain by a massive wedge of semiconsolidated to unconsolidated sediments underlying the Project Area.

The geological units underlying the marine portions of the Project Area are generally composed of Cretaceous to Quaternary age sediments, consisting of sand, gravel, silt, and clay that have deposited during cycles of sea level fluctuations commonly known as coastal plain deposits. Pleistocene deposits unconformably overlie the Coastal Plain deposits and are characterized by layers of chaotic beds created by erosional and depositional glacial cycles. Holocene deposits are interpreted as gravel, sand, silt and clay with organic deposits overlaying the Pleistocene deposits in most of the area. Holocene sediments were deposited in a combination of marine shelf, shoreface, estuarine and fluvial environments due to sea level variations. Channels frequently incise into the underlying Pleistocene and Coastal Plain deposits during fluvial episodes, and incisions were later filled with estuarine and transgressive marine sediments as sea level rose to modern levels.

Onshore Geology

The onshore cable route and onshore substation are located in an area heavily influenced by human development, including the basin-ward extension and stabilization of the shoreline for historic waterfront development purposes. The onshore Project Area is underlain by glacial till that overlies the bedrock to depths of up to 200 ft (60 m). This till consists of unsorted variable texture of clay, silt, sand, and bolder clay of low permeability.

Offshore Geology

Geologic conditions underlying the submarine export cable route are characterized by the surficial geology (determined from grab sampling and geophysical survey work) and the stratigraphic geology (determined through geotechnical sampling). Surficial geology consists of sediments along the submarine export cable route that are interpreted to be comprised primarily of sand, with accumulations of slightly gravelly sand found at lower elevations between bedforms and small depressions. Additionally, closer to shore, isolated areas of outcropping glacial till have been observed, as discussed above in Section 4.2.

The stratigraphy underlying the submarine export cable route contains significant variations. Stratigraphy near the New York State boundary 3 nm (5.6 km) offshore is all sand with occasional gravel bands or pockets. The geology in this area is a series of lag and outwash deposits, with a consistent cover of surficial sediment up to 13 ft (4 m) thick, without glacial till outcrops. As the route moves further towards shore in New York waters, the stratigraphy becomes predominately surficial unconsolidated sediments overlying glacial till and outwash deposits, with the glacial material occasionally observed as an outcrop on the seabed. Within the subsurface glacial till, the existence of buried boulders, also known as glacial erratics, are expected. These glacial erratics are typically under 10 in (25.4 cm) in diameter and are possible along the submarine export cable route due to the glacial origin of the deposits. However, the Project's geotechnical investigations indicate that the presence of these glacial materials is not common at or above target burial depths of the Project's submarine export cables. Surficial sediment overlaying the glacial till in this section is up to 24 ft (7.5 m) thick.

4.3.2.3 Soils

A review of nineteenth century maps of the Brooklyn shoreline indicates that the onshore Project Area occurs on fill constructed into Gowanus Bay in the late nineteenth and early twentieth centuries (NYPL 2019). The area has undergone significant human and construction-related modifications. Artificial fills and rip-rap seawalls have been utilized to modify the original topography to accommodate significant amounts of anthropogenic activities in these locations. The NRCS identifies the area soils as Urban or Udorthents, which are defined as made land over loose sandy and gravelly glaciofluvial deposits and/or firm coarse-loamy basal till derived from granite and gneiss (SoilWeb 2019).

Seabed characteristics of the offshore Project Area are discussed in Section 4.2.

4.3.2.4 Groundwater

New York State classifies groundwater quality under 6 NYCRR Part 701. State water quality classifications of groundwater fall into the following three categories based on the assigned best uses by NYSDEC:

- Class GA: a source of potable water supply. Class GA waters are fresh groundwaters.
- Class GSA: a source of potable mineral waters, or conversion to fresh potable waters, or as raw material for the manufacture of sodium chloride or its derivatives or similar products. Class GSA waters are saline groundwaters.
- Class GSB: a receiving water for disposal of wastes. Class GSB waters are saline groundwaters that have a chloride concentration in excess of 1,000 milligrams per liter or a total dissolved solids concentration in excess of 2,000 milligrams per liter.

The onshore cable route and the onshore substation overlay the Long Island Aquifer, one of the most prolific aquifers in the country. Groundwater was historically pumped from this aquifer for drinking water and industrial uses, but impervious coverage throughout the county reduced recharge, and water demand caused freshwater water tables to drop (USGS 1995b). After saltwater intrusion occurred, pumping for public supply ceased in 1947 in Kings and Queens County on western Long Island; the area has since recovered, with water tables now at pre-pumping levels (USGS 1995b).

The USGS does not monitor groundwater elevations near the cable landfall in New York, although they have a robust monitoring network to the north and east. The depths along the eastern and southern shorelines of Long Island range from 1.71 ft (0.52 m) below mean sea level to 5.83 ft (1.78 m) below mean sea level (MSL), with the wells closest to the cable landfall measuring depths of 4.69 ft (1.43 m) below MSL and 5.83 ft (1.78 m) below MSL (USGS 1997). Based on this older data, groundwater elevations near the cable landfall and onshore substation are likely less than 5 ft (1.52 m) below MSL (USGS 1997). Remedial investigations conducted at the nearby Bush Terminal site approximately 0.6 mi (1 km) to the south of the Project Area found groundwater ranging from 6 to 10 ft (1.8 m to 3 m) below ground surface (G.C. Environmental 2013). Regional groundwater flow is generally to the west and northwest (G.C. Environmental 2013; USGS 1999).

While 25 percent of New York State relies on groundwater for their drinking water source, the areas around the landfall in Brooklyn receive their drinking water from the Catskills, located approximately 125 mi (201 km) north. All fresh groundwater in New York State is considered classification GA, as defined above, with a best use as potable water supply.

4.3.3 Potential Topography, Geology, Soils, and Groundwater Impacts and Proposed Mitigation

4.3.3.1 Construction

During construction, factors producing potential impacts to topography, geology, soils, and groundwater may include:

- Construction activities, including cable lay and seabed disturbance, for the installation of the submarine export cables and cable landfall;
- Installation of the onshore cable system, including open cut trenching and trenchless construction methods; and
- Construction of the new onshore substation.

The potential impacts to topography, geology, soils, and groundwater during construction may include:

- Short-term, minor disturbance to topography, including hazards due to existing topographic and seabed conditions during submarine export cable installation;
- Short-term, minor disturbance to existing surficial geological conditions;
- Short-term, minor disturbance to soils, including potential impacts from erosion and stormwater runoff;
- Short-term, minor impacts to groundwater due to dewatering trenches and excavations; and
- Short-term, minor impacts to groundwater due to the potential for inadvertent returns of drilling fluids during HDD, if HDD is used as a trenchless crossing solution.

Topographical, soil, geological, and groundwater data have been reviewed to inform the Project design and construction methods, including assessment of where seabed and soil conditions may not be suitable for construction. As such, the Project has included appropriate cable installation methodologies and mitigation measures to account for these conditions (see also Section 4.1). Project infrastructure will be designed and installed using industry-standard methodology, which will minimize the Project's potential impacts to topography, geology, soils, and groundwater.

Topography and Geology. Throughout the construction phase of the Project, temporary impacts to natural conditions may occur, as disruptions to surface geology and seabed sediment are unavoidable. Construction methods will take into consideration these disruptions, and methods that limit impact to the surface geology and seabed sediment will be implemented to the extent feasible. Construction impacts associated with installation of the Project will be localized and are not anticipated to result in broad-scale impacts to the geological conditions of the Project Area.

During submarine export cable installation, anchoring of working vessels and Project infrastructure being installed may be disrupted or damaged as a result of the natural and anthropogenic topographic, bathymetric and geological conditions, including scarp, soft soils, and dredged navigation channels. The siting and design of Project components has therefore been informed by the presence or absence of these features and adjusted accordingly to mitigate potential risks.

The use of jet plowing to install the submarine export cables may also cause temporary disturbance to the seabed, resulting in suspended sediments. However, the seabed is expected to be restored, stabilized, and returned to pre-construction conditions through natural currents shortly after the suspended sediments have settled. In certain limited areas of the submarine export cable corridor, where underwater megaripples and sandwaves are present on the seafloor, pre-sweeping may be necessary prior to cable lay activities. Pre-sweeping will involve smoothing the seafloor by removing ridges and edges, where present. The primary pre-sweeping method will involve using a suction hopper dredge vessel and/or mass flow excavator from a construction vessel to remove the excess sediment on the seafloor along the footprint of the cable lay; however, other types of dredging equipment may be used depending on environmental conditions and equipment availability. Dredging of seabed sediment will also be required in order to install the submarine export cables in the vicinity of the cable landfall at SBMT. Additional information on potential construction impacts associated with pre-sweeping, dredging and disturbance of seabed sediment is provided in Section 4.2.

During the construction of onshore infrastructure, there will be short-term disturbance of the upper layers of soil along the onshore cable route, and for preparation of the onshore substation site. Following installation of the onshore cables, all trenches will be backfilled and surface grades will be returned to pre-construction conditions to the extent practicable. Due to the nature of the onshore substation site as relatively flat and previously filled land, the Applicant does not anticipate that significant cut or fill, or modification to existing topography or drainage patterns, will be required as part of onshore substation installation. Site preparation activities for the onshore substation may include excavation and removal of existing belowground and aboveground infrastructure, bulkhead replacement, grading, and installation of foundations and supports.

Design and installation of the cable landfall, onshore cables, and onshore substation will be supported by an onshore geotechnical investigation to be completed in advance of final design. This additional design information will be provided as part of the Applicant's EM&CP.

Soils. During the construction of onshore infrastructure, there will be short-term disturbance of the upper layers of soil along the onshore cable route and for preparation of the onshore substation site. Excavation, soil stockpile, and grading associated with installation of the onshore cables, construction of the onshore substation, and supporting infrastructure may have the potential to temporarily increase erosion and impact the water quality and quantity of stormwater runoff from the construction work areas. Impacts from erosion and runoff during construction are expected to be short-term, minor, and localized, as onshore construction areas are generally flat and the soil types are not especially susceptible to erosion. As the onshore Project Area is sited in its entirety on filled land and urban soils, no significant impacts to soils are expected from construction of the Project.

The Applicant proposes the following measures to avoid, minimize, and mitigate impacts related to soil erosion and stormwater runoff:

- The implementation of a soil erosion and sediment control plan satisfactory to the requirements detailed in the New York State Standards and Specifications for Erosion and Sediment Control (Blue Book), including the development of a SWPPP, as applicable.

- Obtaining a SPDES general permit for stormwater discharges from construction activity and developing a SWPPP per the CWA (33 United States Code [U.S.C.] § 1342) as required for anticipated land disturbance greater than 1 ac (0.4 ha). The plan will identify the measures that will be employed at the site to control the release of erosion and pollutants to the water and outline an implementation and maintenance schedule.

The soil erosion and sediment control plan will identify temporary erosion control devices and soil stabilization measures to be implemented during construction. The Applicant will evaluate the suitability of excavated soils to be reused onsite, and if soil reuse is not possible, excess soils will be disposed of at a licensed facility. If unanticipated contamination is encountered during construction, it will be addressed in accordance with soil management plans to be provided in the EM&CP or in accordance with an approved remedial action plan, if applicable. Following installation, areas temporarily disturbed for installation of the onshore cables and onshore substation will be backfilled, stabilized, and restored to pre-construction conditions to the extent practicable.

Groundwater. Disturbance of soils during the installation of the onshore cables and the onshore substation may result in minor, short-term disturbance to localized shallow groundwater. Neither soil nor groundwater disturbance will affect drinking water resources, as no public drinking water wells are in the vicinity of the Project.

Final engineering design will determine if groundwater will need to be managed during excavation activities for the Project's onshore facilities. As discussed above in Section 4.2.3.4, groundwater may be less than 5 ft (1.5 m) in portions of the onshore Project Area, and therefore may be encountered by trenching for the onshore cable installation or onshore substation foundation excavation activities. As designs for the onshore cable corridor and the onshore substation develop, the Applicant will determine through site-specific test pits whether groundwater is expected to be encountered during construction activities. If dewatering is expected to occur, the Applicant will develop a site-specific dewatering plan to protect groundwater and nearby surface water resources in accordance with a Project-specific SWPPP, which will be provided as part of the Project's EM&CP. The rate of dewatering and the quality of the water will determine whether the water may be placed into frac tanks for off-site disposal, or if permissible, discharged into the storm drain system or onsite. Impacts on water quality will be minor and short-term from dewatering, assuming dewatering best management practices are employed.

HDD technologies or other trenchless technologies (e.g. jack-and-bore) may be implemented to avoid existing infrastructure, in the event that currently unknown utilities or other infrastructure are identified within the onshore cable corridor. The HDD installation method requires HDD drilling fluid, which typically consists of a water and bentonite mixture. The bentonite mixture is made up of mainly inert, non-toxic clays and rock particles consisting predominantly of clay with quartz, feldspars, and accessory material such as calcite and gypsum; the mixture is not anticipated to significantly affect water quality if released. An inadvertent return/release can occur when the drilling fluids migrate unpredictably to the land or seabed surface through fractures, fissures, or other conduits in the underlying rock or unconsolidated sediments. An inadvertent return/release could potentially increase turbidity in marine, groundwater, and/or surface water resources. Should an inadvertent return/release occur, it would likely only result in short-term and localized impacts. If HDD installation is proposed as part of final design, the Applicant will develop and implement an Inadvertent Return Plan, to avoid, minimize, and/or mitigate potential impacts.

4.3.3.2 Operations

During operations, impact-producing factors include the presence and operation of the offshore and onshore components and the operation of the onshore substation. Potential impacts to topography, geology, soils, and groundwater are expected to be minor.

Topography and Geology. As described above, in certain limited areas of the submarine export cable corridor where underwater megaripples and sandwaves are present on the seafloor, pre-sweeping may be necessary prior to cable lay activities to smooth the seafloor by removing ridges and edges, where present. Dredging of seabed sediment will also be required in order to install the submarine export cables in the vicinity of the cable landfall at SBMT. These activities may result in a minor alteration of bathymetry in local areas along the submarine export cable route. It is anticipated that impacts will be short-term in areas subject to pre-sweeping, as underwater currents will facilitate the natural return of pre-construction conditions, whereas dredging will represent a long-term, localized alteration. Additional information on potential operations impacts associated with pre-sweeping, dredging, and disturbance of seabed sediment is provided in Section 4.2.

Following installation of the onshore cables, all trenches will be backfilled and surface grades will be returned to pre-construction conditions to the extent practicable. Due to the nature of the onshore substation site as relatively flat and previously filled land, the Applicant does not anticipate that significant cut or fill, or modification to existing topography or drainage patterns, will be required as part of onshore substation installation. Effects on topography, if any, are anticipated to be minor, and no substantive impacts on geology are expected.

The Applicant will account for the topographical and geological conditions identified in the Project Area during operation of the Project. The submarine export cables will be monitored through Distributed Temperature and Distributed Vibration Sensing equipment. The Distributed Temperature Sensing system will be able to provide real time monitoring of temperature along the submarine export cable route, alerting the Applicant should the temperature change, which often is the result of scouring of material and cable exposure. The Distributed Vibration Sensing system will provide real time vibration monitoring close to the cables indicating potential dredging activities or anchor drag occurring close to the cables. Upon receiving any such alert, the Applicant will assess the cable condition and identify any needed corrective actions.

Soils. Potential impacts to soils are expected to be temporary, short-term, and minor during operations. Potential disturbance of seabed sediment for maintenance dredging, if necessary, along the submarine export cable route in the vicinity of the cable landfall is discussed further in Section 4.2.

Soil disturbance is not anticipated during operations of the Project's onshore infrastructure except during routine maintenance. The onshore substation will be regularly inspected during operations, which may result in routine maintenance activities, such as the replacement of and/or update to electrical components/equipment. The onshore cables will require periodic testing, with readings taken from access chambers, but should not require maintenance except in the case of a fault or damage caused by a third party or unanticipated event. If excavation is required for repairs during operations, disturbance to soils is expected to be minor and short-term, and impacts would be minimized through use of erosion and sediment controls, when needed.

Groundwater. During operations, the onshore substation will contain oils, fuels, and/or lubricants. However, as the equipment will be mounted on foundations with associated secondary oil containment or located within buildings, an inadvertent release of oil at these facilities is not expected to impact the quality of the surrounding groundwater. The Applicant will prepare an SPCC plan detailing spill prevention, control, and mitigation measures to be implemented during onshore operations, which will be provided as part of the Project's EM&CP. In the unlikely event of an impact to groundwater due to an inadvertent spill, that impact is expected to be minor and temporary, and will be addressed immediately.

4.4 Wetlands and Waterbodies

Pursuant to 16 NYCRR § 86.5, this section describes freshwater and tidal wetlands, surface waterbodies, and floodplains identified within and surrounding the Project Area. Potential impacts to wetlands and waterbodies associated with construction and operation within the onshore Project Area, including the upland portion of cable landfall construction activities, are discussed. Impacts to the tidal and marine environments from installation and operation of the submarine export cables are discussed in Section 4.2. This section also describes the Project-specific measures that the Applicant will implement to avoid, minimize, and/or mitigate potential impacts to wetlands and waterbodies. Offshore marine conditions are discussed in Section 4.2, topography, soils and groundwater are discussed in Section 4.3, and fisheries and benthic resources are discussed in Section 4.6.

Wetlands and waterbodies in New York may be protected under federal law, New York State law, or both. The USACE is responsible for assessing permit applications for activities otherwise prohibited by Section 404 of the CWA and Section 10 of the 1899 Rivers and Harbors Act. Under Section 404 of the CWA and Section 10 of the Rivers and Harbors Act, the USACE has regulatory jurisdiction over navigable waters and waters of the United States, including wetlands. Additionally, under Section 401 of the CWA, applicants for a federal license or permit must obtain certification from the state indicating that the permitted activity will not violate the state's water quality standards.

Under Article 24 of the Environmental Conservation Law, commonly referred to as the Freshwater Wetlands Act, New York regulates freshwater wetlands greater than 12.4 ac (5.0 ha) or freshwater wetlands of any size that are of "unusual local importance" (such as those with a documented presence of a threatened or endangered species). New York also regulates the freshwater wetlands adjacent area, defined as the area of land or water that is outside of a wetland and within 100 ft (30 m) of the wetland boundary. NYSDEC is the agency responsible for regulating activities within freshwater wetlands and adjacent areas. NYSDEC assigns freshwater wetlands under its jurisdiction a classification value from 1 (highest) to 4 (lowest), based on characteristics that provide ecological, hydrological, pollution control, and/or other special benefits.

Tidal wetlands in New York State are protected under Article 25 of the Environmental Conservation Law, known as the Tidal Wetlands Act. Under this Act, New York regulates all tidal wetlands and the associated tidal wetlands adjacent areas. There are multiple types of tidal wetlands, including the Littoral Zone, which is defined by 6 NYCRR § 661.4(hh)(4) as "the tidal wetland zone that includes all lands under tidal waters which are not included in any other category. There shall be no [Littoral Zone] under waters deeper than six feet at mean low water.". The tidal wetlands adjacent area is defined as the land adjacent to the wetland boundary to a maximum landward distance of 300 ft (91 m). In New York City, the maximum landward distance is 150 ft (46 m) from the tidal wetland boundary. This maximum landward distance is reduced per section 661.4 of Title 6 of the New York State regulations in the presence of a lawfully and presently existing (i.e. as of August 20, 1977) functional structure greater than 100 ft (30 m) in length (including, but not limited to, paved streets and highways, railroads, bulkheads and sea walls, and rip-rap walls) or where an elevation reaches 10 ft (3 m) above mean sea level (AMSL) (6 NYCRR § 661.4(b)(1)). NYSDEC also regulates activities in tidal wetlands and adjacent areas.

Under Article 15 of the Environmental Conservation Law, New York classifies surface water resources by their best uses (fishing, source of drinking water, etc.; 6 NYCRR Part 701) or as Wild, Scenic and Recreation Rivers (6 NYCRR Part 666). State water quality classifications of freshwater watercourses fall into the following four categories, based on the assigned best uses by NYSDEC:

- Classification AA or A: source of drinking water;

- Classification B: swimming and other contact recreation but not for drinking water;
- Classification C: waters supporting fisheries and suitable for non-contact activities; and
- Classification D: lowest classification/standard.

Freshwater water resources with classifications AA, A, B, and C may also have a standard of (T), indicating that the resource may support a trout population, or (TS), indicating that it may support trout spawning. Special requirements apply to sustain these waters that support these valuable and sensitive fisheries resources. Water quality classifications for tidal waterbodies are discussed in Section 4.2**.**

Temporary or permanent disturbances to the bed or bank of a stream with a classification of AA, A or B, or with a classification of C with a standard of (T) or (TS), requires a Protection of Waters Permit administered by the NYSDEC. Stream banks are defined by NYSDEC as the land area immediately adjacent to, and which slopes toward, the bed of a watercourse, and which is necessary to maintain the integrity of the watercourse. A bank will not be considered to extend more than 50 ft (15 m) horizontally from the mean high-water line, except where a generally uniform slope of 45 degrees (100 percent) or greater adjoins the bed of a watercourse. The bank is then extended to the crest of the slope or the first definable break in slope, either a natural or constructed (road, or railroad grade) feature lying generally parallel to the watercourse.

Development within floodplains in New York State is regulated by local municipalities (e.g. town, city, or village) that participate in the National Flood Insurance Program. All construction proposed within Special Flood Hazard Areas (FHAs) is subject to floodplain development regulations. FHAs are those areas of land that would be covered by the floodwaters of the base flood, also known as the 100-year flood, which is defined as a flood that statistically has a 1% probability of being equaled or exceeded any given year. Additional information on local ordinances, including those associated with floodplain development, and their applicability to the Project is provided in **Exhibit 7: Local Ordinances**.

4.4.1 Wetland and Waterbody Studies and Analysis

Existing wetland and waterbody resources in the vicinity of the Project Area were reviewed using a combination of desktop analysis of publicly available data and targeted field surveys. The following resources were reviewed as part the desktop analysis:

- United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) (USFWS 2019a);
- NYSDEC:
  - Regulatory Freshwater Wetlands (NYSDEC 2002);
  - Tidal Wetlands (NYSDEC 2005); and
  - Water Quality Classifications (NYSDEC 2019a);
- USGS National Hydrography Dataset (NHD) (USGS 2017); and
- FEMA National Flood Hazard Layer (FEMA 2016).

A preliminary reconnaissance of the onshore portion of the Project Area was conducted on December 5, 2018 from publicly accessible areas to evaluate the presence of any mapped or potentially unmapped wetland and waterbody resources. Due to the developed nature of the onshore Project Area, it is not expected that significant changes have occurred since the site visit, and additional field work is not warranted.

4.4.2 Existing Wetlands and Waterbodies

The affected existing environment is defined as the onshore wetlands, waterbodies and adjacent tidal wetland areas that have the potential to be directly or indirectly affected by the construction and operation of the onshore Project components, including the portion upland of cable landfall activities, the onshore cables, and the onshore substation.

4.4.2.1 Wetlands and Waterbodies

Mapped wetlands and waterbodies within one mile of the onshore Project Area, as classified by the NWI and NYSDEC, are displayed on **Figure 4.4-1**. The submarine export cables make landfall from the marine environment of Upper Bay (10-digit Hydrologic Unit Code [HUC 10] 0203010402). Upper Bay, together with Lower Bay (HUC 0203010404), is included in the Sandy Hook/Staten Island Sub-Basin.

The area of Upper Bay adjacent to the onshore Project Area is mapped as tidal wetland, classified by NYSDEC as a Class I estuary water, and it is the only resource on NYSDEC tidal wetlands maps within 1 mi (1.6 km) of the onshore Project facilities (see **Figure 4.4-1**). Areas of Upper Bay crossed by the submarine export cables are mapped as Littoral Zone on NYSDEC tidal wetland maps. A Littoral Zone is defined in 6 NYCRR §661.4 as lands under tidal waters which are not included in any other category, except as otherwise determined in a specific case, with no Littoral Zone under waters deeper than six feet mean low water. Per 6 NYCRR §661.4 "Pending determination by the commissioner in a particular case, the most recent, as of the effective date of this Part, national ocean survey maps published by the national ocean survey, national oceanic and atmospheric administration shall be rebuttable presumptive evidence of such six foot depth."

Based on the most recent Raster Navigational Charts (NOAA 2021a) and Electronic Navigational Charts (NOAA 2021b) from the NOAA Office of Coast Survey, the submarine export cable route within the mapped tidal wetland area is located entirely within areas of water depth greater than 6 ft (1.8 m) at MLLW. At the cable landfall along the shoreline of SBMT, the NOAA Raster Navigational Chart indicates the bathymetry is between the 12-ft (3.7-m) and 18-ft (5.5-m) contours. This is consistent with the Applicant's data, which suggests that water depth at landfall is approximately 17 ft (5.2 m) at MLLW. Since the water depth is greater than 6 ft (1.8 m) on NOAA charts, in accordance with 6 NYCRR §661.4, the presumption is that the area mapped as Littoral Zone does not fall under the protection of the Tidal Wetlands Act[4].

Upper Bay is classified by the NWI as E1UBLx, which indicates an estuarine subtidal system with an unconsolidated bottom, subtidal water regime, and an excavated basin or channel. Additional information regarding Upper Bay, including potential impacts from installation of the submarine export cables, is included in Section 4.2. Additional mapping of waterbodies along the submarine export cable route is provided in **Figure 4.2-4**.

The cable landfall location is mainly comprised of industrial properties behind a bulkheaded bank of the Upper Bay. Historic aerial imagery demonstrates that the bulkheads associated with SBMT are fully contiguous, in excess of 100 feet in length, and have been in place and functional since prior to the 1960s (Aerial Archives 2020a, 2020b). If any regulated tidal wetland were present, the Applicant has determined that any adjacent area associated with the Upper Bay would be truncated along the banks at the seaward edge of all existing structures (i.e. bulkheads and riprap) pursuant to 6 NYCRR § 661.4; however, as stated above, there is a presumption that Upper Bay is not tidal wetland at this location.

[4] Based on NOAA tidal data, MLLW is 0.2 feet below mean low water in the vicinity of the onshore Project Area (NOAA, 2021c)

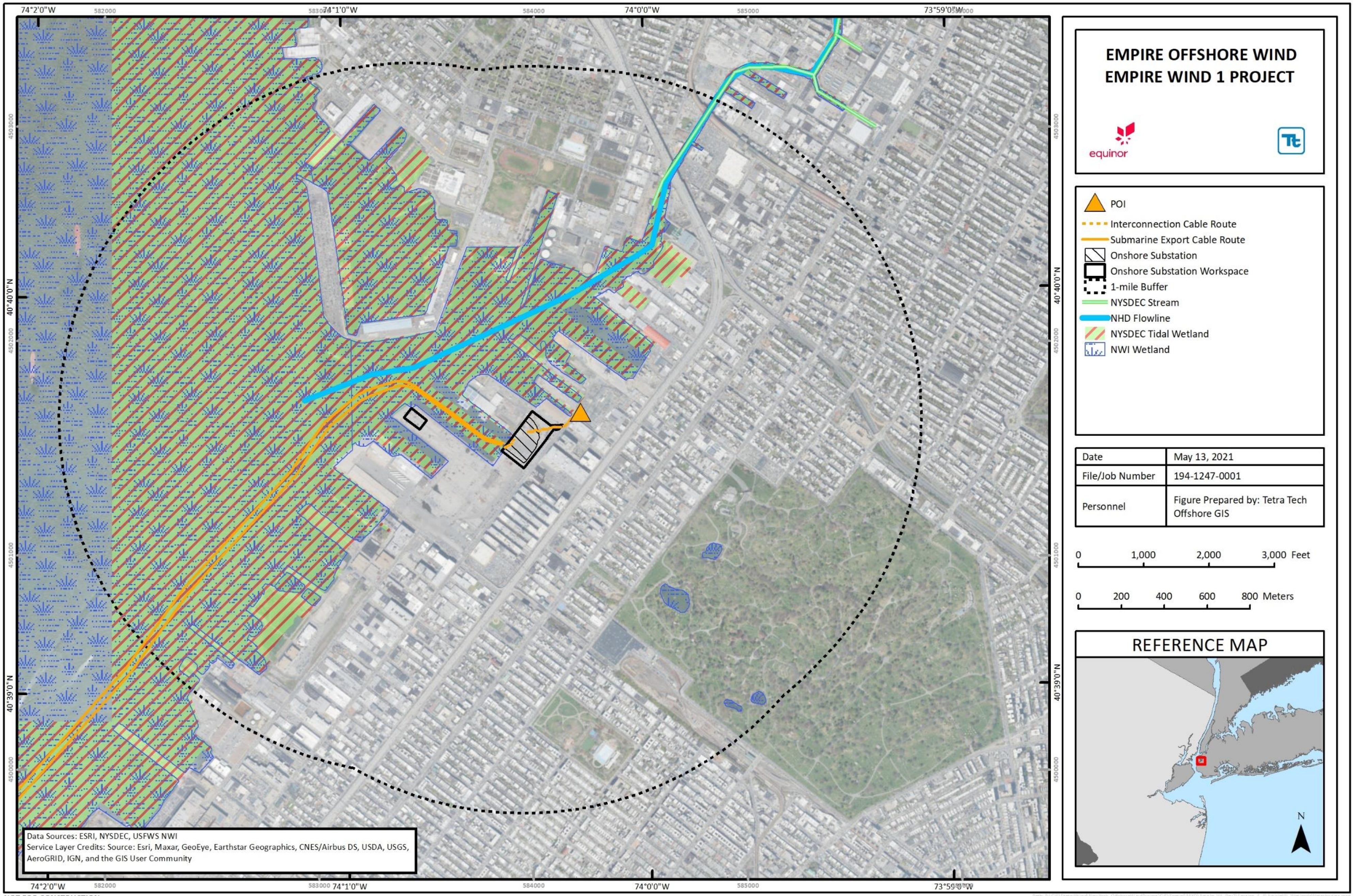


Figure 4.4-1 NWI, NHD and NYSDEC Mapped Wetlands and Waterbodies within one mile of the onshore Project Area

The onshore Project Area is situated above the bank of the Upper Bay and does not contain any mapped tidal or freshwater wetlands or waterbodies. Other than Upper Bay, the nearest mapped wetland or waterbody features are within Greenwood Cemetery, approximately 0.6 mi (0.9 km) to the southeast of the onshore cable corridor, and therefore will not be affected by the Project.

Based on a desktop analysis and observations made during the preliminary site reconnaissance, field delineations are not required for the onshore Project Area, due the developed nature of the area and lack of wetland and waterbody resources identified within the Project Area.

4.4.2.2 Floodplains

FEMA data indicates that portions of the Project are situated within Special FHAs associated with Upper New York Bay. Special FHAs within one mile of the onshore Project Area per the effective 2007 FEMA flood insurance rate maps (FIRMs) include the following:

- Zone AE, which is subject to inundation by the 1-percent-annual-chance flood event but not subject to high velocity wave action. Zone AE is considered a high-risk flooding area.
- Zone VE, which is a coastal area subject to inundation by the 1-percent-annual-chance flood event and which is subject to high velocity wave action. Zone VE is considered a high-risk flooding area.
- Zone X (shaded) is a moderate FHA between the limits of the base (1-percent annual chance or 100-year) flood and the 0.2-percent-annual-chance (or 500-year) flood.
- FEMA Zone X (unshaded) is outside or above the elevation of the 0.2-percent-annual-chance flood.

The onshore Project Area contains Zone AE and Zone X (shaded) as detailed in **Table 4.4-1** and depicted in **Figure 4.4-2**, per the effective 2007 FEMA FIRMs. The majority of the onshore substation is located in Zone AE (the 1-percent-annual-chance floodplain) (FEMA 2016). FEMA's 2015 preliminary FIRMs[5] additionally identify a portion of the 4.8-ac (1.9-ha) onshore substation as within the Coastal A Zone (Coastal A Zone was not mapped prior to the 2015 preliminary FIRMs). Coastal A Zone is the portion of Zone A where wave heights are expected to be between 1.5 ft (0.5 m) and 3 ft (0.9 m) high.

As depicted in **Figure 4.4-2**, Zone VE is additionally present along nearshore portions of the submarine export cable route. The 2015 preliminary FIRMs show the area of Zone VE additionally encompassing the 1.2-ac (0.5-ha) onshore temporary laydown area for the onshore substation.

Table 4.4-1 FEMA-Mapped Zone AE and Zone X (Shaded) within the Project Area

Route Feature	FEMA Flood Zone	Area (ac)
Onshore Substation	AE (1% Annual Chance Flood Hazard)	8.46
	X (shaded) (0.2% Annual Chance Flood Hazard)	0.55
	Total	**9.0**
Onshore Cable Route	AE (1% Annual Chance Flood Hazard)	0.41
	Total	**0.41**

[5] On October 17, 2016, New York City won an appeal of FEMA's 2015 preliminary FIRMs (City of New York 2015a); additional FEMA flood mapping updates are pending.

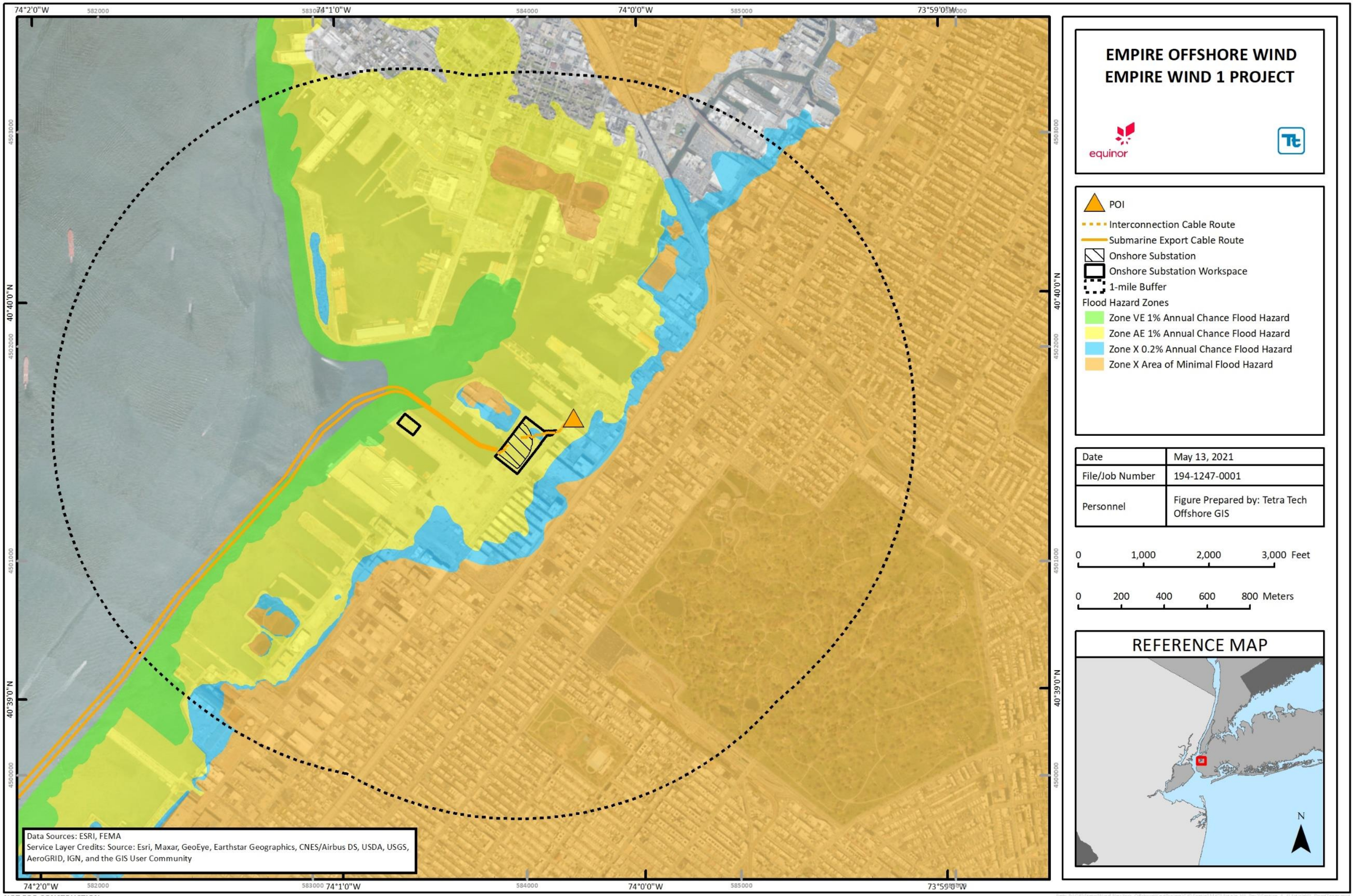


Figure 4.4-2 Mapped Floodplains within one mile of the onshore Project Area

4.4.3 Potential Wetland and Waterbody Impacts and Proposed Mitigation

Because the onshore portion of the Project is located within a highly developed area that lacks sensitive wetland and waterbody habitats, impacts to these resources as a result of the Project's onshore construction and operation will be short-term and minor to negligible. Construction and operations impacts, avoidance, minimization and mitigation measures for in-water work within Upper Bay are discussed in Sections 4.2 and 4.6.

4.4.3.1 Construction

During the construction of onshore facilities, the potential impact-producing factors to wetlands, waterbodies, regulated adjacent areas, and floodplains may include:

- Construction activities for installation of the onshore cable system (including open cut trenching and trenchless installation techniques); and
- Construction of the new onshore substation.

Construction of the onshore Project infrastructure will be located outside of freshwater and tidal wetlands, waterbodies, and adjacent areas, and therefore will not result in direct impacts to these resources. The following potential impacts may occur as a consequence of the impact-producing factors identified above:

- Short-term, minor impacts associated with direct disturbance to special FHAs due to construction activities;
- Short-term, negligible impacts associated with water use during Project construction;
- Short-term, minor impacts associated with accidental releases from construction vehicles or equipment;
- Short-term, minor impacts associated with the possibility of the inadvertent return of drilling fluids during HDD activities, if used;
- Short-term, minor impacts associated with erosion into adjacent surface waters of Upper Bay; and
- Short-term, minor impacts associated with dewatering discharges.

Disturbance to special FHAs due to construction activities. The onshore substation will include concrete foundations, pilings, gravel lots, fencing, and associated structures that will be located in special FHAs AE and X. Additionally, a portion of the temporary construction laydown area is located in Zone VE, based on the 2015 preliminary FIRMs. Impacts will include short-term disturbance to land during construction activities, temporary placement of equipment and materials within special FHAs, and temporary presence of structures and obstructions. Impacts will be minor, and the Applicant will minimize and mitigate these impacts by implementing the following measures:

- The siting of onshore components in previously disturbed areas, existing roadways and road ROWs to the extent practicable; and
- Implementation of a soil erosion and sediment control plan for work in special FHAs that satisfies the requirements detailed in the New York State Standards and Specifications for Erosion and Sediment Control (Blue Book).

Water use during Project construction. Temporary water use will be required for certain activities during construction of the Project. Water use could result in impacts to water resources if water volumes used resulted in a decrease in quality or quantity of existing water resources in the area. Water may be required to suppress dust during dry conditions as part of the Fugitive Dust Control Plan, which will be provided in the EM&CP.

Water also will be used during HDD activities, if required, to cross currently unidentified utilities. In the event an HDD is proposed, water will be used to produce the bentonite-based drilling fluid used to lubricate the drill bit during execution of the HDD. Drilling fluids used during HDD construction will be recirculated and recycled to the extent practicable, minimizing the required water use.

The Applicant intends to use commercial water trucks for water supply for both HDD and dust suppression uses, and therefore does not anticipate impacts from withdrawing water from streams or other surface waters. Indirect impacts to water quality or quantity of surface waters from runoff of water used for construction will be negligible. Excess drilling fluid and drill cuttings will be captured for disposal, recycling or beneficial use in accordance with applicable regulations.

Potential for accidental releases from construction vehicles or equipment. Although very unlikely, contaminants from accidental releases from onshore construction vehicles or equipment could reach adjacent areas of Upper Bay indirectly via stormwater runoff. The Applicant proposes to implement the following measures to avoid, minimize, and mitigate impacts during construction:

- Prevention and management of accidental spills or releases of oils or other petroleum products will be managed through the development and implementation of an SPCC plan, which will be incorporated into the EM&CP;
- Implementation of a soil erosion and sediment control plan that satisfies the requirements detailed in the New York State Standards and Specifications for Erosion and Sediment Control (Blue Book); and
- During construction, access will be restricted to existing paved roads and approved access roads.

Potential for inadvertent return of drilling fluids during HDD. HDD technology may be implemented if currently unknown utility or infrastructure assets are identified along the onshore cable route. In the event that HDD is necessary, inadvertent returns of drilling fluids have the potential to escape to the surface. Because HDD technology would only be used for onshore cable installation and there are no wetlands or waterbodies located along the onshore cable route, it is expected that inadvertent returns, if they occurred, would be limited to upland areas. Therefore, it is unlikely that an inadvertent return would result in any impact to surface waters. If HDD installation is proposed as part of the final design, the Applicant will develop and implement an Inadvertent Return Plan to avoid, minimize, and/or mitigate potential impacts.

Potential for erosion from construction activities into adjacent surface waters. Excavation, soil stockpile, grading, and dewatering associated with the installation of the onshore cables, the onshore substation, and supporting infrastructure may increase the potential for erosion and sedimentation to down gradient areas. The down gradient surface water resource for onshore Project facilities consists of tidal waters of Upper New York Bay (discussed further in Section 4.2). In order to avoid, minimize, and mitigate impacts from potential erosion, the Applicant will implement a soil erosion and sediment control plan that satisfies the requirements detailed in the New York State Standards and Specifications for Erosion and Sediment Control (Blue Book) for the cable landfall, onshore substation, and onshore cable installation. A SWPPP will be further detailed in the Applicant's EM&CP.

The Applicant will evaluate the suitability of excavated soils to be reused onsite, and if soil reuse is not possible, excess soils will be disposed of at a licensed facility. If unanticipated contamination is encountered during construction, it will be addressed in accordance with soil management plans to be provided in the EM&CP or in accordance with an approved remedial action plan, if applicable. Following installation, areas temporarily disturbed for installation of the cables and onshore substation will be backfilled, stabilized, and restored to pre-construction conditions to the extent practicable.

Impacts associated with dewatering discharges. Excavation associated with installation of the onshore cables, the onshore substation, and supporting infrastructure could require short-term dewatering. Water discharged from dewatering excavations during construction could carry sediment and/or other contaminants if the excavation occurs in areas with existing contamination. Dewatering discharges for the Project may be to an existing sewer or to a surface waterbody, and as necessary, will be conducted in accordance with the appropriate SPDES permit and/or New York City dewatering requirements.

Final engineering design will determine if groundwater will need to be managed during excavation activities for the Project's onshore facilities. As designs for the onshore cable corridor and the associated onshore substation develop, the Applicant will determine through site-specific tests pits whether groundwater is expected to be encountered during construction activities. The Applicant will test groundwater in areas of known contamination where excavation will occur to determine if treatment may be necessary prior to discharge in order to comply with the applicable authorization (e.g., SPDES or discharge to sewer). If dewatering is expected to occur, the Applicant will develop a site-specific dewatering plan to protect groundwater and nearby surface water resources, in accordance with the New York State Standards and Specifications for Erosion and Sediment Control (Blue Book), and a Project-specific SWPPP, which will be provided as part of the Project's EM&CP. The Applicant's plans will incorporate dewatering controls as appropriate (such as filter bags, dewatering structures and other practices) to minimize soil erosion and sedimentation downstream of dewatering discharge.

4.4.3.2 Operations and Maintenance

The potential impact-producing factors to wetlands, waterbodies, regulated adjacent areas, and floodplains during operations may include the long-term presence of new onshore infrastructure and the operation of the permanent onshore substation. Additional information on potential operations impacts to tidal waterbodies associated with operation of the Project's submarine export cables is provided in Section 4.2. During onshore operations, no new impacts to wetlands or waterbodies are anticipated, as Project-related operations are expected to use permitted access roads and entry points.

Soil disturbance is not anticipated during operation of the Project's onshore infrastructure, except in the case that maintenance or repair activities are required. If excavation is required for maintenance or repairs during operations, soil disturbance is expected to be minor and short-term. The Applicant will use erosion and sediment controls, when needed, and will implement impact avoidance, minimization, and mitigation strategies similar to those detailed in Section 4.4.3.1 on a case-by-case basis and as defined through the regulatory process. Onshore temporary workspaces used during maintenance activities will be restored to pre-construction conditions and stabilized following disturbances, to the extent practicable.

The impact-producing factors may cause the following potential direct and indirect impacts to wetlands, waterbodies, regulated adjacent areas, and floodplains during operations:

- Long-term, minor impacts from the presence of the aboveground facilities, including the onshore substation, within special FHAs;
- Short-term, minor impacts from erosion, sedimentation and runoff to off-site surface waters (Upper New York Bay) during Project operations; and
- Short-term, minor impacts associated with accidental releases from vehicles or equipment.

Presence of the aboveground facilities, including the onshore substation, within special FHAs. The onshore substation, its associated components, and the cable landfall at SBMT will include concrete foundations, gravel lots, fencing, and structures in special FHAs AE and X. Changes in elevations and grades, as well as the placement of structures have the potential to impact flood flows and flood storage; however, these impacts will be minor and mitigated through appropriate facility design. The Applicant will avoid, minimize, and mitigate impacts due to the long-term presence of aboveground facilities within special FHAs by implementing the following measures:

- Onshore components will be sited in previously disturbed areas, existing roadways, and/or ROWs to the extent practicable;
- The design of the facilities will address NYSDEC requirements governing construction within mapped floodplains, including locating aboveground structures at base flood elevation plus two feet; and
- The design of the facilities will address New York City flood-resistant construction standards.

Additional discussion of sea level rise is provided in Section 4.2.

Erosion, sedimentation and runoff to off-site surface waters (Upper Bay) during Project operations. Following onshore substation construction and installation of the onshore cables, trenches and excavations will be backfilled and stabilized. In areas temporarily used for construction, surface grades will be returned to pre-construction conditions to the extent practicable. However, changes in elevations and grades, impervious surfaces, and placement of structures for the onshore substation, cable landfall, and associated aboveground components could affect post-construction stormwater runoff from the Project Area.

As the onshore substation site is relatively flat and on previously filled land, the Applicant does not anticipate significant cut or fill, or modification to the existing topography or drainage patterns. Stormwater management and sediment control features for the onshore substation and its associated components, if necessary, will be designed to minimize offsite impacts from soil erosion and stormwater offsite during operations. Stormwater control features will be routinely inspected and cleaned to remove debris or excess vegetation that may impede its functionality. The inspection schedule for stormwater controls will be detailed in the SWPPP and/or SPCC, to be provided as part of the Project's EM&CP.

Potential for accidental releases from construction vehicles or equipment. During operations, the onshore substation will contain oils, fuels, and/or lubricants. However, the equipment will be mounted on foundations with associated secondary oil containment or located within buildings, so that an inadvertent release of oil at the facility is not expected to reach adjacent areas of Upper Bay or impact the quality of surrounding surface waters. The Applicant will prepare an SPCC plan, which will be provided as part of the Project's EM&CP, detailing spill prevention, control, and mitigation measures to be implemented during onshore operations.

4.5 Terrestrial Vegetation and Wildlife

This section describes the terrestrial vegetation and wildlife resources that have been observed, or have the potential to occur, in the vicinity of the Project Area. Potential impacts to terrestrial vegetation and wildlife resources associated with construction and operation within the onshore Project Area landward of cable landfall are discussed. This section also describes the Project-specific measures that the Applicant will implement to avoid, minimize, and/or mitigate potential impacts to terrestrial vegetation and wildlife. This section addresses the requirements of 16 NYCRR § 86.5 relative to impacts to terrestrial plant life and wildlife, protection of natural vegetation, protection of adjacent resources, and the use of pesticides and herbicides. Protected plant and animal species and significant natural communities are discussed in detail in Section 4.7.

4.5.1 Terrestrial Vegetation and Wildlife Studies and Analysis

In order to determine the baseline terrestrial vegetation and wildlife conditions, a desktop review of the onshore cable routes and the onshore substation site was conducted, using the following resources:

- 2016 National Land Cover Dataset (NLCD): Land Cover Conterminous United States (Dewitz 2019);
- Google Earth Historical Aerial Imagery, 1994 – 2018. Brooklyn, New York; and
- USFWS Information for Planning and Consultation (IPaC) (USFWS 2018a).

In January 2019, a formal inquiry was submitted to the NYSDEC Division of Fish and Wildlife to review the state Natural Heritage Program database and determine whether state and/or federally protected wildlife species may potentially be present in or within the immediate vicinity of the Project Area. Updated inquiry letters were submitted to the NYSDEC in June 2019 and April 2021. Official Species Lists were also obtained from the USFWS Information for Planning and Consultation (IPaC) project planning tool to identify threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may be present within the onshore portion of the Project Area. The responses from these requests have been incorporated into the analysis in this section and in Section 4.7. Relevant agency correspondence is provided in **Appendix A Agency Outreach and Correspondence.**

A field reconnaissance of terrestrial vegetation and wildlife habitat was conducted on December 5, 2018 from publicly accessible locations as part of a preliminary assessment of the onshore Project Area. Due to the developed nature of the onshore Project Area, it is not expected that significant changes have occurred since the site visit, and additional field work is not warranted.

4.5.2 Existing Terrestrial Vegetation and Wildlife

The affected environment described in this section is defined as the onshore Project Area that has the potential to be directly affected by the construction and operation of the onshore Project components, including the upland portion of cable landfall activities, the onshore cables, and the onshore substation.

4.5.2.1 Terrestrial Vegetation

The onshore portions of the Project will be located within the urbanized landscape of New York City. Vegetation is almost entirely absent in the area proposed for disturbance. The submarine export cables will make landfall at SBMT, a paved commercial shipping terminal largely devoid of vegetation. From there, the onshore export cables will extend to the onshore substation to be located on a portion of the SBMT that currently consists of a paved lot. This area is devoid of any vegetation and already contains electrical transmission infrastructure. The 2016 NLCD indicates the SBMT parcel is primarily situated within developed lands of variable development intensity (see **Figure 4.5-1**; Dewitz 2019). The interconnection cables will extend from the onshore substation northeast across SBMT and continue within an existing public roadway (2nd Avenue) to the POI. NLCD cover classifications for the onshore components of the Project are available in **Table 4.5-1**.

Table 4.5-1 2016 NLCD Land Use for the Onshore Project Area

Route Feature	NLCD Cover Class (2016)	Area (Acres)	Percent of Total
Onshore Substation a/	Developed, High Intensity	8.87	98%
	Developed, Medium Intensity	0.13	2%
	Total	**9.0**	**100%**
Onshore Interconnection Cable Corridor	Developed, High Intensity	0.38	93%
	Grassland/Herbaceous b/	0.03	7%
	Total	**0.4**	**100%**

Notes:
a/ this includes the EW 1 onshore export cables, cable landfall and onshore interconnection cables located on the SBMT parcel
b/ based on aerial photography and pedestrian reconnaissance, grassland/herbaceous vegetation is absent

Invasive plant species commonly associated with disturbed and urban areas occur throughout terrestrial regions in the vicinity of the Project. For example, during the site reconnaissance, common reed (*Phragmites australis*), tree-of-heaven (*Ailanthus altissima*), Norway maple (*Acer platanoides*). And mugwort (*Artemesia vulgaris*) were observed within the limited undeveloped land in areas of Brooklyn surrounding the Project Area and common reed has been noted in other areas of the SBMT site. However, due to the high level of urban development, impervious surfaces and lack of vegetated areas, minimal vegetation of any kind (native or invasive) is present within the Project Area.

4.5.2.2 Terrestrial Wildlife

As the onshore components of the Project will be located within an urban landscape that is predominantly devoid of vegetation, it is expected that wildlife is limited to scavengers and other species that are adapted to living in association with human disturbance and noise: such as gulls, pigeons, and rodents. Other seabird species and migratory birds (see Section 4.7) may occur along the route; however, due to the lack of natural habitat, these species are not expected to occur at high densities or be dependent on habitats in the Project Area.

4.5.3 Potential Terrestrial Vegetation and Wildlife Impacts and Proposed Mitigation

Because the onshore portion of the Project is located within a highly developed area that predominantly lacks vegetation, impacts to terrestrial vegetation and wildlife as a result of the Project's onshore construction and operation are anticipated to be negligible.

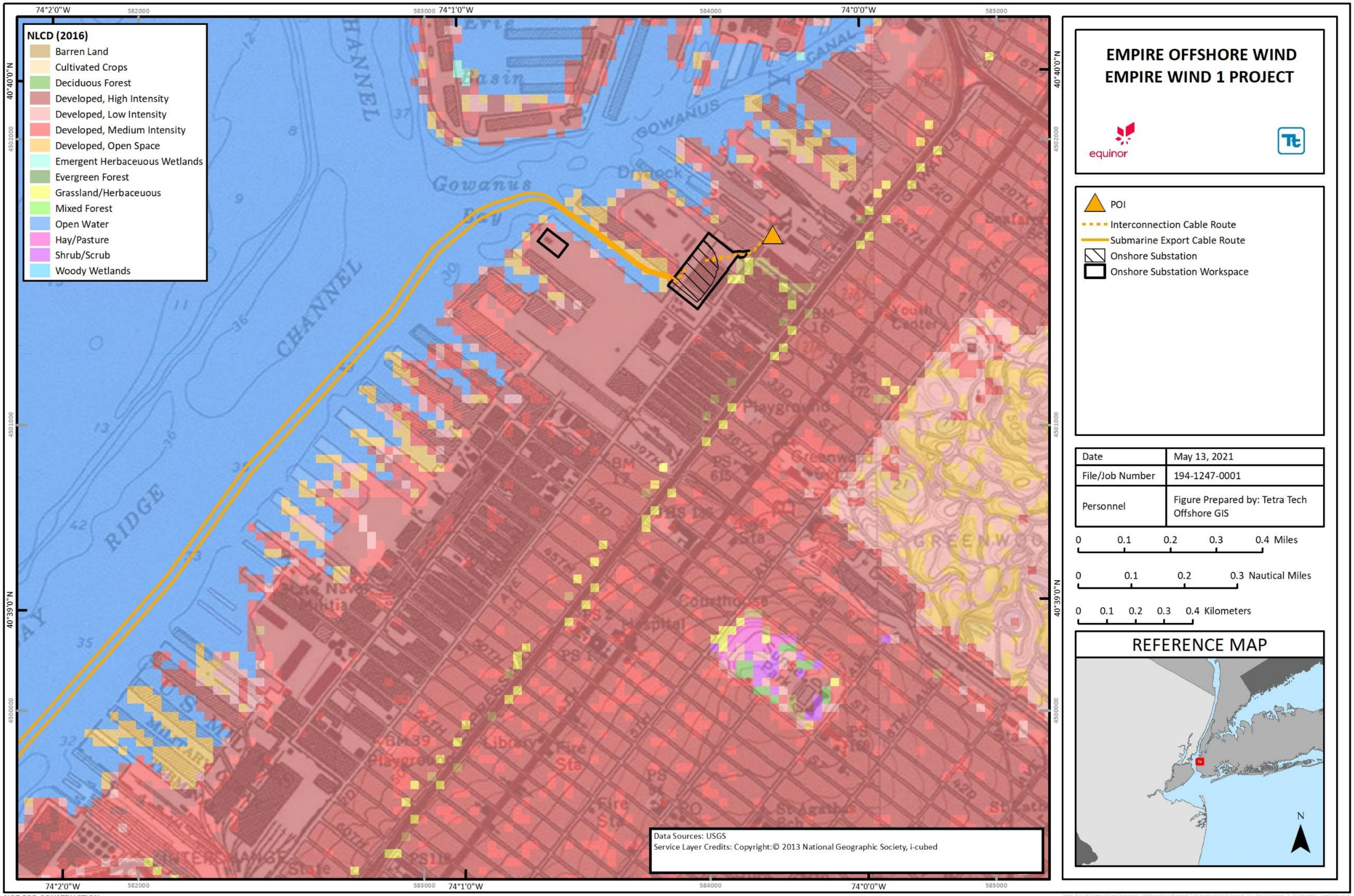


Figure 4.5-1 Land Cover in the Vicinity of the Project

4.5.3.1 Construction

During construction, the potential impact-producing factors to terrestrial vegetation and wildlife resources may include:

- Construction/installation of cable landfall and onshore cable systems, including open cut and trenchless installation techniques; and
- Construction of the new onshore substation.

Considering the high level of development and minimal habitat within the onshore areas of the Project, construction-related impacts to terrestrial vegetation and wildlife are expected to be negligible. The onshore Project Area is nearly devoid of vegetation and likely does not support wildlife, with the exception of disturbance-tolerant wildlife species typical of human-influenced landscapes. These wildlife species may be temporarily displaced from the construction area by noise and construction activities, but they are expected to return once construction and restoration are completed. Project construction is not expected to cause long-term impacts to terrestrial vegetation, wildlife, or wildlife habitats.

To avoid or minimize impacts to vegetation and wildlife habitat, the Applicant proposes to site onshore components in previously disturbed areas, existing roadways, and/or ROWs to the extent practicable. The onshore construction ROW width and temporary laydown will be minimized to what is necessary to safely construct the Project. During construction, the Applicant will implement the following measures to further minimize impacts:

- Protection of soil through the implementation of a soil erosion and sediment control plan that satisfies the requirements detailed in the New York State Standards and Specifications for Erosion and Sediment Control (Blue Book) (NYSDEC 2016a), including development of a SWPPP; and
- Management of accidental spills or releases of oils or other petroleum products through an SPCC Plan.

4.5.3.2 Operations

No new impacts to terrestrial vegetation and wildlife habitats are anticipated during operations. Project-related activities are expected to use permitted access roads and entry points, and temporary workspaces utilized during construction will be restored to pre-construction conditions to the extent practicable. Permanent aboveground structures associated with the onshore substation will remain on-site throughout the lifetime of the Project. Stormwater management and sediment control features will be installed during Project construction if required. Accidental releases or spills of oils or other petroleum products will be avoided, minimized, or mitigated to the extent practicable, through the development and implementation of an SPCC plan for operations.

When onshore cable inspection or repairs require excavation or other ground disturbance, the Applicant will implement mitigation strategies similar to those detailed in Section 4.5.3.1 for construction, on a case-by-case basis, and as defined through the regulatory process.

Due to the urbanized nature of the onshore cable routes, as well as the onshore substation site, routine vegetation management to maintain the ROW during operations is not expected to be required. Therefore, the Applicant does not anticipate regular use of herbicides or pesticides as part of maintenance activities. If required, minimal handheld herbicide application, consistent with manufacturer's recommendations, may be conducted. An Operations and Maintenance (O&M) Plan will be developed and finalized by the Applicant prior to the commencement of construction.

4.6 Fisheries and Benthic Resources

This section describes the benthic and pelagic habitats and species known or expected to be present in the Project Area, species that may transit through, or occur incidentally in the Project Area, and the commercial and recreational fishing resources within the Project Area. Potential impacts to fisheries and benthic resources resulting from construction, operation, and maintenance of the Project are discussed. This section also describes Project-specific measures adopted by the Applicant to avoid, minimize, and/or mitigate potential impacts. This section addresses requirements of 16 NYCRR § 86.5 relative to benthic and pelagic habitats, species, and fisheries. Marine physical and chemical conditions are described in Section 4.2, including results of sediment transport modeling, and protected species are further described in Section 4.7.

Federally managed fisheries resources are managed under the Magnuson-Stevens Fisheries Conservation and Management Act (MSFCMA; 16 U.S.C. §§ 1801 *et seq*.) through eight Regional Fishery Management Councils (FMCs) that develop species-specific Fisheries Management Plans (FMPs). These FMPs establish fishing quotas, seasons, and closure areas, as well as protecting Essential Fish Habitat (EFH). The designation of EFH extends into New York State waters, where applicable, for specific life stages of managed species. The Regional FMCs work in conjunction with NOAA Fisheries to assess and predict the status of fish stocks, set catch limits, promote compliance with fisheries regulations, and reduce bycatch. Congress amended the MSFCMA by enacting the Modernizing Recreational Fisheries Management Act of 2018 (S. 1520, "Modern Fish Act") to expand recreational fishing opportunities through enhanced marine fishery conservation and management. The Modern Fish Act recognizes differences between recreational and commercial fishing and directs management agencies to adopt management approaches suitable to each sector.

Within the Project Area, commercial and recreational fisheries are further managed by state regulatory agencies under various ocean management plans, developed either at the state level or at the regional level, such as by the Mid-Atlantic Fisheries Management Council (MAFMC). The NYSDEC's Division of Marine Resources administers all laws relating to marine fisheries and is responsible for the development and enforcement of regulations pertaining to marine fish and fisheries in New York State waters.

The NYSDEC also works in cooperation with adjoining states and federal agencies concerning marine fisheries regulations through the Atlantic States Marine Fisheries Commission (ASMFC), a deliberative body with representatives from each of the Atlantic coastal states that coordinates the conservation and management of nearshore fish species. In addition, federal, state, or local agency activities that may affect New York's coastal zone, including fish habitat, are evaluated for consistency with New York's Coastal Zone Management program and Local Waterfront Revitalization Programs (**Appendix C Coastal Zone Management Consistency Statement**).

The New York Ocean Action Plan 2017-2027 (NYSDEC 2016b) serves as the blueprint for protection and sustainable management of the state's ocean resources. The plan has four interconnected goals: (1) ensure the ecological integrity of the ocean ecosystem, (2) promote economic growth, coastal development, and human use of the ocean in a manner that is sustainable and consistent with maintaining ecosystem integrity, (3) increase resilience of ocean resources to impacts associated with climate change, and (4) empower the public to actively participate in decision-making and ocean stewardship. The NYSDEC and New York State Department of State (NYSDOS) coordinate the implementation of the Ocean Action Plan.

4.6.1 Existing Fisheries and Benthic Studies and Analysis

To support the characterization of fish and invertebrate resources, the Applicant conducted extensive site-specific surveys, compiled data from publicly available databases (e.g., NOAA Fisheries 2018a [EFH Mapper];

Northeast Regional Ocean Council 2018; Mid-Atlantic Regional Ocean Council 2019; NYSDOS 2020), regional surveys, and resource reports (e.g., NEFMC 2017; NOAA Fisheries 2017a; MAFMC 2016, 2017), and incorporated relevant peer-reviewed literature.

The Applicant conducted geophysical and geotechnical surveys as described in Section 4.2.1. Project-specific geophysical survey data (multibeam echo sounder and side-scan sonar) were used to support the characterization of seabed conditions. Sediment grab samples were analyzed for grain size distribution, total organic carbon, and benthic infauna (identified and classified according to the Coastal and Marine Ecological Classification Standard [FGDC 2012]). Digital imagery was reviewed to aid in identification of key habitat types, macroinvertebrates, and fish.

The Applicant contracted Inspire, LLC to do benthic sampling along the proposed cable corridor in Spring 2019. Sediment profile imagery (SPI) was used to characterize benthic habitats. The interpretation of benthic substrate indicated by backscatter was well correlated with SPI results. Grain size distribution was analyzed in two sediment grab samples to ground-truth the SPI results; no infauna or epifauna were sampled. Survey results are summarized in this section and the survey report is provided in **Appendix E Benthic Resource Characterization Reports**; digital imagery is available upon request.

The Applicant also contracted Alpine Ocean Seismic Survey Inc (Alpine) to conduct benthic sampling along the proposed submarine export cable siting corridor in 2020 and 2021, to ground-truth results of HRG and geotechnical survey conducted previously and to supplement the surveys conducted in 2019 in areas where the EW 1 submarine export cable route has been subsequently modified. The 2020 and 2021 benthic surveys were conducted on the *RV Shearwater* and included physical characterization of grab samples, identification and enumeration of infaunal organisms, towed video, time-lapse still camera images from bottom habitats, and measurement of water quality parameters.

The Applicant augmented the Project-specific HRG and benthic surveys with NorthEast Area Monitoring and Assessment Program Nearshore Trawl Survey (summarized in NYSERDA 2017a) and other reports and publications (as cited in this Exhibit) to characterize the distribution and relative abundance of fish and invertebrates in the Project Area. Results of the Applicant's benthic surveys were evaluated in combination with data collected by others in the vicinity, including USGS sediment data, grab samples with infauna, FMPs (MAFMC 2017; NEFMC 2017; ASMFC 2015; 2018a,b; 2019a,b; 2020; 2021), and regional analyses of species assemblages (e.g., Walsh et al. 2015; Hare et al. 2016; Selden et al. 2018). The Applicant reviewed available fisheries, fish habitat, and non-fisheries datasets, surveys, and reports to identify key species and life stages of fish and invertebrates potentially occurring in the Project Area. Data sources included federal and state fisheries agencies (NOAA Fisheries, New England Fishery Management Council [NEFMC], MAFMC, ASMFC, NYSDEC, and others), BOEM field studies and expert reviews, reports from commercial and recreational fishing representatives, as well as the NOAA Fisheries EFH Mapper tool and source documents.

In addition, the commercial and recreational fishing community provided site-specific information to the Applicant during numerous engagement events, as outlined in **Appendix A**. The Applicant retained in-house Fisheries Liaison Officers, who conducted extensive pre-survey outreach to area fishing interests, including mass e-mail updates, phone calls, and dock visits. In addition, Onboard Fisheries Liaison Representatives selected from a pool of commercial fishermen were present on vessels conducting geophysical surveys on behalf of the Applicant for offshore wind-related activities. On survey vessels, Onboard Fisheries Liaison Representatives provided information on seabed characteristics and fishing grounds, based on their experience and subject to confidentiality of fishermen's operations. This information helped the Applicant assess, together with other data collected, the relative levels of interaction between fishermen and surveyed areas. The Applicant has also prepared a Fisheries Communications Plan for ongoing coordination, which is included in the Public Involvement Plan (**Appendix D Public Involvement Plan**).

4.6.2 Existing Fisheries and Benthic Resources

This section describes the existing benthic and pelagic habitats, benthic communities, and finfish and shellfish species known or expected to occur within the Project Area, as well as the commercial and recreational fishing resources within the Project Area. The affected environment includes the coastal and offshore areas along the submarine export cable route within 3 nm of the shoreline in New York State, where softbottom and hardbottom benthic habitat, pelagic habitat, plankton, benthic infauna and epifauna, or managed fish and macroinvertebrates could be directly or indirectly affected by the construction, operation, or maintenance of the Project.

4.6.2.1 Benthic and Pelagic Habitats

The Project Area lies near the border between Southern New England and the Mid-Atlantic Bight, with the Hudson Canyon as the nominal boundary between the two ecoregions (Cook and Auster 2007). The submarine export cable route is geographically within Southern New England; ecologically, however, the geographic distinction has little meaning because dominant species assemblages from both ecoregions are resident in or transient through the Project Area. With sea temperatures increasing, historically southern species are moving north, further blurring the ecoregion boundary (Hare et al. 2016). While site-specific data are given the greatest weight in this section, recent regional reports of conditions in Southern New England and the Mid-Atlantic Bight are considered representative of the Project Area, as appropriate.

During the Spring 2019 benthic surveys, the Applicant investigated 14 locations along the Project's submarine export cable corridor (**Figure 4.6-1**). **Appendix E** provides the Benthic Resource Characterization Reports. Data for portions of the Project's submarine export cable corridor covered by 2020 and 2021 benthic survey activities are pending and will be provided when available. Additional benthic target locations were assessed during the 2020 and 2021 benthic surveys. A team of marine ecologists, marine geologists, and geographic information system spatial analysts evaluated existing acoustic data to select benthic targets, which were purposefully biased toward expected complex habitats identified in the HRG data and areas of high heterogeneity. Benthic sample locations were selected to ground-truth acoustic data, fill spatial gaps, or further investigate complex habitat. Areas of substrate heterogeneity and transition zones were also targeted to more fully represent the range of benthic habitats in the survey area.

At each sample location, SPI/plan view imagery was reviewed in real time to identify sensitive, rare, or unexpected species (including nonindigenous species) and note any hardbottom habitat requiring additional imagery. Preliminary results are summarized below. Most sample locations were dominated by mobile sands; sand ripples were visible across the survey area. Gravels were distributed unevenly. No soft coral, lobster, seagrass, or squid eggs were observed during the survey.

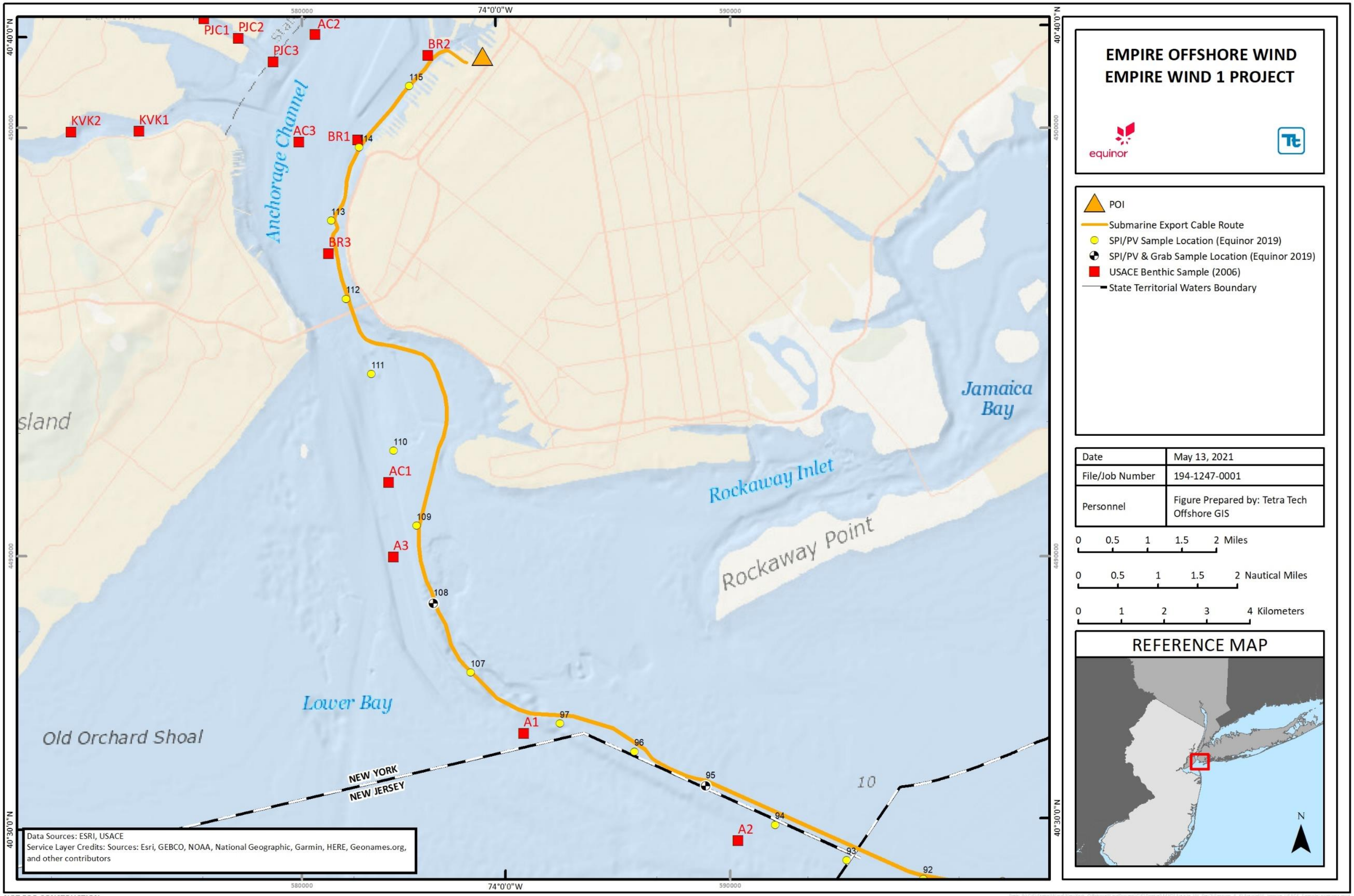


Figure 4.6-1 2019 Benthic Sample Locations (Empire 2019 and USACE NYD 2006)

The USACE New York District also surveyed portions of the New York Harbor in 2005 as part of a pre-dredging baseline characterization. Most of the samples were collected from within or adjacent to the Ambrose Channel, the main vessel route in the Lower Bay, which had not been dredged for 22 years; these samples were mostly sand and fine sand. (USACE NYD 2006). The USACE also collected sediment samples from the Bay Ridge Channel, which overlaps with the inshore portion of the Project's submarine export cable corridor. The samples near the cable landfall were very fine-grained particles (mud, clay, and silt) (USACE NYD 2006).

Most of the Applicant's 2019 SPI samples were collected in the submarine export cable corridor, which is roughly parallel but located inward towards shore from the USACE channel sampling locations (see **Figure 4.6-1**); both surveys were conducted during summer. Although collected 13 years apart and using different methods, the two datasets supported similar benthic characterization, which is provided in **Table 4.6-1**. The submarine export cable corridor was dominated by relatively stable sand inhabited by soft-bodied infauna (e.g. polychaetes), hard-bodied mollusks (e.g. blue mussel), and mobile crustaceans (crabs). Both surveys identified blue mussel (*Mytilus edulis*) beds in the area just outside the Lower Bay (**Table 4.6-1**). Overall, benthic habitat and species assemblages were stable across years, showing little interannual variability.

In the USACE data, in the summer of 2005, more than half of the 33 taxa collected in grab samples from Ambrose Channel were annelids; the remaining taxa were mostly arthropods and mollusks. The benthic community in Ambrose Channel was characterized as moderately abundant, high diversity, and high evenness relative to the rest of the New York Harbor. Juvenile blue mussel dominated samples from Ambrose Channel in 2005 but were absent in 2009. It was suggested that the juvenile blue mussels collected in 2005 were being carried by currents to established intertidal mussel beds where they could settle and mature (USACE NYD 2011). The samples from the Bay Ridge Channel also contained annelids, arthropods, and mollusks, but at much lower abundances than in Ambrose Channel. The Bay Ridge samples had the highest diversity and evenness of all harbor samples. Of the 20 taxa collected, the dwarf surfclam (*Mulinia lateralis*) was present at the highest density (35 organisms per square meter).

The Applicant's 2019 HRG survey of the submarine export corridor in New York State waters identified rocky till and areas of rocky till that also contained boulders (**Figure 4.6-2**). The till and boulders may have originated as glacial moraine or been placed offshore as debris. From a benthic resource perspective, the habitat value of the hardbottom lies in its ability to support encrusting and attaching organisms, which in turn provide a center of productivity for mobile fish and invertebrates.

New York places and manages artificial reefs in state waters to enhance fish habitat, largely for recreational anglers and divers. Artificial reefs in coastal New York waters are known for black sea bass, blackfish (*Tautoga onitis*), scup (*Stenotomus chrysops*), American lobster (*Homarus americanus*), summer flounder (*Paralichthys dentatus*), cod, and several species of edible crab (NYSDEC 2020a). The reef nearest to the EW 1 submarine export cable route is the Bush Terminal Reef, located within 0.25 mi (0.4 km) of the Project.

The Billion Oyster Project has been working since 2014 to restore the Eastern oyster (*Crassostrea virginica*) to the New York Harbor. One of the seven restored reefs is at Bush Terminal Park near the cable landfall. The oyster was once abundant in the harbor, but since the early 1900s populations have declined by more than 99 percent in response to wastewater discharges, oyster disease, overharvesting, and dredging for shipping channels.

Table 4.6-1 Benthic Characterization Data

Sample Locations in or Adjacent to the Submarine Export Cable Corridor	Number of Taxa	Dominant Taxa	Dominant Species	Notes	Grain Size
Ambrose					
USACE: A1, A2, A3	33	Annelids (52%); Arthropods (21%); Mollusks (21%)	Blue mussel (41% of total catch); amphipods; polychaetes; northern dwarf tellin	Pollution-sensitive taxa more common than pollution-tolerant tax (indicating relatively clean sediment)	Mostly sand, with some fine sand at A1; patches of fine and coarse sediments scattered in area
Empire: 095	--	Larger tube-building fauna; diverse soft sediment epifauna; small surface-burrowing fauna	Anemones; gastropods; hermit crabs	Indeterminate	Sand sheet
Empire: 097	--	Smaller tube-building fauna; small surface-burrowing fauna	Anemones; gastropods; hermit crabs; sand dollars	Indeterminate	Sand sheet
Empire: 108	--	Mussel beds; attached hydroids, attached sea urchins	Hydroids; spider crabs; sea urchins	Succession stage: 2 on 3	Indeterminate
Anchorage					
USACE: AC1	42	Annelids (55%); arthropods (19%); mollusks (21%)	Blue mussel (79% of total catch); amphipods; northern dwarf tellin; polychaete *Spio setosa*	Fewer pollution-tolerant taxa than other locations (indicating potential sediment contaminants)	Sand and rock; some patches of fine and coarse sediment
Empire: 109 and 110	--	Mussel beds; attached hydroids	Hydroids; mussels	Succession stage: 2 on 3	Sand sheet/indeterminate

Table 4.6-1 Benthic Characterization Data (continued)

Sample Locations in or Adjacent to Submarine Export Cable Corridor	Number of Taxa	Dominant Taxa	Dominant Species	Notes	Grain Size
Bay Ridge					
USACE: BR1, BR2, BR3	20	Annelids (50%); arthropods (20%); mollusks (30%)	Dwarf surfclam (16% of total catch), northern dwarf tellin polychaeta (*Neptys* sp.)	More than half of all taxa were pollution-tolerant.	Mud, clay, silt at BR1 and BR2; shell at BR3; some fine and coarse sediments
Empire: 114	--	--	Indeterminate	Successional stage: 2 on 3	--
Empire: 115	--	--	Indeterminate	Successional stage: 2 on 3	--
Empire: 113	--	Indeterminate	Indeterminate	Successional stage: 2	Sand sheet

Sources:
USACE data are from Harborwide Benthic Monitoring Program Final Report, USACE NYD (2006).
Empire (2019) data are included in Appendix E.
Notes:
All sampling occurred in summer.
-- No data available

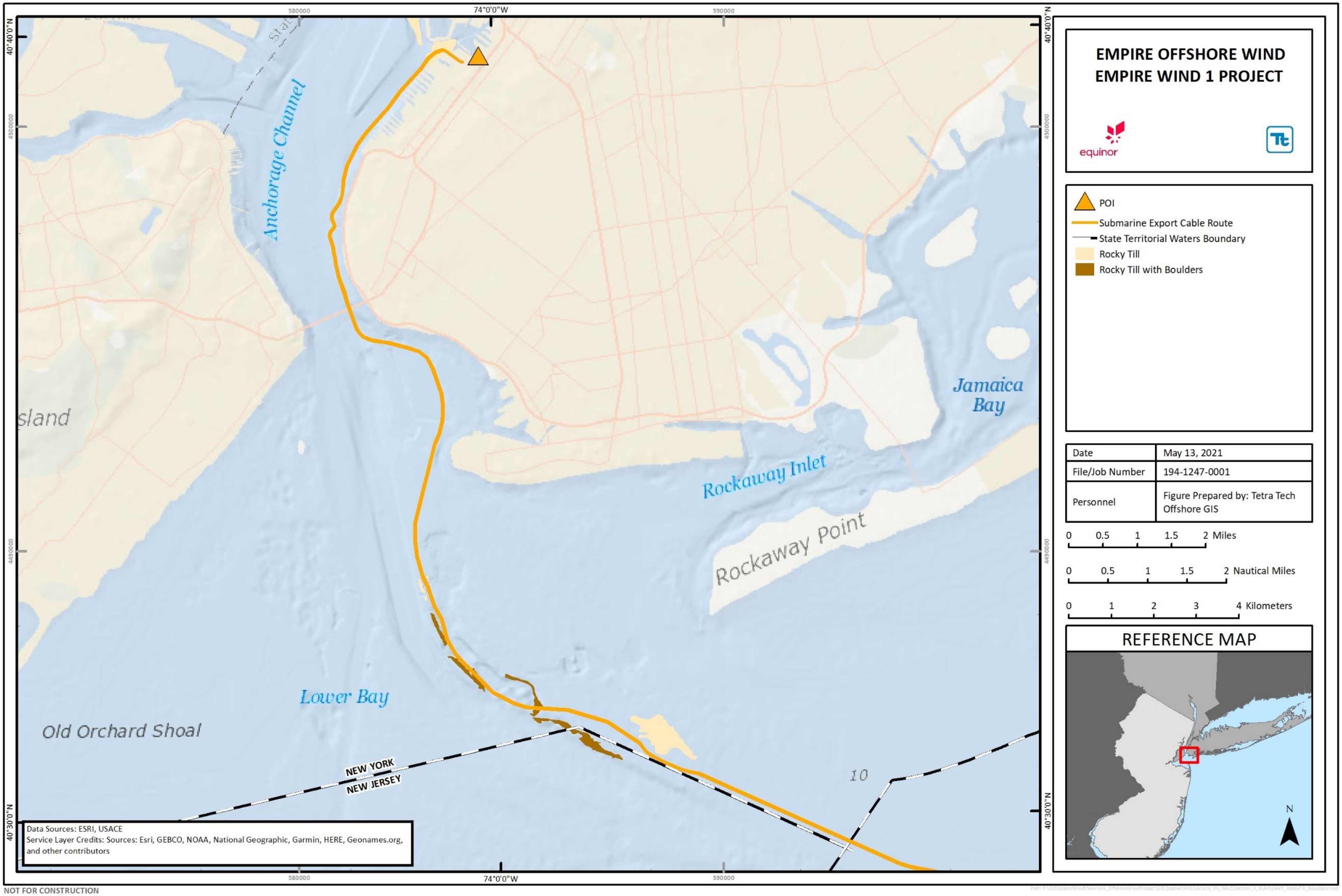


Figure 4.6-2 Areas of Rocky Till and Rocky Till with Boulders within the Survey Area

The Nature Conservancy provides support with monitoring restored oyster reefs at seven sites in the New York Harbor, including the Bush Terminal Park Community Reef adjacent to the landfall in the Upper Bay. Nearly one million 2-mm oysters were installed in 2016 to create the Bush Terminal Park Community Reef; additional culch was placed on the reef in 2018 (McCann 2018).

Oysters at the Bush Terminal Reef grew more quickly than at other sites and began cementing together to form a reef. Some individuals appeared to have spawned in summer 2017; however, no recruits were observed the following spring. To date, the incidence of oyster diseases has been low at this reef. Water quality has been generally good, with adequate dissolved oxygen. Measures of biodiversity showed no difference between the restored reef and a reference location in 2017. Long-term monitoring studies of biodiversity, reproduction, growth, and other parameters are ongoing (McCann 2018).

Benthic habitats are strongly influenced by the overlying ocean, especially the top 600 ft (200 m) of the ocean known as the photic zone, where sunlight supports photosynthetic phytoplankton (Karleskint et al. 2006). The water column is particularly important for planktonic eggs and larvae of demersal species and all life stages of planktivorous species (NEFMC 2017; NOAA Fisheries 2017a). Oceanic currents, temperature, conductivity, pH, dissolved oxygen, and other features of the water column influence the occurrence and abundance of marine species in the Project Area (Pineda et al. 2007). Oceanic conditions in the Project Area and bathymetry mapping are provided in Section 4.2.

Pelagic habitats extend from the sea surface to near the seafloor; habitats vary by depth, temperature, light penetration, distance from shore, turbidity, and other physical and chemical characteristics. Dynamic water quality parameters such as dissolved oxygen, pH, and conductivity are influenced by currents, human activities onshore, climate and weather, and other processes.

Other important features of pelagic habitats, such as light penetration, temperature, and dissolved oxygen, generally co-vary with depth, although the relationships can be complex and dynamic. In the relatively confined waters of Upper and Lower Bays, dissolved oxygen was reported to exceed 5 mg/L consistently during several years of monitoring (USACE NYD 2015a). Water temperatures in the Project Area vary seasonally and with depth. As described in Section 4.2, surface waters fluctuate as much as 40°F (22°C) throughout the year. Interannual variability in water temperatures is high but general patterns are predictable: waters are always warmer at the surface and cooler at the bottom, with the magnitude of vertical difference greatest in spring and summer. Annual and vertical variability in temperatures are strong triggers of seasonal migrations that lead to changes in the distributions of adult benthic organisms and settlement of recruits from the plankton (Guida et al. 2017).

Together, the benthic substrate and overlying water provide supportive habitat for demersal (associated with the sea floor) and pelagic (associated with the water column) fish and invertebrates. Marine communities are supported by phytoplankton (diatoms, dinoflagellates, and others) that thrive where nutrients and sunlight are abundant. Phytoplankton are essential food for zooplankton (tiny animals such as copepods and larval forms of crustaceans, bivalves, and other invertebrates) and ichthyoplankton (fish larvae). Although benthic and pelagic habitats are often discussed separately, most marine species are associated with both habitats.

Marine communities are sustained by benthic-pelagic coupling in which energy is continuously transferred between the seafloor and water column through foraging, animal waste, and decomposition. For example, many invertebrates live relatively sedentary lives buried or burrowed into the softbottom sea floor. These organisms are collectively known as infauna because they live within the top layer of sediment, with only their respiratory or feeding appendage extended into the water column. Infaunal organisms such as amphipods, polychaetes, and clams feed on plankton and nutrient-rich detritus in the overlying water. Organisms that live on or attached to the seabed or submerged objects are known as epifauna; common examples include sponges, sea stars, hermit crabs, and moon snails.

Many key benthic life stages depend on pelagic habitats for feeding and/or reproducing. The designation of EFH explicitly recognizes the joint contribution of benthic and pelagic habitat components in designating specific bottom types, water depths, and prey sources as essential to managed species (NEFMC 2017). An initial EFH Assessment was filed with BOEM as part of the COP for the Project. The Applicant conducted additional benthic survey activities in 2020 and intends to update the EFH Assessment in late 2021. A copy of the EFH Assessment will be provided at that time.

4.6.2.2 Fish and Invertebrate Resources

Demersal Species and Life Stages

Demersal organisms and/or life stages are those that are oriented physically and behaviorally toward the seafloor, including the infaunal and epifaunal invertebrates described previously and fishes that preferentially forage on the bottom. Burrowing infaunal organisms (e.g., amphipods, clams, polychaetes, sand lances) create a complex microhabitat at the sediment-water interface as they filter water, mix and redistribute sediment, oxygenate subsurface sediment, and recycle nutrients (Rutecki et al. 2014). The infaunal assemblage is eaten by demersal fish and invertebrates such as gastropods (whelks, moon snails), sea stars, horseshoe crab (*Limulus polyphemus*) lobster, swimming crabs, fish (especially flatfish and skates), and other demersal predators.

Commercially valuable demersal fish and invertebrates in the Project Area include flounders, hakes, scup, black sea bass, bluefish (*Pomatomus saltatrix*), spiny dogfish (*Squalus acanthias*), skates, and species managed under multispecies groundfish plans (e.g., cod, haddock, pollock, various species of hake and flounders) (Guida et al. 2017; Petruny-Parker et al. 2015). Although demersal fishes and invertebrates are closely associated with benthic habitats as adults, many species interact with overlying pelagic habitats through predator-prey interactions, early life stage dispersal, or seasonal migrations (Malek et al. 2014).

For example, the ecologically important adult sand lances (*Ammodytes* spp.) burrow in sand but forage on zooplankton carried on currents. Adults are present year-round in the Project Area and are heavily preyed upon by demersal fishes (e.g., silver hake [*Merluccius bilinearis*], yellowtail flounder [*Pleuronectes ferrugineus*]) as well as more pelagic predators (e.g., bluefish) and harbor seal (*Phoca vitulina*) and grey seal (*Halichoerus gryphus*) (MAFMC 2017; NOAA Office of National Marine Sanctuaries 2017). The sand lance lays demersal eggs that hatch into planktonic larvae (Able and Fahay 1998). Similarly, the winter flounder (*Pleuronectes americanus*) is demersal during the adult and egg stages but planktonic during the larvae stage.

Other fishes are demersal only as adults, releasing pelagic eggs that hatch into planktonic larvae; examples in the Project Area include hakes, windowpane flounder (*Scophthalmus aquosus*), yellowtail flounder, summer flounder, monkfish (*Lophius* spp.), black sea bass, and others (NEFMC 2017 and references within; Able and Fahay 1998). Many of these species, notably black sea bass, hakes, and some flounders, spawn elsewhere but their planktonic larvae drift or juveniles recruit to the bottom within the Project Area.

The fishes in the Project Area with the most consistent demersal exposure are skates, which have no pelagic or planktonic life stage. The little skate (*Leucoraja erinacea*), which dominates the fish fauna year-round in the Project Area, forages almost exclusively on benthic amphipods, crabs, shrimp, and polychaetes, taking a few fish only in later years. The winter skate also eats burrowing sand lance (Smith and Link 2010).

The longfin inshore squid (*Doryteuthis pealeii*) illustrates the reverse of the demersal adult-pelagic larvae life cycle. Adult squid live in the water column but attach their eggs (known as squid mops) to hardbottom, empty shells on sandy bottoms, and artificial structures; the squid mops remain on the bottom for up to four weeks before hatching into paralarvae that migrate to the sea surface, where they feed on copepods and other zooplankton (Cargnelli et al. 1999).

Migratory schooling species dominated nine years of demersal fish surveys in the Lower Bay and Upper Bay (2002–2010) conducted by the USACE. Typical species included white perch, bay anchovy (*Anchoa mitchilli*), spotted hake, Atlantic herring, winter flounder, Atlantic silversides, Atlantic menhaden, alewife, blueback herring (*Alosa aestivalis*), and striped bass. Relative abundance of species varied by year, largely driven by winter temperatures. In years with mild to moderate winters, abundance of alewife and spotted hake increased in both bays, and American sand lance and Atlantic silverside increased in the Lower Bay. In years with colder winters, fish species were more evenly distributed throughout the system. Collections were greatest in spring in both Upper and Lower Bays, where the bay anchovy was the principal catch. Although 81 fish taxa were collected during the 9-year survey, about two-thirds of all individuals were of five species: bay anchovy, white perch, spotted hake, alewife, and striped bass. Except for white perch and bay anchovy, juvenile life stages dominated the catches (USACE NYD 2015a).

Samples from within the Upper and Lower Bay were used to characterize species likely to occur within the Project's submarine export cable corridor. The USACE NYD (2015a) survey goals focused on differentiating samples from within channels and outside of channels. Although the cables will be installed outside the channel, species within and outside of channels were included in the discussion because construction impacts could occur throughout the cable corridor. Fishes with demersal life stages in the Lower Bay and Upper Bay include winter flounder, American eel (*Anguilla rostrata*), Atlantic tomcod (*Microgadus tomcod*), and white perch (*Morone americana*). In recent years, summer migrants such as summer flounder, black sea bass, and scup have become increasingly common. Black sea bass settle as juveniles in nearshore waters, including the Raritan/Hudson estuary (USACE NYD 2015a). All species listed in **Table 4.6-2** were either reported from the Upper or Lower Bay or have designated EFH in the Project Area; these species are assumed to occur in the submarine cable corridor.

Table 4.6-2 Fish Species Occurring in New York Harbor and Nearshore New York Bight

Common Name	Scientific Name
American eel c/	*Anguilla rostrata*
Atlantic butterfish a/ c/	*Peprilus triacanthus*
Atlantic cod a/ c/	*Gadus morhua*
Atlantic croaker b/ c/	*Micropogonias undulatus*
Atlantic herring a/ c/	*Clupea harengus*
Atlantic mackerel a/	*Scomber scombrus)*
Atlantic menhaden b/ c/	*Brevoortia tyrannus*
Atlantic sea scallop a/	*Placopecten magellanicus*
Atlantic sturgeon c/	*Acipenser oxyrinchus*
Atlantic tomcod c/	*Microgadus tomcod*
Bay anchovy c/	*Anchoa mitchilli*
Black drum c/	*Pogonias cromis*
Black sea bass a/	*Centropristis striata*
Blueback herring b/ c/	*Alosa aestivalis*

Common Name	Scientific Name
Bluefish a/c/	*Pomatomus saltatrix*
Clearnose skate a/	*Raja eglanteria*
Common thresher shark a/	*Alopias vulpinus*
Conger eel c/	*Conger oceanicus*
Cunner c/	*Tautogolabrus adspersus*
Dusky shark a/	*Carcharhinus obscurus*
Feather blenny c/	*Hypsoblennius hentzi*
Fourbeard rockling c/	*Enchelyopus cimbrius*
Grubby c/	*Myoxocephalus aenaeus*
Hickory shad c/	*Alosa mediocris*
Hogchocker c/	*Trinectes maculatus*
Little skate a/	*Leucoraja erinacea*
Longfin inshore squid a/	*Doryteuthis [Amerigo] pealeii*
Longhorn sculpin c/	*Myoxocephalus octodecemspinosus*
Monkfish a/	*Lophius americanus*
Mummichog c/	*Fundulus heteroclitus*
Naked goby c/	*Gobiosoma bosci*
Northern kingfish c/	*Menticirrhus saxatilis*
Northern puffer c/	*Sphoeroides maculatus*
Northern searobin c/	*Prionotus carolinus*
Ocean pout a/	*Macrozoarces americanus*
Ocean quahog a/	*Arctica islandica*
Oyster toadfish c/	*Opsanus tau*
Pollock c/	*Pollachius virens*
Rainbow smelt c/	*Osmerus mordax mordax*
Red hake a/ c/	*Urophycis chuss*
Rock gunnel c/	*Pholis gunnellus*
Sand tiger shark a/	*Carcharhinus taurus*
Sandbar shark a/	*Carcharhinus plumbeus*
Scup a/	*Stenotomus chrysops*
Seaboard goby c/	*Gobiosoma ginsburgi*
Sheepshead c/	*Archosargus probatocephalus*
Shortnose sturgeon c/	*Acipenser brevirostrum*
Silver hake a/	*Merluccius bilinearis*
Silver perch c/	*Diapterus rhombeus*
Skipjack tuna a/	*Katsuwonus pelamis*
Smallmouth flounder c/	*Etropus microstomus*

Common Name	Scientific Name
Smoothhound shark a/	*Mustelus canis*
Spiny dogfish a/ c/	*Squalus acanthias*
Spot c/	*Leiostomus xanthurus*
Spotted hake c/	*Urophycis regia*
Striped anchovy c/	*Anchoa hepsetus*
Striped cuskeel c/	*Ophidion marginatum*
Striped killifish c/	*Fundulus majalis*
Striped mullet c/	*Mugil cephalus*
Summer flounder a/ c/	*Paralichthys dentatus*
Tautog c/	*Tautoga onitis*
Threespine stickleback c/	*Gasterosteus aculeatus*
Weakfish c/	*Cynoscion regalis*
White shark a/	*Carcharodon carcharias*
Windowpane flounder a/c/	*Scophthalmus aquosus*
Winter flounder a/ c/	*Pleuronectes americanus*
Winter skate a/	*Leucoraja ocellata*
Witch flounder a/ c/	*Glyptocephalus cynoglossus*
Yellowtail flounder a/ c/	*Pleuronectes ferrugineus*

Notes:
a/ Species has designated EFH in Project Area.
b/ State managed species of concern
c/ Species reported in USACE NYD (2015a).

Pelagic Species and Life Stages

The most numerically abundant component of the pelagic fish community in the open waters of the Project Area is the ichthyoplankton assemblage. Buoyant eggs and larvae of most marine fishes in the Southern New England ecoregion can remain in the plankton for weeks to months (Walsh et al. 2015). Diel vertical migrations of zooplankton and ichthyoplankton are known to occur within nearshore waters of New York (Able and Fahay 1998). The assemblage of species represented in the ichthyoplankton varies seasonally and is strongly influenced by water temperature; patterns of ichthyoplankton assemblages have changed in recent decades, likely in response to climate change (discussed below; MAFMC 2017; Walsh et al. 2015).

Some species in the Project Area are truly pelagic, living in the water column throughout their lives. Planktivorous coastal pelagic forage species are typically small and shiny, with schooling tendencies, as characterized by the Atlantic menhaden (*Brevoortia harengus*), Atlantic herring (*Clupea harengus*), Atlantic saury (*Scomberesox saurus*), and smaller mackerels (MAFMC 2017). The forage species tend to be short-lived, fast-maturing, and highly fecund, with wide fluctuations in abundances from year to year. Species abundances do not necessarily rise and fall in synchrony, so migratory predators target whichever prey is available in a given place (Suca et al. 2018). Squid and butterfish (*Peprilus triacanthus*) function as forage as juveniles then shift to a predatory niche as they mature. Interannual variability in recruitment in many species can drive peaks in abundance for a given species unrelated to standing stock (Bethoney et al. 2016). These small pelagic forage fishes transfer energy from zooplankton to top predators such as shortfin mako shark (*Isurus oxyrinchus*), porbeagle shark, thresher shark, Atlantic mackerel, tunas, bluefish, mahi-mahi, and sharks (Suca et al. 2018). For example, the bluefin tuna feeds predominantly on Atlantic mackerel and squid in the Mid-Atlantic Bight (Chase 2002). Most of the highly migratory species migrate to nearshore waters of New York as waters warm in the spring (Able and Fahay 1998; NOAA Fisheries 2017b).

Blueback herring and alewife dominated USACE mid-water trawl samples throughout the New York Harbor between 2011 and 2013. These river herring migrate through the Upper Bay to spawn in the Hudson River in spring, when discharges are typically greatest. Abundances peaked in April, declined in May, and dropped to near zero in June (USACE NYD 2015b). The most abundant managed pelagic fishes in the Lower and Upper Bays were Atlantic herring and Atlantic butterfish; bluefish and silver hake were present but less common. Pelagic fish in the Lower Bay and Upper Bay identified as species of concern by NOAA include alewife, blueback herring, American shad, and striped bass (USACE NYD 2015b). The Atlantic menhaden, Atlantic herring, bay anchovy, and striped anchovy (*Anchoa hepsetus*) are considered important in the bays because of their role as key forage species (MAFMC 2017).

In the 2011 to 2013 USACE trawl samples, pelagic species assemblage varied by season and area. In the Upper Bay, Atlantic herring, bay anchovy, alewife, and blueback herring were most abundant in winter and spring. In summer and fall, the bay anchovy made up almost 90 percent of the trawl samples. In the Lower Bay, the bay anchovy represented 74 percent of the samples in fall (the remainder was mostly blueback herring). Bay anchovy made up 91 percent of the spring samples and 99 percent of the summer samples (USACE NYD 2015b).

The USACE conducted ichthyoplankton surveys in January and June for 10 years (2002-2011) in the Upper and Lower Bays. Four of the 22 taxa in the ichthyoplankton trawls accounted for 95 percent of all eggs: bay anchovy, wrasse (including cunner [*Tautogolabrus adspersus*] and tautog), Atlantic menhaden, and windowpane flounder. Federally managed species making up a substantial portion of the ichthyoplankton included winter flounder and windowpane flounder (all 10 years) and Atlantic mackerel (6 of 10 years); the Atlantic menhaden made up about 9 percent of the eggs collected. Density of ichthyoplankton increased from January to June, as winter spawners (winter flounder and American sand lance) had relatively lower density than spring spawners. Eggs were most abundant in May and June. Fish larvae were more evenly distributed throughout the system than eggs, possibly because tidal mixing facilitated transport. Bay anchovy, gobies, and winter flounder comprised about 80 percent of the larvae in trawl samples, which contained 51 species overall.

4.6.3 Managed and Exploited Species

4.6.3.1 Essential Fish Habitat and Habitat Area of Particular Concern

In the Project Area, NEFMC and MAFMC share authority with NOAA Fisheries to manage and conserve fisheries in federal waters, and designate EFH within both federal and state waters. Together with NOAA Fisheries, the councils maintain FMPs for specific species or species groups (and designated EFH for each) to regulate commercial and recreational fishing within their geographic regions (**Table 4.6-2**). NOAA Fisheries' Highly Migratory Species Division is responsible for tunas and sharks in the Project Area (NOAA Fisheries 2017b). The ASMFC manages more than two dozen fish and invertebrate species in cooperation with the states and NOAA Fisheries.

Managed finfish with designated EFH in the Project Area were identified using the EFH data inventory in each FMP and the online EFH Mapper. EFH habitat categories were based on the EFH descriptions within each of the EFH source documents. The spatial overlap of EFH and Project components was evaluated initially using plan-view maps in the EFH Mapper and habitat descriptions in EFH source documents. Managed species in the Project Area are listed in **Table 4.6-2**.

FMCs and NOAA Fisheries may also designate Habitat Areas of Particular Concern (HAPC), defined as a subset of the habitats that a species is known to occupy, to conserve fish habitat in geographical locations particularly critical to the survival of a species. No HAPC has been designated in the Project Area (NOAA Fisheries 2018a).

Commercial and recreational fisheries in state waters are further managed by state regulatory bodies. Each coastal state has its own structure of agencies and plans governing fisheries resources. As noted above, the NYSDEC Division of Marine Resources administers laws relating to marine fisheries, and NYSDEC and NYSDOS coordinate the implementation of New York's Ocean Action Plan, which guides the sustainable use of New York's ocean resources, including marine fisheries.

The commercially and recreationally valuable species managed under the MSFCMA rely on prey ranging in size from single-celled plankton to large conspecifics; the diets of most managed species change throughout the life cycle as they mature and grow (Able et al. 2018 and references within). In recognition of the role of invertebrate and fish forage species in maintaining sustainable stocks of managed species, the MAFMC summarized predator-prey relationships involving unmanaged forage species and proposed management measures to protect these species from directed harvest and unintentional impacts (MAFMC 2017). Virtually all species in the Project Area function as forage at some point in their lives; however, this section focuses on those species that were identified in digital images, collected in benthic grabs and beam trawls, or otherwise reported to occur in the Project Area. This assessment draws from direct sampling by the Applicant as well as reports from USACE NYD (2015a, b), and others.

4.6.3.2 Other Managed Species

The ASMFC manages several fish and invertebrate species separately from the MSFCMA and the Endangered Species Act of 1973 (ESA). Such species potentially affected by the Project include the horseshoe crab, Jonah crab, river herring, and striped bass. These species are described briefly here and in more detail throughout this section.

The horseshoe crab stock is in neutral condition in the mid-Atlantic, but in poor condition in New York, where the state allows the harvest of just 150,000 crabs per year (ASMFC 2019a). Commercial harvest (for bait) and collection for biomedical research are the largest intentional sources of horseshoe crab mortality but discards by commercial harvesters are considered substantial and habitat loss may contribute to recent declines (NYC Parks 2021).

Adult horseshoe crab typically spawn in summer on sandy beaches in protected bays and coves along the U.S. Atlantic Coast, and juveniles rear in shallow inshore waters. Although most spawning occurs south of the Project Area in Delaware and Chesapeake Bays (ASMFC 2019a), NYC Parks has led a monitoring program for several years in which volunteers count and tag individual horseshoe crabs and document spawning activity every May and June on beaches at Calvert Vaux Park, Conference House Park, and Kaiser Park. In 2013, NYC Parks and NYSDEC restored sandy beach habitat for horseshoe crab spawning at Calvert Vaux Park on Coney Island Creek (NYC Parks 2021). Juvenile horseshoe crabs rear in shallow inshore waters. Non-spawning adults are subtidal, most commonly at depths of less than 98 ft (30 m) (ASMFC 2019a).

The blue crab (Callinectes sapidus), which is managed by NYSDEC, shares shallow coastal bay habitat with the horseshoe crab, but also ventures into the tidal Hudson River and other less saline habitats (NYSDEC 2016b, 2020). Adults are associated with structures and submerged aquatic vegetation, but also occur over unvegetated sandy, clay, and mud substrates (NJ SeaGrant 2014). The New York/New Jersey Harbor Estuary supports recreational and commercial fisheries for the blue crab, although several contaminated areas of the Harbor are closed to crabbing and consumption advisories are in place for many other locations in the Harbor (NJ SeaGrant 2014).

The Jonah crab is commercially and recreationally harvested in the Project Area, although site-specific data are not available. The Jonah crab is reported to be attracted to rocky habitats with crevices as well as softbottom habitats in the New York Bight, where it feeds on polychaetes and mollusks (ASMFC 2019b; NOAA Fisheries 2018b. Although its life cycle is poorly known, adult Jonah crabs are reported to move seasonally between nearshore and offshore waters (ASMFC 2020). Its population status and trends are unknown (ASMFC 2018.

In New York, river herring are currently harvested only from the Hudson River Estuary and tributaries, as historical fisheries in Long Island streams have become unsustainable (ASMFC 2017). River herring stocks are considered depleted with declining trends coastwide (ASMFC 2018) but were determined not to warrant protection under the ESA (NOAA Fisheries 2019a,b). Spawning occurs upriver of the Project Area, typically from March (alewives) through June (blueback herring). Adults return to offshore marine waters after spawning, and offspring rear in fresh riverine waters (ASMFC 2017).

The anadromous striped bass spawns in the Hudson River Estuary. Juveniles were collected in mid-water trawls in the Upper Bay in spring, fall, and early winter; adults appeared in bottom trawls from January through May (USACE NYD 2015a). Although the striped bass was identified by NOAA Fisheries and NYSDEC as a migratory species of particular concern (USACE NYD 2015a), ASMFC determined that the Atlantic population is not overfished, nor is overfishing occurring; however, declines in female striped bass have been noted since the mid-2000s (ASMFC 2018). The striped bass is predicted to expand its northern range in response to rising sea temperatures (Kleisner et al. 2017). As a large predatory species, it has been implicated in the decline of winter flounder (Frisk et al. 2018).

4.6.3.3 Commercial and Recreational Fishing

Most saltwater recreational fishing involves the use of hook and line (rod and reel), either from a boat or from a shoreline access point (beach, jetty, pier, bulkhead, etc.). Party/charter boats are also utilized for access to recreational fishing within state waters. The most highly targeted species for recreational saltwater fishing activities in the Project Area include summer flounder (fluke), sea robins, black sea bass, striped bass, porgy (scup), bluefish, and tautog (blackfish). Recreational shell fishing also occurs, and commonly targets species such as blue crabs, scallops, quahogs, Atlantic surfclam, and softshell clams (steamers).

Commercial fishing activity has both seasonal and interannual variation based on individual fishing preferences, vessel types, target species, regulatory restrictions, market demands, and weather. Fishing activity also varies in location and intensity throughout the year as fishermen follow target species along seasonal migration routes and adhere to regulatory closures.

Commercial fishing occurring within the Project Area can generally be categorized as the following:

- Lobster & crab fisheries (lobster, blue crab, and horseshoe crab),
- Finfish (Hudson river finfish, marine finfish, and menhaden purse seine), and
- Shellfish and whelk (clam/mussel/oyster/scallop digging, clam dredging, and whelk/conch pots).

However, shellfish prohibitions apply for most of the Project Area (see **Figure 4.6-3**).

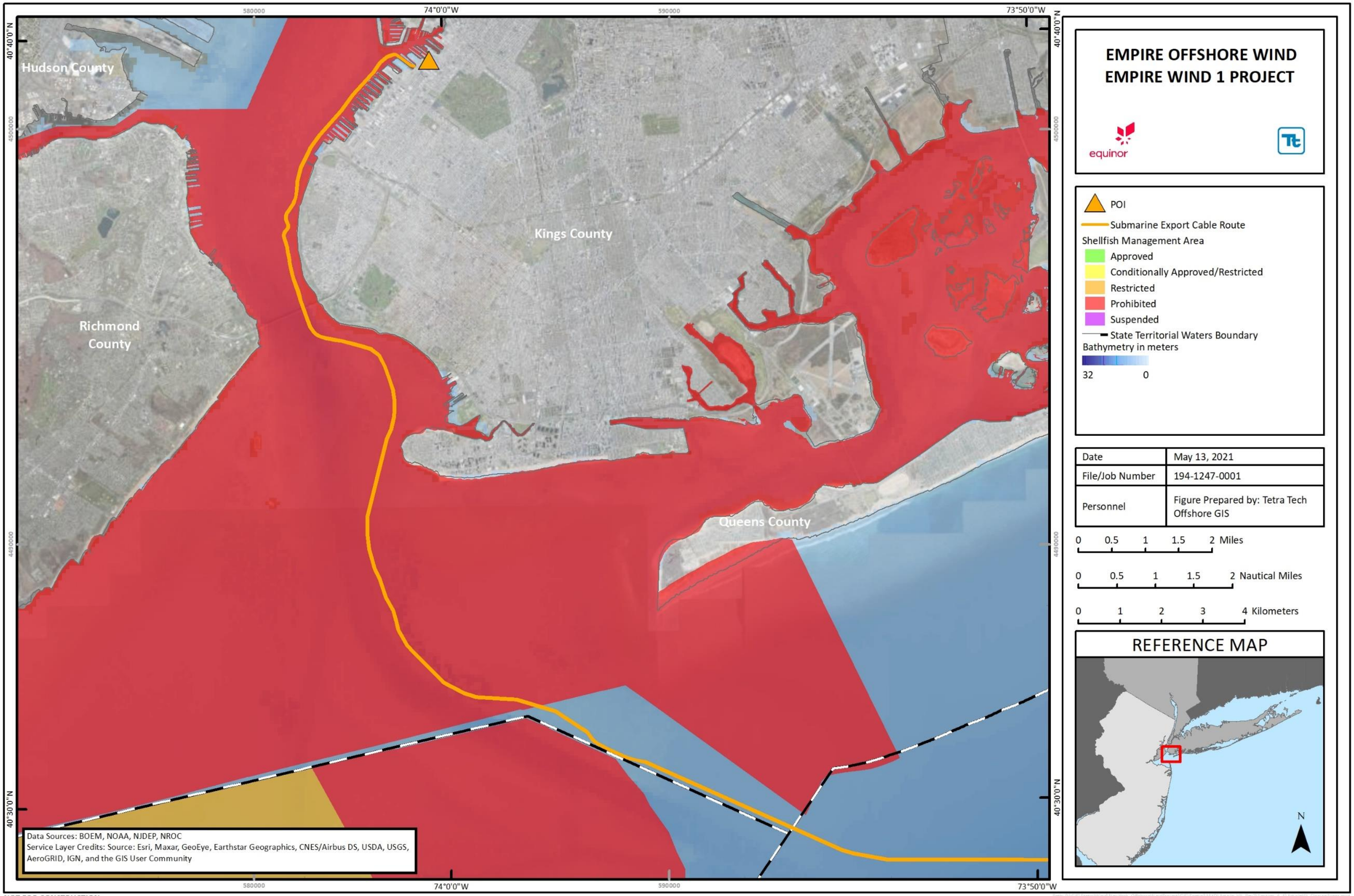


Figure 4.6-3 Certified and Uncertified Shellfish Areas in Project Area

Mobile commercial fishing gear utilized in these fisheries includes otter trawls, mid-water trawls, purse seines, dredges, and rod and reel. Fixed fishing gear types utilized in these fisheries include lobster pots, crab pots, whelk pots, fish pots, and demersal gillnets. The data sources above and discussions with the fishing industry have helped identify the extent of fishing activity and the various gear types used in the Project Area.

4.6.4 Potential Impacts and Proposed Mitigation: Fisheries and Benthic Resources

Potential impacts of construction, operation, and maintenance of the Project on benthic and fisheries resources are described in this section. Effects on fish and invertebrates are discussed in terms of habitat rather than species to reflect the varied habitats a given species may use to complete its life cycle, as described above (e.g., demersal and pelagic life stages, infaunal and epifaunal benthic organisms). Species of concern are discussed in more detail as warranted by the potential harm posed by the impact-producing factors discussed below. For example, impacts to demersal eggs in general apply to winter flounder. Impacts to anadromous pelagic species apply to species such as striped bass and river herring.

4.6.4.1 Construction

Construction of the submarine export cables and cable protection measures is a potential impact-producing factor affecting fisheries and benthic resources. Potential impacts include:

- Short-term, minor direct disturbance, injury, and/or mortality of benthic species and life stages;
- Short-term, minor change in water quality, including increased turbidity, sediment deposition, suspended sediment and chemical contamination;
- Short-term, minor entrainment of plankton and ichthyoplankton;
- Short-term, minor disturbance of common softbottom sandy habitat; and
- Short-term, minor increase in Project-related noise and vibrations.

Direct Disturbance, Injury, or Mortality of Benthic and Demersal Species and Life Stages. Immobile or slow-moving demersal life stages of fish and invertebrates (including eggs and larvae) could be injured or killed during pre-construction grapnel runs, seabed preparation activities (including pre-sweeping and pre-trenching), cable burial and installation, and dredging armoring activities. These activities would disturb the seabed directly and crush or bury small sessile organisms, including benthic organisms and demersal life stages of fish and invertebrates. Pre-lay grapnel runs, pre-sweeping, pre-trenching, and dredging, which would be completed throughout the Project Area prior to cable installation, would disturb the bottom in a manner similar to clam dredges and trawls. Such short-term disturbance would injure or kill individual organisms within the immediate cable route but would not result in detectable population-level or stock-level effects to managed species or their prey. Effects of cable installation on diversity and abundance of benthic and fish species are expected to be negligible (Hiddink et al. 2017, Goldberg et al. 2012).

Following the pre-lay grapnel run and seabed preparation within the submarine export cable routes, cable-laying equipment would disturb the bottom within a narrower band where the cable would be buried. Burrowing surfclams and other invertebrates that were not previously disturbed by pre-lay activities would be displaced by the jetting (or other installation equipment) as the cables were installed. The cable installation would move slowly, which would allow most mobile fish and invertebrates time to move away from the equipment and likely escape injury; soft-bodied sessile invertebrates within the trenched area would be crushed or buried. Shelled mollusks would fare better; mortality of surfclams left behind in the path of a commercial clam dredge is generally assumed to be 12 percent (Kuykendall et al. 2019), although mortality could be considerably lower. Only 1 percent of the surfclams in an experimentally trawled area in Portugal died from trawl injury (Sabatini 2007). Injury and death of surfclams following commercial dredging are attributed to the direct impact of the dredge teeth. In contrast, the jet plow has no metal teeth and so would not cause physical breakage of surfclam shells. The cable installation would remain in a given area for only a few hours, representing a transient impact on fish and invertebrates. Surf clams, ocean quahogs, and other burrowing bivalves would use their muscular foot to reposition themselves at the desired depth in the sediment after the cable installation was complete.

The Applicant has conservatively assumed that 10 percent of the Project's submarine export cable route would require armoring (surface protection), mostly in areas where sufficient burial cannot be achieved (i.e., at cable and pipeline crossings). Armoring material would be lowered into place from a construction vessel, which would be stabilized by dynamic positioning, spuds, or anchors. Mobile fish and invertebrates would likely leave the area to avoid the noise and physical disturbance during armoring. Sessile organisms within the armored area that were injured or buried by the armoring material would likely be scavenged by fish, crabs, and other mobile predators following construction activity in the area (Vallejo et al. 2017).

The submarine export cable route was selected to minimize overlap with sensitive benthic habitats, and cables will be further micro-sited within the routes to avoid boulders and other fine-scale hardbottom to the extent feasible. Given these avoidance and conservation measures, the probability of adverse interactions of construction with sensitive benthic resources is low.

Change in Water Quality, including Turbidity, Sediment Deposition, Suspended Sediment and Chemical Contamination. Softbottom sediment would be suspended and turbidity would increase temporarily within and immediately adjacent to the submarine export cable route. Long-term chronic increases in suspended sediment can cause physiological stress to sessile organisms; however, most fish and invertebrate organisms are capable of mediating short-term turbidity plumes by expelling filtered sediments or reducing filtration rates (NYSERDA 2017a; Bergstrom et al. 2013; Clarke and Wilbur 2000). Some bivalves temporarily close their shells to avoid contact with unsuitable water, which temporarily interrupts their ability to feed and excrete wastes (Roberts and Elliott 2017; Roberts et al. 2016a).

During the brief disturbance of the bottom as the cable is installed, turbidity would temporarily increase, temporarily reducing visibility and altering the behavior of some fish and invertebrates in the immediate vicinity. Pelagic fishes such as river herring and striped bass in the Lower and Upper Bays may encounter areas of increased turbidity, especially in the relatively confined areas. However, fish and invertebrates inhabiting estuarine and coastal habitats are generally adapted to temporary turbidity events caused by storms and may even use the visual cover provided by suspended sediment to forage opportunistically. Conversely, the suspended sediment plume raised by the jetting or other installation methods may directly increase the density of food particles in the immediate area, indirectly benefitting the surfclam and other suspension feeders in the cable corridors. The high metabolic demands of large surfclams may not be met solely by planktonic food sources. The nutritional value of suspended sediment near the sea floor can be two orders of magnitude greater than in the water column 3 ft (1 m) above the sea floor (Munroe et al. 2013). Surfclams and other demersal filter feeders may benefit from the benthic algae and detritus mobilized by bottom disturbance during construction. Blue crab and horseshoe crab typically occur in dynamic nearshore waters where turbidity is naturally high; effects on these species would be transient and similar to those described for other large mobile demersal crustaceans such as lobster and swimming crabs.

The oyster reefs at the Bush Terminal Community Reef are in a protected area near shore where disturbance from cable installation is not expected. Short-term suspension of sediment within the water column is not considered a stressor to oysters, as these animals feed on plankton and other small particles that are suspended with the sediment (McCann 2018).

Sediment modeling for this Project indicates that suspended sediment would increase in the immediate area around bottom-disturbing construction, then decrease to ambient concentrations (see Section 4.2). The model results are consistent with empirical data from other projects. Suspended sediment concentrations during jet plowing and cable installation at the Block Island Wind Farm were well below predictions of the project-specific turbidity model (Elliot et al. 2017). Turbidity raised by hydraulic dredges, which are considerably larger than the proposed jetting methods for the majority of Project, poses no obstacle to fish migration or transit through the area, as suspended sediments behind the dredge fall rapidly back to the bottom within a short distance from the dredge (USACE NYD 2015b).

Suspended sediments from construction activities would settle in and adjacent to the submarine export cable routes. The duration and height of the suspended sediment above the bottom would be influenced by particle size and bottom currents. Along the submarine export cable routes, pre-sweeping activities will result in the side-casting of material along sandwaves and megaripples; at submarine cable and pipeline asset crossings, material has the potential to be side-cast or removed. At the landfall, sediment would be removed from SBMT to facilitate submarine export cable burial and installation (see Section 4.1).

Some demersal eggs and larvae (e.g., longfin squid, winter flounder) could be buried by deposited sediments during construction. However, the Applicant's Sediment Transport Analysis indicates that measurable sediment deposition would be limited to the installation trench and areas directly adjacent (see Section 4.2). Currents, storms, and other oceanographic processes frequently disturb softbottom habitats in the Project Area, and native fish and invertebrates are adapted to respond to such disturbances. For example, the surfclam is considered tolerant of smothering and burial by sediment because it is a fast burrower that can move both vertically in the sediment and laterally across the surface of the sediment; its recovery following sedimentation events is very high. Under experimental trawl conditions, the surfclam reburied in the sediment within a few minutes of the trawl disturbance (Sabatini 2007). Mobile scavengers such as hermit crabs, whelks, sea stars, and some fish would likely move into the area to eat the dead and injured invertebrates (Sciberras et al. 2018; Vallejo et al. 2017; Kaiser and Hiddink 2007; Ramsay et al. 1997; NYSERDA 2017a). Some species may even benefit from disturbances as new substrate becomes available for colonization (NOAA Fisheries 2018b).

Indirect impacts on fish and invertebrate resources from sediment suspension and deposition would be short-term and minor. This disturbance would not prevent natural recovery of benthic communities. Estimates of recovery time following construction vary by region, species, and type of disturbance. Case studies from cable installations on the continental shelf at depths comparable to the Project Area indicate that recovery begins immediately after construction and is complete within two years after jet plowing; the duration depends on the availability of mobile sediment (Brooks et al. 2006). Softbottom habitat recovers more quickly after cable installation by mechanical plowing than by water jetting (Kraus and Carter 2018). Evidence of recovery following sand mining in the United States Atlantic and Gulf of Mexico indicates that softbottom benthic habitat in the Project Area would fully recover within 3 months to 2.5 years (Kraus and Carter 2018; BOEM 2015; Normandeau 2014; Brooks et al. 2006). NOAA Fisheries estimated recovery of the softbottom benthic community at Block Island Wind Farm within three years (NOAA Fisheries 2015).

In order to further minimize the potential impacts of submarine export cable installation on fish and invertebrate resources, including winter flounder spawning and Atlantic Sturgeon (see Section 4.7), the Applicant will restrict seabed-disturbing activities for submarine export cable installation to the period from July 1st to September 30th. This will avoid the sensitive time of year for winter flounder and Atlantic Sturgeon.

Sources of non-routine chemical releases that could affect water quality during construction include potential suspension of contaminated sediments within the submarine export cable routes and fuel spills from vessels. Subsurface sediment disturbed along the submarine export cable route in the Lower and Upper Bays is likely to contain elevated concentrations of contaminants, as discussed in Section 4.2. However, contaminants in sediment in this area would not necessarily affect local benthic organisms. A joint USGS/NOAA Fisheries study used standard coastal monitoring protocols to evaluate the effect of suspended sediments on mussels from sites in northern New Jersey, Hudson/Raritan Bay, and southern Long Island following Hurricane Sandy (Smalling et al. 2016). Despite well-documented elevated concentrations of PCBs in sediments in the Hudson River/Raritan Bay area, concentrations of PCBs in mussels were unchanged following the storm. Likewise, concentrations of legacy organochlorine pesticides (chlordane and dichlorodiphenyltrichloroethane) in mussels from Jones Beach, Long Island, and dieldrin in Hudson River/Raritan Bay mussels were lower than before the hurricane (Smalling et al. 2016). These results indicate that resuspension of sediments during installation of the export cables would be unlikely to cause an increase in contaminant uptake by local organisms. Direct and indirect adverse impacts on fish and invertebrates exposed to suspended sediment would be short-term, minor, and localized.

In addition to chemical contaminants, fecal coliform colonies have affected water and sediment in coastal portions of the submarine export cable route. Shellfish in the nearshore and inshore portions of the submarine cable corridor are considered unsuitable for harvest based on water quality monitoring for nutrients, fecal coliform, and harmful algae (NYSDEC 2019b; **Figure 4.6-3**).

Typical offshore construction support vessels burn diesel fuel and have the potential to accidentally release small amounts of fuel to the waterway. Diesel floats on the water's surface briefly before volatilizing; it does not sink to the bottom and would not affect benthic habitat or species. The Applicant would require all construction vessels to minimize the risk of fuel spills and leaks, as detailed in the Project's OSRP; vessels would not refuel at sea. Construction vessels would comply with USGS regulations, as appropriate for the vessel size and type. Chemical releases from vessels are considered unlikely with the minimization measures contained in the OSRP; impacts would be short-term, negligible, and localized.

Project-related marine debris would have an indirect short-term and minor effect on fish and invertebrate resources. However, the Applicant would continue practices established during the site assessment surveys that require offshore personnel to comply with USCG regulations on the proper disposal of marine debris (see Section 4.7 for additional discussion of marine debris).

Entrainment of Plankton and Ichthyoplankton. Ichthyoplankton may be entrained by suction hopper dredges or mass flow excavation during pre-sweeping and by jetting equipment during cable installation. Dredging, mass flow excavation or jetting equipment would move continuously, affecting a given area for a brief time. The area of impact would be small relative to the water column habitat available for ichthyoplankton, consistent with entrainment analyses for other offshore wind farms in Southern New England (BOEM 2019). Species entrained would vary by location, water depth, and season. Although entrained organisms would likely be killed, the loss would not be detectable against the background of existing vessels, including hydraulic scallop and clam dredges, in the Project Area.

Disturbance of Common Softbottom Sandy Habitat. Larger sandwaves are maintained by current flow into and out of New York Harbor in the nearshore portion of the submarine export cable corridor; this high-flow area of sandwaves is designated EFH for silver hake. Sandwaves increase habitat value for demersal species by providing topographic relief where fish can shelter from high current flow and hide from predators and prey (Auster et al. 2003; Lock and Packer 2004; Hallenbeck et al. 2012). The pre-sweeping, pre-lay grapnel runs, and cable installation would disturb the sand ripples temporarily, but tidal and wind-forced bottom currents would reform most ripple areas within days to weeks (Kraus and Carter 2018). Areas that are more strongly influenced by extreme weather events would reform in response to Nor'easters and tropical systems. Benthic organisms in soft-sediment coastal environments are well adapted to shifts in the location of sand waves and sand ripples as natural processes constantly reshape the mobile sediments to create a dynamic mosaic of microhabitats (NOAA Fisheries 2018b). The sandwaves and sand ripples would reform and provide pre-construction conditions within a few months of cable installation. The only permanent alteration of habitat would be up to 6.29 ac (2.55 ha) of softbottom in the cable corridor that is converted to hardbottom by cable armoring. The remainder of the submarine export cable corridor would remain softbottom habitat.

Minor Short-Term Increase in Project-related Noise and Vibrations. The Project will generate noise during construction that could directly and indirectly affect marine fish and invertebrates. Construction activities such as jettting, Project-related vessel noise, and pile driving associated with the bulkhead replacement at SBMT will temporarily increase underwater noise in the Project Area; this increase in noise would have the potential to indirectly impact fish and invertebrates.

Sudden loud noises can cause behavioral changes, permanent or temporary threshold shifts, injury, or death (Popper and Hastings 2009; Popper et al. 2014; Popper and Hawkins 2016; Andersson et al. 2017). Extended exposure to mid-level noise or brief exposure to extremely loud sound can cause a permanent threshold shift, which leads to long-term loss of hearing sensitivity. Less-intense noise may cause a temporary threshold shift, resulting in short-term negligible and reversible loss of hearing acuity (Buehler et al. 2015).

The potential impact of underwater noise is influenced by the physiology of the receiver, the magnitude of the sound, and the distance of the receiver from the sound. Fish and invertebrates may be sensitive to both sound pressure and particle motion (oscillation of water molecules set in motion by sound) generated by underwater construction. While all marine fish and invertebrates can detect particle motion, fish with swim bladders connected to the ear are most sensitive to sound pressure (Popper and Hawkins 2018; Hawkins and Popper 2018; Popper et al. 2014) (**Table 4.6-3**).

Table 4.6-3 Relative Sensitivity of Fish and Invertebrates to Sound

Morphological Type	Vulnerability to Barotrauma	Vulnerability to Sound Pressure	Typical Species in Project Area
No swim bladder or other gas-filled organ linked to hearing	Low	No	***Fish***: flounders, sharks, rays, some eggs and larvae ***Invertebrates***: squid, clams, whelk, crabs, lobster
Swim bladder not related to hearing	Medium	No	Sturgeons, striped bass, yellowfin and bluefin tuna, some eggs and larvae
Swim bladder or gas-filled organ related to hearing	High	Yes	Atlantic cod, haddock, herring

Fishes in the field exhibit various reactions to pile driving noise; in south Florida, the sheepshead (*Archosargus probatocephalus*) remained for 10 days in a pile driving area while the grey snapper (*Lutjanus griseus*) left the area after only three days (Iafrate et al. 2016). The study of noise effects on marine invertebrates has lagged behind fish and other vertebrates (de Soto et al. 2016). In a prior study, a marine mussel and hermit crab were reported to detect and respond to sound-generated vibrations of the sediment itself, suggesting acoustic pathways not typically measured or modelled (Popper and Hawkins 2018 and references within).

During Project construction, pile driving used to install the replacement bulkhead at SBMT and the landfall cofferdam would temporarily elevate underwater sound pressure and particle velocities, which could impact marine wildlife fish and invertebrates in the vicinity. Atlantic sturgeon could be exposed to pile driving noise during installation of the cofferdam (see Section 4.7). However, the bulkhead and cofferdam would be constructed within a relatively confined area between piers along the Brooklyn shoreline. In general, vibratory pile driving is less noisy than impact pile driving. Impact pile driving produces a loud impulse sound that can propagate through the water and substrate whereas vibratory pile driving produces a continuous sound with peak pressures lower than those observed in pulses generated by impact pile driving. If impact hammer installation is required, additional consultation with NOAA Fisheries would be conducted to determine appropriate mitigation measures to minimize temporary impacts.

Vessels used for construction would introduce noise into the Project Area. Construction vessel noise does not differ substantively from noise generated by other commercial vessels moving slowly while trawling or idling in an area. Noise generated during cable laying (using jetting or similar equipment) and associated activities (such as pre-sweeping and cable protection installation) would be similar to other diesel-powered vessels. The noise of maintenance dredging was determined not to differ from vessel background sounds and to pose no barrier to migratory behavior of fishes in New York Harbor (USACE NYD 2015b). The acoustic impact of vessels on fish and invertebrates would be short-term, localized and minor.

4.6.4.2 Operations

During operations, the presence and maintenance of new energized buried submarine export cables and cable protection materials may result in the following impacts on fisheries and benthic resources:

- Short-term negligible underwater noise/vibration;
- Short-term negligible changes in water quality (turbidity, incidental spills, and marine debris);
- Short-term minor increase in Project-related EMF;
- Long-term minor disturbance, displacement, and/or modification of habitat and the introduction of artificial habitat; and
- Long-term moderate risk of bottom disturbance secondary to interaction with fishing gear and vessel anchors.

Underwater Noise/Vibration. O&M activities will introduce intermittent underwater noise in the Project Area. Noise from Project-related operations and support vessels would not contribute substantially to ambient noise levels in the Project Area. Vessel activity will be within the ambient noise area of established shipping channels and industrial ports and will be indistinguishable from those sound sources. The acoustic impact of O&M vessels on fish and invertebrates would be intermittent and negligible.

Changes in Water Quality (turbidity, incidental spills, and marine debris). During operations, routine maintenance activities have the potential to result in temporary increases in turbidity and sedimentation in the Project Area. Potential impacts to water quality resulting from turbidity are further discussed in Section 4.2. The increase in turbidity and/or release of contaminants from re-suspended sediments is not expected to exceed background levels during natural events. Turbidity events would be transient and impacts on fisheries and benthic resources would be negligible.

All Project-related vessels operate in accordance with laws regulating the at-sea discharges of vessel-generated waste. The Applicant has developed an OSRP that details measures proposed to avoid, minimize, and mitigate inadvertent releases and spills from vessels. Vessel crews will be trained to implement written protocols should a spill event occur.

Long-Term Increase in Project-related EMF and Thermal Gradient. The submarine export cables would generate EMF in the Project Area, as described in Section 4.13. A recent review of potential effects of the weak EMF generated by alternating current undersea power cables associated with offshore wind energy projects concluded that such cables would not negatively affect any fishery species in Southern New England, because the frequencies are not within the range of detection for these species (Snyder et al. 2019). Nevertheless, the Applicant has committed to minimize detectable EMF by sufficiently burying electrical cables wherever feasible and by installing cable protection measures where sufficient burial depth is not achieved.

Numerous studies of EMF emitted by subsea alternating current cables reported no interference with movement or migration of fish or invertebrates (Hutchison et al. 2018; Love et al. 2017; Rein et al. 2013); no adverse or beneficial effect on any species was attributable to EMF (Snyder et al. 2019; Copping et al. 2016). A review of effects of EMF on marine species in established European offshore wind farms suggested that heat generated by electrified cables should be further investigated (Rein et al. 2013); however, follow-up analysis of thermal effects of subsea cables on benthic species concluded that effects were negligible because cable footprints are narrow, and the small amount of thermal output is easily absorbed by the sediment overlying buried cables (Taormina et al. 2018; Emeana et al. 2016). Thermal gradients do not form above the buried cables because the overlying water is in constant motion. At Block Island Wind Farm off the Rhode Island coast, buried subsea cables were determined to have no effect on Atlantic sturgeon or on any prey eaten by whales or sea turtles (NOAA Fisheries 2015), which includes most fish and macroinvertebrates.

Given the data from operational wind projects, field experiments in Europe and the United States (Snyder et al. 2019; Kilfoyle et al. 2018; Taormina et al. 2018; Wyman et al. 2018; Love et al. 2017; Dunlop et al. 2016; Gill et al. 2014), modeling results of potential effects of EMF on fish and invertebrates in the Project Area, and the Applicant's commitment to cable burial, impacts of energized cables on fish and invertebrates would be negligible. No adverse effect of existing subsea cables offshore or in state waters of New York has been demonstrated for any marine resource (Copping et al. 2016; NYSERDA 2017a). Electric and magnetic fields generated by the buried export cables would be detectable by some benthic fish and invertebrates but would not adversely impact individuals or populations (Snyder et al. 2019).

Disturbance, Displacement, and/or Modification of Habitat and Introduction of Artificial Habitat. The placement of cable protection and scour protection materials over the submarine export cable will result in the conversion of some softbottom habitat to artificial hardbottom habitat. The Applicant has conservatively assumed that 10 percent of the submarine export cable route would require armoring (surface protection), mostly in areas where sufficient burial cannot be achieved (e.g., at cable and pipeline crossings). A 15 ft (5 m) wide cable protection area was conservatively assumed. Approximately 6.32 ac (2.55 ha) of the 15.1 nm (28.1 km) long submarine export cable corridor would be armored.

The armored areas would be colonized by organisms that attach to hard substrate (e.g., sessile anthozoans, sponges, bryozoans, mussels), mobile macroinvertebrates such as crabs, and small demersal fish (NOAA Fisheries 2015). Organisms would emigrate from adjacent habitats or recruit from the plankton and reestablish the infaunal and epifaunal communities in adjacent softbottom habitats.

On balance, the Project's impact on benthic and pelagic habitat would be either neutral or beneficial to most fish and invertebrates (Hooper et al. 2017). While the presence of new hardbottom may influence local distributions of demersal fish and invertebrates on a small spatial scale, no population-level effects are expected. Structure-associated species such as black sea bass and others may benefit from the expanded habitat. The new infrastructure would neither harm nor benefit demersal species that prefer open sandy bottoms, such as surfclam and flounders, because sandy bottom is not a limiting feature in the Project Area; therefore, impacts are expected to be minor.

Bottom disturbance secondary to interaction with fishing gear and vessel anchors. The presence of the submarine export cables is not expected to restrict access to traditional fishing grounds along the submarine export cable route. The Applicant will determine through a CBRA the appropriate target burial depth for submarine cables, informed by engagement with regulators and stakeholders (including commercial fisheries stakeholders), extensive experience with submarine assets, and based on an assessment of seabed conditions and activity (including fishing) in the area. Additional information on target burial depth will be provided with the Project's EM&CP. The target burial depth accounts for seabed mobility and the risk of interaction with external hazards such as fishing gear and vessel anchors, while also considering other factors such as existing navigational routes.

Information from the subsea telecommunications cable sector can provide insight to the discussion of offshore wind cable burial depth. Northern New Jersey and southern central Long Island have long been hubs where multiple existing international fiber optic subsea telecom cables land. There are currently approximately ten active international cables originating from northern and central New Jersey and an additional ten from Long Island. During the 1980s and 1990s, regional submarine telecom cables experienced several cases of damage from hydraulic clam dredges. During that period the typical target burial for such a cable was 2-3 ft (0.6-0.9 m) into the sediment. Since the year 2000, mainly for protection from such dredges, all new subsea telecom cables in this region have targeted burial of at least 5-6 ft (1.5-1.8 m) into the sediment. Subsea cable company sources report that regional damage rates at this target burial depth have been reduced to near zero (NASCA 2019).

The Applicant will install Distributed Temperature and Distributed Vibration Sensing equipment to monitor the submarine export cables. The Distributed Temperature Sensing system will be able to provide a real time monitoring of temperature along the submarine export cable route and will alert the Applicant should the temperature change, which often is the result of scouring of material and cable exposure. The Distributed Vibration Sensing system will provide real time vibration monitoring close to the cables indicating potential dredging activities or anchor drag occurring close to the cables. In the event of a fault or failure of the offshore components, the Applicant will repair and replace the Project component in a timely manner. Should the submarine export cables fault, the affected portion of the cable will be spliced and replaced with a new, working segment.

Additionally, the location of the submarine export cables and associated cable protection will be provided to NOAA's Office of Coast Survey after installation is completed so that they may be marked on nautical charts. Frequency of cable burials after the initial post-lay survey will depend on the findings of the initial surveys (i.e., site seabed dynamics and sediment conditions).

The submarine export cable corridor is engineered to minimize areas where burial might be hindered by seabed conditions including hard grounds, variable glacial tills, areas of steep slopes, and shallow or surficial hardbottom or ledge. In certain locations where target burial depth is not achieved, cable protection may be required. However, in areas where firm seabed prevents deep burial by specialized cable tools, it is less likely that common fishing gear including trawls and dredges would penetrate such firm seabed. The activities requiring deepest burial in the Project Area are ship anchoring and clam dredging.

It is anticipated that cable protection will have minimal impact to the existing fisheries regime, as areas where the seabed dictates cable protection is needed are often found in proximity to other natural snags, and therefore are not likely trawled or dredged. Should an area of surficial hardbottom or a subsea asset crossing necessitate external protection of the cables (i.e., crushed rock), that area of bottom could become a snag to trawling or dredging (i.e., due to the potential for gear hangs). These areas may have already been known seabed obstructions (snags) prior to construction, as they often represent pre-existing surficial obstructions to burial that were unavoidable; however, some loss of grounds is likely to occur due to cable protection methods (see **Exhibit E-6**). Areas along the path of these existing assets may be considered ground lost to mobile gear.

Additionally, to decrease the risk of gear snagging where target burial depth cannot be achieved and there is evidence of these fishing practices, the Applicant has committed to limit the use of concrete mattresses, except where required for certain asset crossing locations. Cable protection, when applied, will be designed to minimize the potential for gear snags, as feasible. Fixed gear fishing around such deployments would continue as normal or with the potential benefit of additional seabed structure. Further, additional mitigation to avoid and reduce impacts (e.g., route planning, burial depth surveys, feedback based on fisheries input, etc.) will minimize the impacts of the export cable on fishing.

The varying perception of fishing over subsea cables has been considered by the Project since it was initially raised. Some fishermen have indicated that they would be concerned about fishing over buried subsea cables, regardless of how deeply the cables were buried, although this concern was mainly focused on areas with higher densities of cable such as within the Lease Area. Other captains stated that they would have no concerns towing over cables. Other fishermen have advised they would fish over sufficiently buried cables.

4.7 Important Habitats and Protected Species

Pursuant to 16 NYCRR § 86.5, this section describes important habitats and protected species that have been observed, or have the potential to occur, in or near the Project Area, and discusses potential impacts within New York State's jurisdiction to those important habitats and protected species resulting from the construction, operation, and maintenance of the Project. This section also describes the proposed Project-specific measures adopted by the Applicant to avoid, minimize, and/or mitigate potential impacts to important habitats and protected species. General impacts to terrestrial vegetation and wildlife are addressed in Section 4.5 and impacts to marine habitats and aquatic species are further described in Section 4.6.

4.7.1 Important Habitats and Protected Species Studies and Analysis

Existing important habitats and protected species in the vicinity of the Project were reviewed using a combination of desktop analyses of publicly available data, technical reports, and scientific literature; targeted field surveys; and agency correspondence. The offshore Project Area consists of the submarine export cable corridor, and the onshore Project Area consists of the onshore cable corridors and the onshore substation.

Protected species include species listed under the ESA, New York's State Endangered Species Act, Environmental Conservation Law §11-0535, and Endangered and Threatened Species Regulations, 6 NYCRR Part 182, as well as other protections such as the Bald and Golden Eagle Protection Act of 1940, the Migratory Bird Treaty Act, the Marine Mammal Protection Act of 1972 (MMPA), and the Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended. Important habitats include designated critical habitats under the ESA, EFH under the Magnuson-Stevens Fishery Conservation and Management Act, and other state-designated and mapped sensitive habitat areas.

4.7.1.1 Onshore Studies and Analysis

A desktop review of the onshore Project Area was conducted using the following resources:

- 2016 National Land Cover Dataset: Land Cover Conterminous United States (USGS 2016);
- NYSDEC Wildlife Management Areas (NYSDEC, n.d.);
- NYSDOS Significant Coastal Fish and Wildlife Habitats-2.0 (NYSDOS 1998);
- NYSDEC Natural Heritage Community Occurrences (NYSDEC 2018);
- Google Earth Historical Aerial Imagery, 1994–2018, Brooklyn, New York; and
- USFWS Information for Planning and Consultation (IpaC) (USFWS 2018a).

Natural Heritage Database inquiries were submitted to NYSDEC Division of Fish and Wildlife on January 16, 2019; June 26, 2019; July 10, 2020 and April 20, 2021 to determine potential New York State and federally protected wildlife species likely to be present in or near the Project Area, with responses received on February 14, 2019; July 30, 2019; and August 21, 2020, respectively. Correspondence was updated as refinements were made to the Project location.

The NYSDEC provided a list of species that have been documented in the vicinity of the onshore cable routes and the onshore substation. An official Species List was also obtained from the USFWS IPaC project planning tool to identify threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitats that may be present within or in the immediate vicinity of the Project Area. Additional onshore marine resource species data (for seals) were obtained using desktop analyses of published, peer-reviewed, geographically relevant papers and technical reports. Relevant agency correspondence is provided in **Appendix A**.

Avian resources were also assessed based on a review of the New York Wildlife Action Plan (NYSDEC 2015). Data on possible bird species present in the vicinity of the Project Area was primarily compiled from eBird citizen science data (Sullivan et al. 2009; eBird 2019).

On December 5, 2018, the Applicant conducted field reconnaissance of habitats and wildlife from publicly accessible locations as part of a preliminary assessment of the onshore Project Area. Due to the developed nature of the onshore Project Area, it is not expected that significant changes have occurred since the site visit, and additional field work is not warranted.

4.7.1.2 Offshore Studies and Analysis

A desktop review of the offshore Project Area was conducted using the following resources:

- NOAA National Estuarine Research Reserves (NOAA 2018);
- NOAA EFH Mapper (NOAA Fisheries 2018a);
- NYSDOS Significant Coastal Fish and Wildlife Habitats-2.0 (NYSDOS 1998);
- USFWS IPaC (USFWS 2018a); and
- NOAA Fisheries Stock Species Assessments (Hayes et al. 2018, 2019).

Avian resources were also assessed based on a review of the New York Wildlife Action Plan (NYSDEC 2015). Data on possible bird species present in the vicinity of the offshore Project Area was primarily compiled from eBird citizen science data (Sullivan et al. 2009; eBird 2019).

In addition, this section relies on publicly available information (including existing scientific literature or reports of sightings, such as from newspapers or other historical accounts), agency data from the NOAA Species Directory (NOAA Fisheries 2019a), scientific publications and technical reports, survey data, and geospatial sighting information retrieved from the Ocean Biogeographic Information System datasets (Roberts et al. 2016b, 2016c, 2017, and 2018; Halpin et al. 2009). Other information sources relied upon for marine species include the NOAA Fisheries ESA Section 7 mapper tool (NOAA Fisheries 2020), as well as data from the New York Audubon Society, the New England Aquarium Marine Animal Rescue Program, and the Riverhead Foundation.

Survey data were reviewed from Protected Species Observer vessel-based visual sighting reports and Passive Acoustic Monitoring acoustic detection reports from surveys initiated by the Applicant during offshore Project-related vessel-based survey activities in 2018 and 2019 (AOSS 2019; A.I.S. 2019). The Applicant also reviewed the digital-camera aerial survey report by the New York State Energy Research and Development Authority (NYSERDA, APEM and Normandeau Associates 2018a, 2018b) and NYSDEC visual-observer line transect aerial survey data reports (Tetra Tech and SES 2018; Tetra Tech and LGL 2019 and 2020). These surveys recorded sightings of avian species; fish species including sharks, rays, and large fish assemblages; marine mammals; and sea turtles. These surveys occurred predominantly in federal waters; however, since marine-protected species are mobile, information collected in nearby waters informs potential species presence in Project Area waters.

Additional data sources not specific to the EW 1 Project were reviewed for due diligence because marine species are mobile biological resources. These sources included published literature on sighting and acoustic data findings, as well as regionally specific survey data.

4.7.2 Existing Important Habitats and Protected Species

The affected environment, as described in this section, is defined as the offshore, coastal, and onshore areas that have the potential to be directly affected by the construction, operation, and maintenance of the Project.

The offshore Project Area includes the submarine export cable corridor from the New York State boundary 3 nm (5.6 km) offshore to the cable landfall at SBMT in Brooklyn, New York. The offshore Project Area includes a variety of marine and estuarine habitats of the westernmost New York Bight and Upper and Lower New York Bay, Gravesend Bay, and Gowanus Bay, as further described in Sections 4.2 and 4.6.

The onshore substation and onshore cable routes are located within the urbanized landscape in the New York metropolitan area along or within an existing developed property or roadway corridor. The cable landfall, EW 1 onshore export cable, and onshore substation are located at SBMT, a commercial shipping terminal that is largely devoid of natural habitat. From the onshore substation, the interconnection cable route proceeds northeast along 2nd Avenue to the POI, at the existing Gowanus 345-kV Substation. Based on the 2016 NLCD, the onshore components of the Project are situated within developed lands of variable development intensity. As such, expected wildlife is limited to scavengers and other species adapted to living in association with human disturbance and noise, such as gulls, pigeons, and small rodents.

4.7.2.1 Protected Species

Federally and state listed threatened and endangered species identified as potentially occurring in the Project Area based on the USFWS IPaC (2018a), NOAA Fisheries ESA Section 7 mapper tool (2020), Stock Reports (Hayes et al. 2018, 2019), NYSDEC correspondence, and other reviewed data sources are summarized in **Table 4.7-1**. No critical habitats, NYSDEC Areas of Concern, Critical Environmental Areas, NYSDOS Significant Coastal Fish and Wildlife Habitats, or Significant Natural Communities have been identified in the Project Area (see **Appendix A** for agency correspondence and Section 4.7.2.2 for additional discussion).

Table 4.7-1 Federally and State Listed T&E Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Location/Habitat within the Project Area	New York Status b/	Federal Status
Plants				
Seabeach amaranth	*Amaranthus pumilus*	Not Identified	T	T
Birds				
Peregrine falcon	*Falco peregrinus*	Verrazano-Narrows Bridge (Nesting)	E	DL
Piping plover	*Charadrius melodus*	Not Identified	E	T
Red knot	*Calidris canutus rufa*	Not Identified	T	T
Roseate Tern	*Sterna dougallii dougallii*	Not Identified	E	E
Marine Mammals				
North Atlantic right whale	*Eubalaena glacialis*	Offshore waters	E	E
Humpback whale	*Megaptera novaeangliae*	Offshore Waters and Nearshore/ Coastal	E	DL
Fin whale	*Balaenoptera physalus*	Offshore Waters	E	E

Table 4.7-1 Federally and State Listed T&E Species Potentially Occurring in the Project Area (continued)

Common Name	Scientific Name	Location/Habitat within the Project Area	New York Status	Federal Status
Sea Turtles				
Atlantic (Kemp's) ridley sea turtle	*Lepidochelys kempii*	Nearshore	E	E
Loggerhead sea turtle	*Caretta caretta*	Nearshore and Offshore	T	T
Green sea turtle	*Chelonia mydas*	Coastal	T a/	T/E a/
Leatherback sea turtle	*Dermochelys coriacea*	Coastal; and Offshore	E	E
Finfish				
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	Coastal and offshore	NL	E
Shortnose sturgeon	*Acipenser brevirostrum*	Hudson River	E	E

Notes:
a/ Individuals from the threatened population of the North Atlantic District Population Segment are more likely to be found in the Project Area.
b/ T= Threatened, E=Endangered, DL= Delisted, NL= Not listed

NYSDEC recently issued a pre-proposal to change the protection status of several species due to documented growth or decline in populations (NYSDEC 2019c). This includes a downgrade in status for those listed species that have experienced population growth, and an upgrade in status, or a newly assigned status for previously unlisted species, due to documented population declines. The peregrine falcon is listed as potentially being downgraded from a state-listed endangered species to a state-listed Species of Special Concern. Likewise, the humpback whale is proposed to be removed from the list. The Atlantic sturgeon is listed as a potential addition to the list as endangered. A 90-day public comment period on the pre-proposal was held from October 25, 2019 to January 24, 2020, and a formal proposal to revise the protection status of these species is pending[6].

Plants

One federally listed threatened plant species, the seabeach amaranth (*Amaranthus pumilus*), was identified on the USFWS IPaC (2018a) as potentially present within and/or near the onshore components of the Project. However, the onshore Project Area is located in an urban and developed environment that is nearly devoid of vegetation and generally unsuitable to support protected plant species. The seabeach amaranth is a relatively small, low-growing, herbaceous annual flowering plant considered threatened under the ESA and in New York State. It emerges from April to July, exhibiting branching, prostrate growth, with clusters of small round leaves at the ends of pink-red stems. Typically, plants are only 20-40 cm in diameter. The plants bear small, wind-pollinated yellow flowers in the leaf axils, beginning in June (NJDEP, n.d.).

Seabeach amaranths occur in dynamic coastal habitats consisting of wide barrier beaches, usually over 20 m wide, and typically inhabit between the wrack line and the first dune (NYNHP 2020a). The combination of

[6] As of May 7, 2021, the NYSDEC website indicates that there is currently no timetable for regulatory changes to the list of endangered species, due to the impacts of COVID-19 (NYSDEC 2021).

wind and water seed dispersal and shifting coastal habitat means the species may disperse and colonize temporary habitats as they become available (NJDEP, n.d.). In New York, the seabeach amaranth's known distribution is on the south coast of Long Island, from Coney Island to South Fork (NYNHP 2020a). Extant populations are threatened by the loss of such habitat due to development for recreation, hard structures, and beach stabilization by bulkhead, seawalls, or riprap, and public use. The species is also thought to be susceptible to consumption by native webworms (NJDEP, n.d.).

Based on the expected distribution in New York and the lack of suitable barrier beaches, this species is not expected to occur in the Project Area. Seabeach amaranth is not recorded in the New York Natural Heritage Program database in the vicinity of the onshore Project Area, according to the list provided by NYSDEC.

Birds

Based on the USFWS IPaC (2018a) review, three species listed under the ESA may be present in the vicinity of the Project Area: the piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), and roseate tern (*Sterna dougallii*). Additionally, correspondence from NYSDEC indicated that the peregrine falcon (*Falco peregrinus*), currently listed as a state endangered species, may be present in the vicinity of the submarine export cable route, as there is a documented breeding occurrence on the Verrazzano-Narrows Bridge (see **Appendix A** for agency correspondence).

Onshore habitats in and near the Project Area are significantly altered by human development and are primarily used for industrial and commercial operations. The area surrounding the onshore Project Area serves as a transportation and service corridor, and associated infrastructure is a dominant feature. Due to the mobility of birds, a variety of species have the potential to pass through the Project Area; however, the highly developed nature of the area does not provide important bird habitat for native species or species of conservation concern.

A variety of bird species protected under the Migratory Bird Treaty Act, potentially including marine species such as loons, seaducks, and tubenoses; coastal bird species such as shorebirds, wading birds, raptors, coastal waterbirds, and waterfowl; as well as migratory songbird and passerine species; have the potential to transit through the coastal and offshore areas traversed by the submarine export cable corridor. A total of 65 bird species protected under the Migratory Bird Treaty Act of 1918 were identified in the USFWS IPaC. However, these species are unlikely to be affected by the temporary nature of potential disturbance associated with cable laying and related offshore construction activities for the Project, so they are not addressed further in this section. Species of loons, waterfowl, tubenoses, gulls, and terns are likely to use marine habitats along the submarine export cable route for foraging; however, the disturbance associated with construction will be short term and confined to a relatively small area, so permanent loss of foraging habitat or prey species is not anticipated. During construction activities, avian species, including migrants and passerines, may be attracted to construction equipment and/or vessel lighting; however, associated impacts would be similar to other vessel traffic in the area. Additional information on wildlife and wildlife habitats is provided in Section 4.5, Terrestrial Vegetation and Wildlife, and state and federally listed species are discussed in more detail below.

Piping Plover (*Charadrius melodus*)

Piping plovers are small shorebirds present in New York during spring and fall migratory periods and during the breeding season (USFWS 2019b). Piping plovers are also state listed as endangered in New York. In New York, piping plovers breed on Long Island's beaches (from Queens to the Hamptons), in the eastern bays, and in the harbors of northern Suffolk County (NYSDEC 2019d). They breed above the high tide line along the coast, primarily on sand beaches (USFWS 2019b). Non-migratory movements in May–August appear to be exclusively coastal (Burger et al. 2011). Piping plovers make nonstop long-distance migratory flights

(Normandeau Associates Inc. 2011), or offshore migratory "hops" between coastal areas (Loring et al. 2017). Due to the developed nature of the shoreline and lack of suitable breeding or foraging habitat at the cable landfall and in the onshore Project Area, piping plovers are unlikely to be present.

Red Knot (*Calidris canutus rufa*)

Red knots are arctic breeding shorebirds that winter on the southeast U.S. coast, Caribbean, and South America; therefore, they are only present in the New York area during migratory periods (BOEM 2016a; Loring et al. 2018). The fall migration period is generally July–October, but birds may pass through as late as November (Loring et al. 2018). Migration routes appear to be highly diverse, with some individuals flying out over the open ocean from the northeastern U.S. directly to stopover/wintering sites in the Caribbean and South America, while others make the ocean "jump" from farther south, or follow the U.S. Atlantic coast for the duration of migration (Baker et al. 2013). While at stopover locations, red knots make local movements (e.g., commuting flights between foraging locations related to tidal changes), but are thought to remain within 3 mi (5 km) of shore (Burger et al. 2011). Stopover foraging habitat typically consists of tidal flats and shores, and occasionally sandy beaches, where they feed on mollusks, small clams, snails and other invertebrates (USFWS 2013). Due to the developed nature of the shoreline at the cable landfall and in the onshore Project Area, red knots are unlikely to be present.

Roseate Tern (*Sterna dougallii dougallii*)

Roseate terns are agile coastal waterbirds, with a silvery-gray back, white underparts, black cap, and long wings and tail. Like other terns, they feed from the air with sand lance as their primary prey (NYSDEC 2019e). The northeastern North American population are colonial breeders from the maritime provinces of Canada to New York, on the southern edge of their extant breeding range, where they can use a variety of habitats including rocky islands, barrier beaches, and saltmarsh (NYSDEC 2014b). Within New York, breeding is only known from a few colonies and offshore islands of Long Island (NYSDEC 2019e). Roseate terns arrive on breeding grounds in late April to early May and depart in late summer (August/September), with the northeastern population wintering primarily in northern South America (USFWS 2011). Threats to breeding habitats include coastal development, rising sea levels, human disturbance, predation, and climate change (NYNHP 2020b). Due to the developed nature of the shoreline at the cable landfall and in the onshore Project Area, and the lack of suitable breeding habitat or colonies in the vicinity, roseate terns are unlikely to be present.

Peregrine Falcon (*Falco peregrinus*)

Peregrine falcons (*Falco peregrinus*) are diurnal raptors known for speed and agility. They are relatively large falcons, with adults typically slate gray to gray brown above and dark barred below. They are wide ranging, inhabiting many different upland and coastal habitat types, and usually take bird prey. Peregrine falcons may be present year-round in New York. Nests are typically built on ledges, whether natural rock or artificial structures (NYSDEC 2020b). NYSDEC indicated that the peregrine falcon (*Falco peregrinus*) may be present in the vicinity of the submarine export cable route, as there is a documented breeding occurrence on the Verrazzano-Narrows Bridge.

Since peregrine falcons are known to breed on anthropogenic structures in New York City, including the Verrazzano-Narrows Bridge, they could be present in and around the Project Area.

Marine Mammals

All marine mammal species are protected under the MMPA (50 CFR § 216), as amended in 1994. Within the framework of the MMPA, marine mammal populations are further defined into a "stock" which is defined as "a group of marine mammals of the same species or smaller taxa in a common spatial arrangement that interbreed when mature" (16 U.S.C. § 1362). The MMPA prohibits the "take" of marine mammals, which is defined under the MMPA as the harassment, hunting, or capturing of marine mammals, or the attempt thereof. "Harassment" is further defined as any act of pursuit, annoyance, or torment, and is classified as Level A (potentially injurious to a marine mammal or marine mammal stock in the wild) and Level B (potentially disturbing a marine mammal or marine mammal stock in the wild by causing disruption to behavioral patterns).

In addition, some marine mammal species found in U.S. waters are listed and protected under the ESA (16 U.S.C. § 1531). The ESA protects endangered and threatened species and their habitats by prohibiting the take of listed animals. Under the ESA, to "take" a listed endangered or threatened species is to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. All marine mammals listed in **Table 4.7-1** as endangered under the federal ESA (except for the humpback which, which was removed from the ESA list in 2016 but remains state listed for now pending proposed changes described above) are additionally protected by the MMPA.

Marine mammals inhabit all of the world's oceans and are highly mobile, so they can be found in coastal, estuarine, and pelagic (offshore) habitats. There are 38 marine mammals (cetaceans and pinnipeds) found in the northwest Atlantic Outer Continental Shelf (OCS) regional waters with portions of their documented ranges in the vicinity of the Project. Federally or state-listed T&E marine mammals with the potential to occur in the Project Area are listed in **Table 4.7-1**; however, in general most of these species are not expected to be found except for incidental occurrences. A few species are more likely to occur as detailed below.

MMPA species that may occasionally be present in nearshore waters (meaning waters along the shoreline) of the Project Area include cetacean species (whales) and pinnipeds (seals); the most likely are: humpback whale (*Megaptera novaeangliae*) (currently endangered in New York State, with a pending proposed change to the listing status as described in Section 4.7.2.1), minke whale (*Balaenoptera acutorostrata*), bottlenose dolphin (*Tursiops truncatus*), harbor porpoise (*Phocoena phocoena*) (considered as a Species of Special Concern in New York State), harbor seal (*Phoca vitulina*), and gray seal (*Halichoerus grypus*).

In year-round acoustic studies conducted using permanent buoys in the New York Bight, the sei, fin, right, and humpback whales were the most frequently detected large whales (WHOI 2018) in waters offshore of the Project Area. Most of the large whales found in EW 1 Project waters are the baleen whales (a whale that has plates of whalebone in the mouth for straining plankton from the water). The sperm whale is the only large odontocete whale (whales with teeth) known to occur in New York waters but it would be found mainly offshore. Of the large whales most frequently detected in EW 1 Project Area waters, the humpback (ESA delisted) and fin whale (ESA endangered) are present year-round (have been sighted or acoustically detected in all months) and can occur coastally. The ESA-listed North Atlantic right whale (right whale) occurs seasonally and has been sighted in all seasons except summer; it is acoustically detected year-round, albeit rarely in summer. The right whale is not expected in the Project Area as discussed further below.

The NOAA Fisheries ESA Section 7 mapper tool (NOAA Fisheries 2020) includes the area of the submarine export cable corridor from the New York State boundary through Lower New York Bay up to the Verrazzano-Narrows Bridge as having the potential for occurrence of Atlantic large whales. Additionally, correspondence from the NYSDEC identified both humpback whale and fin whale as species documented in offshore waters along the submarine export cable route. Historically, the Gowanus Canal (near the cable landfall) has been known for a multitude of whale and dolphin sightings. Dating back to 1928, whale hunts would occur in the canal, and records even show evidence of a sperm whale in the canal (New York Times 1928). Over the course of the last century, there have been other recorded whale and dolphin sightings, including the sighting of "Sludgie," the juvenile minke whale that stranded and eventually died in 2007 in the Gowanus Canal (Albrecht

2017). Additional historical references indicate that whales were plentiful in the area in the 1600-1800s, and a large decline was experienced due to increased water pollution from the early 1900s to the 1980s. As efforts to clean up the Hudson River and the waters surrounding Manhattan have been undertaken, there has been an increase in the number of whale sightings over the last 10 years. It was documented that 272 whales occurred in New York City waters in 2018 alone (Milman 2019), with a "boom" in large whales noted (Worrall 2019).

There are several seal haul out sites in New York, including the nearby Swinburne Island, Little Gull Island, and Jones Beach State Park (NYSDEC 2019f; Woo and Biolsi 2018; Riverhead Foundation for Marine Research and Preservation 2018; Save Coastal Wildlife 2019). Harbor seals generally predominate in the onshore haul out sites, but gray seals intermix and are present as well.

<u>North Atlantic Right Whale (Right Whale) (*Eubalaena glacialis*)</u>

The North Atlantic right whale is a migratory species that moves annually between high-latitude feeding grounds and low-latitude calving and breeding grounds. This species was listed as a federally endangered species in 1970 and is one of the most endangered large whale species in the world. It is considered critically endangered under the ESA and is listed as endangered in New York. North Atlantic right whales are typically found in feeding grounds within New England waters and the waters off of New York and New Jersey between February and May, with peak abundance in late March (Hayes et al. 2019). Most nearshore occurrences of right whales are along barrier islands along Long Island and none have been reported within the Lower Bay (Roberts et al. 2018; Halpin et al. 2009). Right whales feed mostly on copepods belonging to the *Calanus* and *Pseudocalanus* genera (McKinstry et al. 2013) and are considered "grazers" as they swim slowly with their mouths open when feeding. They are the slowest swimming whales, only reaching speeds up to 10 miles per hour (mph, 16 km/h). They can dive at least 1,000 ft (300 m) and typically stay submerged for 10 to 15 minutes, feeding on their prey below the surface (Jefferson et al. 2015).

Contemporary anthropogenic threats to right whale populations include fishery entanglements and vessel strikes, although habitat loss, pollution, anthropogenic noise, and intense commercial fishing may also negatively impact their populations (Kenney 2002). Most vessel strikes are fatal to this species (Jensen and Silber 2004). Right whales have difficulty maneuvering around boats and spend most of their time at the surface feeding, resting, mating, and nursing, increasing their vulnerability to collisions. To address the potential for vessel strike, NOAA Fisheries designated the nearshore waters of the Mid-Atlantic Bight as the Mid-Atlantic U.S. SMA for right whales in December 2008. The outermost portion of the submarine export cable corridor in New York traverses this SMA (**Figure 4.7-1**).

Aerial survey findings show peak right whale sighting rates in federal waters in early spring (Tetra Tech and SES 2018; Tetra Tech and LGL 2019 and 2020). The NYSERDA (APEM and Normandeau Associates 2018a. 2018b) aerial survey acquired photographs of right whales in winter and spring. Whitt et al. (2013) had detections in all months of the year with peak detection days in March through June. Permanent buoys deployed in the New York Bight by the Woods Hole Oceanographic Institution and Wildlife Conservation Society detected right whales mainly between December and January and again in March (WHOI 2018), although Estabrook et al. (2019) reported detections of right whale calls in all seasons and all months except August (note: several buoys were offline that August). Inter-annual variation, or perhaps seasonal differences in vocalization rates and surfacing times, may explain some differences in results from acoustic and aerial monitoring efforts, but further research and analysis would be necessary to determine this. These findings indicate that right whales are found in waters off of New York; however, right whales are expected to occur primarily in federal waters of the EW 1 Project and near the OCS, and are less likely to occur in New York State waters in the Project Area.

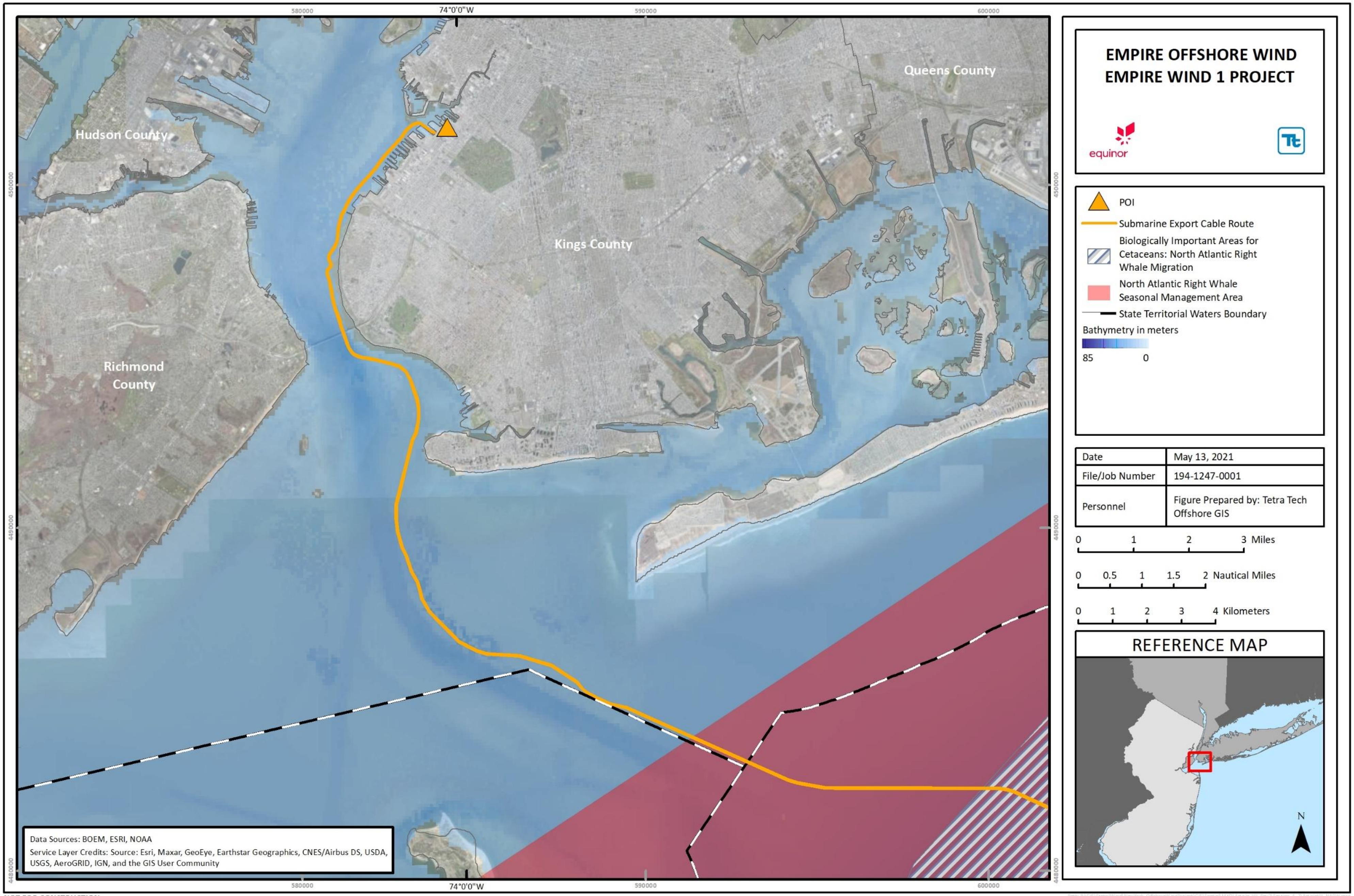


Figure 4.7-1 North Atlantic Right Whale Seasonal Management Area and Biologically Important Area

Fin Whale (*Balaenoptera physalus*)

The fin whale was listed as federally endangered in 1970 and is listed as endangered in New York. While fin whales typically feed from Maine to Virginia in the summer, mating and calving (and general wintering) areas are still largely unknown (Hayes et al. 2019). Fin whales are the second largest living whale species on the planet (Kenney and Vigness-Raposa 2010). Their gestation period is approximately 11 months, with females giving birth every two to three years, typically between late fall and winter. Fin whale hearing is in the low-frequency range (Southall et al. 2007; NOAA Fisheries 2018b). Present threats to fin whales are similar to threats to other whale species, e.g. anthropogenic noise, fishery entanglements, and vessel strikes.

The overall pattern of fin whale movement is complex, and the overall distribution may be based on prey availability, as this species preys opportunistically on both invertebrates and fish (Watkins et al. 1984). Generally speaking, based on survey data, density of fin whales offshore of New York is highest during spring, lower during summer and fall, and lowest during winter (e.g. Whitt et al. 2015; Kraus et al. 2016; Hayes et al. 2019), although studies (Whitt et al. 2015., APEM and Normandeau Associates 2018a, Normandeau Associates 2018b, Tetra Tech and SES 2018; Tetra Tech and LGL 2019 and 2020) have recorded fin whales during all seasons. Typically, fin whales occur farther offshore in federal waters, with nearshore sightings occurring along Long Island (Halpin et al. 2009).

These findings suggest that the fin whale will be found in waters off of New York; however, they would be expected to occur primarily in federal waters of the EW 1 Project and are less likely to occur in the Project Area.

Humpback Whale (*Megaptera novaeangliae*)

The humpback whale was listed as endangered under the ESA in 1970, but it was delisted on September 8, 2016 (81 Federal Register 62259). Under this new final rule, humpback whales along the East Coast of the United States are part of the West Indies Distinct Population Segment (DPS). While humpback whales are no longer federally listed, they are currently state listed as endangered in New York, and are protected under the MMPA. As discussed in Section 4.7.2.1, there is a pending proposed change to the listing status of humpback whales in New York.

Humpback whales feed on small prey and mainly feed while migrating and in summer feeding areas. This species exhibits consistent fidelity to feeding areas within the northern hemisphere and feeds over the continental shelf in the North Atlantic. Humpback whales migrate south in winter, where calves are born between January and March (Blaylock et al. 1995). Their hearing is in the low-frequency range (Southall et al. 2007; NOAA Fisheries 2018b). Present threats to humpback whales are similar to other whale species, e.g. anthropogenic noise, fishery entanglements, and vessel strikes.

Recent aerial survey data indicate that humpbacks occur in the vicinity of the EW 1 Project in all four seasons (Tetra Tech and SES 2018; Tetra Tech and LGL 2019 and 2020). Peak abundance typically occurs in spring and summer months. Overall, they are considered to be increasing in abundance in New York waters (Brown et al. 2018, 2019). They do occur coastally in increasing numbers and could occur in the Project Area. In 2017, one humpback whale made international news when it breached in front of a camera less than a few miles from Battery Park in New York (Milman 2019). Humpback whales are one of the most common species seen in New York Harbor with an increase in sightings in the last 10 years. The increase is attributed to two major factors: the cleanup and reduction of water-based pollution in the harbor, as well as an increase in prey fish species for these whales. These findings suggest that the humpback whales are likely to occur in Project Area waters and could occur in nearshore waters adjacent to the cable landfall.

Sea Turtles

There are five species of sea turtles that have been documented in or within the northwest Atlantic OCS region waters, which include the New York State waters of the Project Area. These species include, in order of likelihood, Atlantic (Kemp's) ridley (*Lepidochelys kempii*), loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), and the Atlantic hawksbill (*Eretmochelys imbricate*). All five are federally listed and have a status of either threatened or endangered in New York State. The hawksbill is considered unlikely to occur as only one historic (pre-1970) sighting record exists, and if seen, would be considered an incidental transient; therefore, the hawksbill will not be discussed further in this section.

It is possible that any of the remaining four species of sea turtles mentioned above could occur in nearshore portions of the Project Area, along the submarine cable corridor. The NOAA Fisheries ESA Section 7 Mapper (NOAA Fisheries 2020) indicates the possible presence of sea turtles throughout the offshore Project Area, through Lower and Upper New York Bay to the East River. Sea turtles spend their life at sea other than during nesting periods. There are no current habitual nesting sites in the New York coastline habitat; sea turtles typically migrate over 1,000 mi (1,600 km) from their northern latitude feeding grounds to nesting grounds either in the southern U.S. or in other countries to reproduce. In New York, sea turtles are known to occur throughout the nearshore waters as far north and west as the Lower Bay portion of Gowanus Bay. Juvenile sea turtles may occupy nearshore areas that contain algae or eelgrass habitat, as well as benthic habitat for species of mollusks and arthropods, the preferred diet of juvenile sea turtles (Morreale et al. 1992; Burke et al. 1994; Morreale and Standora 1998); however, the Project has been routed to avoid sensitive benthic habitats to the extent feasible.

There is no designated critical habitat for sea turtles in the Project Area. The four sea turtle species with the potential to occur in the offshore Project Area are described below.

<u>Atlantic (Kemp's) Ridley Sea Turtle (*Lepidochelys kempii*)</u>

The Kemp's ridley sea turtle is federally and state listed as endangered. It is the smallest of the Cheloniidae sea turtles (in the family of larger marine turtles, having a flat, wide, and rounded shell and paddle-like flippers). Adults average a carapace (top shell) length of about 2 ft (65 cm) and a weight of 99 pounds (lbs) (45 kilograms [kg]) and typically have a rounded shape and light gray coloring.

During early life stages, Kemp's ridley sea turtles inhabit open-ocean areas within the North Atlantic Ocean. Within the vicinity of the EW 1 Project, juveniles primarily occur (NYSERDA 2017b; APEM and Normandeau Associates 2018a, 2018b) during summer months when they feed in nearshore waters on blue crabs, mollusks, shrimp, fish, and plant material (USFWS 2018b).

Kemp's ridley sea turtles are one of the most frequently observed sea turtles in federal waters offshore of New York. They also can be found within shallow benthic environments, in nearshore or coastal New York waters, including in waters of the Long Island Sound and nearby Gardiner's Bay, Peconic Estuary, and Great South Bay. They also occur in Jamaica Bay and in the lower New York Harbor (NYSDEC 2019g).

Globally, the Kemp's ridley sea turtle is considered the most endangered sea turtle, as this species faces a number of threats from fisheries bycatch, entanglement, marine debris, noise pollution, vessel strike, and habitat loss (NOAA Fisheries 2019b). In 2010, it was reported that 53 percent of the Kemp's ridley sea turtles rescued in New Jersey since 1995 showed signs of human impact (NJDEP 2010). They are the most common sea turtle species subject to cold-stunning, a drop in sea surface temperature affects sea turtles, which is also considered a threat (NOAA Fisheries 2019c; NYSDEC 2019g).

This species occurs with some regularity both coastally nearshore in New York State waters, and in the federal waters of the EW 1 Project, particularly in summer but also into the fall. Thus, the Kemp's ridley sea turtle may occur in the Project Area.

Green Sea Turtle (*Chelonia mydas*)

Green sea turtles are listed as threatened by New York and are federally divided into several DPSs that have different ESA status listings. Individuals documented in the vicinity of the EW 1 Project (either as juveniles or adults) are most frequently from the North Atlantic DPS (federally listed as threatened).

As the largest species of the hard-shelled sea turtles, green sea turtle adults can reach a size of up to 330 lbs (150 kg) and a 3.3 ft (100 cm) carapace (NOAA Fisheries 2019b). "Green" refers to the color of their subdermal (beneath the skin) fat deposits and not to their external coloring. During the post-hatchling and early juvenile phase, green turtles have an omnivorous diet and are known to eat algae, invertebrates, and small fishes (Ernst et al. 1994). However, late juvenile and adult turtles maintain a primarily herbivorous diet of algae, seagrasses, and occasionally sponges and invertebrates (NOAA Fisheries 2019b).

The major threats facing this species include bycatch, harvesting of eggs, loss of nesting habitat, entanglement, vessel strikes, and disease (NJDEP 2006; USFWS 2018c; NOAA Fisheries 2019b). Green sea turtles are also subject to fibropapillomatosis, a disease that causes both internal and external tumors.

Green turtles can be found globally in both tropical and subtropical waters (Ernst et al. 1994). Generally, hatchlings are found in offshore areas for several years before traveling to nearshore foraging areas as juveniles (NOAA Fisheries 2019b). As adults, green turtles typically live in nearshore environments, bays, lagoons, reefs, and seagrass beds (NOAA Fisheries 2019b). Along the East Coast of the U.S., this species accounts for 10-20 percent of the inshore sea turtle fauna throughout the year (DoN 2005). They have been documented occurring in inshore coastal New York waters (meaning bays and estuaries protected from ocean surf), including waters of the Long Island Sound.

This species occurs in New York State waters in summer and less frequently in the fall and can be found (albeit infrequently) coastally nearshore. It is more common in federal waters near the EW 1 Project. The species may occur in the waters of the Long Island Sound, but is unlikely to occur in the Project Area.

Loggerhead Sea Turtle (*Caretta caretta*)

The loggerhead sea turtle is federally and state listed as threatened. This species derives its name from its relatively large head size. It is a larger hard-shell species that has a typical carapace length of 3 ft (92 cm) and an average weight of 249 lbs (113 kg). Post-hatchling loggerheads have been observed feeding on zooplankton, jellyfish, larval shrimp, and crabs (Carr and Meylan 1980). Adult turtles are believed to maintain a carnivorous diet of nearshore benthic invertebrates while juveniles are considered omnivores, feeding on crabs, mollusks, vegetation, and jellyfish (Dodd 1988).

The loggerhead can be found globally in both nearshore waters, including coastal estuaries, and offshore habitats throughout their lifespan (NOAA Fisheries 2019b). Threats to loggerhead turtle populations include bycatch, entanglement, vessel strikes, ingestion of marine debris, habitat loss, and harvest (USFWS 2018d). Loggerheads are considered one of the most abundant sea turtles in the United States. It is estimated that approximately 8,000-11,000 loggerheads can be found in northeastern region of the United States in the summer, and continental shelf waters in the mid-Atlantic have been identified as juvenile loggerhead feeding territory (NOAA Fisheries 2019b).

Loggerhead sea turtles are the most frequently documented sea turtle in New York waters as well. They inhabit different habitats during different lifecycle stages. Juveniles are most frequently found in nearshore bays and in waters of the Long Island Sound and other New York coastal areas, though sightings are rare within the Lower Bay (Halpin et al. 2009). Other age groups including adults are most often observed in federal waters. This species has the potential to occur in federal waters of the EW 1 Project and may occur but is unlikely to occur in the Project Area, as juvenile sightings are rare in the Lower Bay and adults are most often observed in federal waters.

Leatherback Sea Turtle (*Dermochelys coriacea*)

The leatherback sea turtle is listed as endangered by the federal government and by New York State. It is the largest of the sea turtle species, with a range in carapace length of 4 to 6 ft (130 to180 cm) and weight of 440 to 1,543 lbs (200 to 700 kg). Leatherbacks tend to maintain a diet heavily focused on jellyfish and salps, but have also been known to prey upon other species and will feed throughout the water column (Bjorndal 1997).

The biggest global threats to the leatherback population include bycatch in fishing gear such as gillnets, longlines, trawls, and traps, and ingestion of marine debris (USFWS 2018e; NOAA Fisheries 2019b; NJDEP 2006, 2010; Lewison et al. 2004).

Currently, it is estimated that there are about 20,000 to 30,000 leatherbacks in the North Atlantic Ocean (Coren 2000). Habitat preferences for early life stages of this species are likely entirely oceanic; however, adult leatherbacks can typically be found in both mid-ocean to continental shelf and nearshore waters (USFWS 2018e). The leatherback is unique in that it moves into cooler water more than any other turtle species. Leatherbacks can be seen off the mid-Atlantic coast beginning in the spring and early summer months (Shoop and Kenney 1992). While most abundant in the summer, leatherbacks could be present in the vicinity of the EW 1 Project at any time of year and tend to be most concentrated near southern New Jersey and the southeastern end of Long Island (Shoop and Kenney 1992). They are rarely sighted within the Lower Bay (Halpin et al. 2009).

This species is typically found offshore and may occur in federal waters of the EW 1 Project but is unlikely to occur in the Project Area.

Finfish

Two federally and state listed finfish species potentially occur in the Project Area, Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) and shortnose sturgeon (*Acipenser brevirostrum*). The NOAA Fisheries ESA Section 7 mapper tool (NOAA Fisheries 2020) includes the entire area of the submarine export cable corridor in New York as an area with the potential for the occurrence of Atlantic sturgeon. NOAA Fisheries (2020) includes only the Upper Bay portion of the submarine export cable corridor in New York, north of the Verrazzano-Narrows Bridge, as an area with the potential for the occurrence of shortnose sturgeon.

Harvested fishes and macroinvertebrates with designated EFH, as managed under the MSFCMA or other fisheries programs, occur throughout the Project Area, although restrictions for shellfish harvest exist within most of the Project Area within New York Bay (see Section 4.6). Information on managed species and designated EFH found within the Project Area is provided in Section 4.6.

Atlantic Sturgeon (*Acipenser oxyrinchus*)

The Atlantic sturgeon is listed as endangered under the ESA. It is not state listed but is considered critically imperiled in New York (NYNHP 2019). The Atlantic sturgeon is a large, bottom-dwelling, long-lived anadromous fish. Anadromous fish hatch from eggs laid in freshwater rivers, then migrate to oceanic waters as juveniles. The species feeds on benthic invertebrates such as isopods, crustaceans, worms, and mollusks (NOAA Fisheries 2014; NMFS 1998; Stein et al. 2004). Although several DPS of the Atlantic sturgeon are listed under the ESA, the DPS are not entirely separate and all individual sturgeon are protected. Individuals occurring in the Project Area may be from the New York Bight DPS, or from other DPS located along the East Coast (NOAA Fisheries 2012).

Adult Atlantic sturgeon migrate to freshwater spawning habitats, including the Hudson River; eggs hatch in the rivers, and the young migrate to marine foraging waters (NOAA Fisheries 2017a). During non-spawning years, adults may remain in marine waters year-round (Bain 1997). Spawning adults migrate upriver in spring to spawn, then back into estuarine and marine waters in summer or fall (Dadswell 2006). Immature Atlantic sturgeon disperse widely once they move into coastal waters (Secor et al. 2000) and are often observed over mud-sand bottoms (Dadswell 2006). Subadults and adults forage in coastal waters and estuaries, generally in shallow (35 to 165 ft [10 to 50 m]) inshore areas of the continental shelf (Ingram et al. 2019; Dunton et al. 2015). The New York Bight DPS of Atlantic sturgeon is strongly associated with New York State waters including New York Bay and the lower Hudson River Estuary (Ingram et al. 2019; Stein et al. 2004).

Declines of sturgeon populations, which contributed to its ESA listing, are attributed to overfishing, habitat loss, and degradation of spawning grounds (NOAA Fisheries 2012). Specific population threats include dams that restrict access to upstream spawning habitats, dredged material disposal, channel maintenance, oil and gas exploration, trawling, and water quality degradation by pesticides, heavy metals, and other agricultural and industrial contaminants (USFWS and NOAA Fisheries 2009; Collins et al. 2000; Smith and Clugston 1997). Vessel strikes have also been noted as threats to the New York Bight DPS (Brown and Murphy 2010; Balazik et al. 2012). In the lower Hudson River, 69 Atlantic sturgeon mortalities between 2007 and 2015 were suspected of being attributed to vessel strikes (NOAA Fisheries 2016).

Atlantic sturgeon may occur in the Project Area; however, the Project Area is located outside of the designated critical habitat for the Hudson River DPS of the Atlantic sturgeon, which is located from the mouth of the Hudson River where the river discharges into New York Harbor to the Troy Lock and Dam north of Albany, a length of 154 mi (248 km) (NOAA Fisheries 2017a).

Shortnose Sturgeon (*Acipenser brevirostrum*)

The shortnose sturgeon (*Acipenser brevirostrum*) is listed as endangered under the ESA and in New York under 6 NYCRR § 182.2(g). The shortnose sturgeon is anadromous, but unlike Atlantic sturgeon, they only occasionally move into marine waters and typically remain close to nearshore habitats when present in marine waters (Kynard 1997). The Hudson River population of shortnose sturgeon is one of 19 spawning populations along the East Coast and is part of the mid-Atlantic metapopulation (Shortnose Sturgeon Status Review Team 2010).

In New York State waters, shortnose sturgeon primarily occur in the Hudson River ranging from River Mile 0 at the southern tip of Manhattan to 150 miles upriver (NYSDEC 2019h). Within New York Harbor and Upper New York Bay, shortnose sturgeon juveniles/sub-adults/adults co-occur with Atlantic sturgeon, with similar habitat and foraging for both species (Bain 1997; Haley 1999). Despite their association with natal rivers and estuaries, individuals from the Hudson River population have been observed to stray to other large river systems (e.g., Delaware River, Connecticut River), using nearshore coastal habitats as migration pathways (Shortnose Sturgeon Status Review Team 2010).

The threats to shortnose sturgeon populations are largely the same as listed for Atlantic sturgeon above, including overfishing, habitat loss, degradation of spawning grounds, dams that restrict access to upstream spawning habitats, channel maintenance, and water quality degradation by pesticides, heavy metals, and other agricultural and industrial contaminants. However, vessel strikes are expected to be a less important a factor due to the relatively small size of shortnose sturgeon, compared to Atlantic sturgeon (Shortnose Sturgeon Status Review Team 2010).

There is currently no designated critical habitat for shortnose sturgeon. This species may transit through the Project Area and may be temporarily exposed to Project-related activities but is not expected to be adversely affected by the Project.

4.7.2.2 Important Habitats

To determine the important habitats potentially present in the Project Area, the Applicant assessed the potential presence of designated critical habitats, New York State Wildlife Management Areas, NYSDEC Critical Environmental Areas, New York State Areas of Concern, National Estuarine Research Reserves, Important Bird Areas (IBAs), NYSDEC-designated Significant Coastal Fish and Wildlife Habitat (SCFWH), New York Natural Heritage Program (NYNHP) Significant Natural Communities, and NOAA Fisheries-designated EFH.

Critical Habitats

Critical habitats may be designated for federally listed ESA species. Critical habitats are defined as specific geographic areas occupied by a species at the time it was listed that contain physical or biological features essential to the conservation of the endangered or threatened species. No critical habitats have been identified in the Project Area.

New York State Wildlife Management Areas

Wildlife Management Areas are lands owned by New York State and operated by the NYSDEC's Bureau of Wildlife. There are no Wildlife Management Areas located in the vicinity of the Project or within the limits of New York City (NYSDEC, n.d.).

New York State Critical Environmental Areas

Critical Environmental Areas may be designated by local agencies for specific geographic areas within their boundaries or by state agencies for geographic areas they own, manage, or regulate. Critical Environmental Areas must have an exceptional or unique character relative to human health, natural setting, agricultural social, cultural, historic archeological, recreational or educational values, or inherent ecological, geological, or hydrological sensitivity to change.

There are no Critical Environmental Areas in the Project Area. The only Critical Environmental Area in Kings County, New York, is Jamaica Bay, including its tributaries, tidal wetlands and regulated adjacent areas, all of which are located outside of the Project Area.

New York State Areas of Concern

Areas of Concern are designated areas under the 1987 Great Lakes Water Quality Agreement that are environmentally degraded. There are no Areas of Concern in the Project Area. The only Areas of Concern in New York State are six such areas located along the Great Lakes, which are unaffected by the Project.

Natural Estuarine Research Reserves

The National Estuarine Research Reserve is a network of 29 sites throughout the coastal United States and Puerto Rico designated to protect and study estuarine systems (NOAA 2018). One of these reserves, the

Hudson River National Estuarine Research Reserve, is located in New York and is operated as a partnership between the NYSDEC and NOAA; it includes four federally designated and state-protected sites along 100 miles of the Hudson River (NYSDEC 2019i). The nearest of the four sites to the Project is identified as Piermont Marsh, located approximately 25 mi (40 km) upstream from the Project Area, with the remaining three sites located further upstream along the Hudson River (NOAA 1999). There are no National Estuarine Research Reserves crossed by the Project.

Important Bird Areas

Important Bird Areas in the United States are identified by the National Audubon Society as part of an international collaboration to identify the most important places to support bird populations. No IBAs are located in the Project Area.

The nearest Audubon IBA to the onshore Project Area is located approximately 1.5 mi (2.4 km) east of the Project Area. This IBA (Prospect Park) supports high diversity of migrant songbirds and is thought to be an important migratory stopover site for landbirds (New York Audubon Society 2016). The closest Audubon IBA to the submarine export cable corridor is the Raritan Bay IBA, approximately 0.6 mi (0.9 km) from the route. The submarine cable corridor also passes to the east of the Hoffman Island IBA (1.2 mi [1.9 km]) and the Swinburne Island IBA (1.3 mi [2.1 km]).

Significant Coastal Fish and Wildlife Habitats

The NYSDOS, following recommendations from NYSDEC, designates and maps a variety of aquatic and terrestrial habitats along the state coastline as SCFWH. These designated habitats include marshes, wetlands, mud and sandflats, beaches, rocky shores, riverine wetlands and riparian corridors, stream, bay and harbor bottoms, submerged aquatic vegetation beds, dunes, old fields, grasslands and woodlands, and forests. For each mapped SCFWH, NYSDEC generates a narrative to establish the basis for the habitat's designation and provides specific information regarding the fish and wildlife resources that depend on this area (NYSDOS 1998).

The Project Area is not located within a designated SCFWH. The nearest SCFWH areas are the Breezy Point SCFWH, located at the western end of the Rockaway Peninsula in Queens, which approaches to within approximately 2.3 mi (3.7 km) of the Project (NYSDOS 1998), and the Lower Hudson Reach SCFWH, located approximately 2.5 mi (4 km) north of the Project along the western banks of Manhattan, the Bronx, and Yonkers.

NYNHP Significant Natural Communities

The NYNHP maintains a database of Significant Natural Communities, which include rare or high-quality wetlands, forests, grasslands, ponds, streams, and other types of habitats, ecosystems, and ecological area. Based on the July 30, 2019 correspondence from NYSDEC, no Significant Natural Communities were identified on or in the vicinity of the Project (**Appendix A**). Desktop review indicates that the nearest Significant Natural Communities are a tidal river community of the Hudson River, located approximately 2.5 mi (4 km) north of the Project, and a maritime dune community located approximately 2.3 mi (3.7 km) east of the Project (NYSDEC 2018). The boundaries of these mapped Significant Natural Communities approximately correspond to the mapped SCFWH areas detailed above.

Essential Fish Habitat

Harvested fishes and macroinvertebrates managed under the MSFCMA or other fisheries programs occur throughout the Project Area. Most of the managed species have designated EFH in the Project Area.

Information on managed species and designated EFH found within the Project Area are presented in Section 4.6. Fisheries Management Councils and NOAA Fisheries may also designate HAPC, defined as a subset of the habitats that a species is known to occupy, to conserve fish habitat in geographical locations particularly critical to the survival of a species. No HAPC has been designated in the Project Area (NOAA Fisheries 2018a).

4.7.3 Potential Important Habitats and Protected Species Impacts and Proposed Mitigation

This section details the potential impacts to federally and state listed threatened and endangered species and important habitats from construction, operation, and maintenance of the Project. It also describes the Project-specific measures adopted by the Applicant to avoid, minimize, and/or mitigate potential impacts.

4.7.3.1 Construction

As described in Sections 4.7.1 and 4.7.2, due to the placement of the onshore portion of the Project within a highly developed area, potential impacts to protected species and important habitat associated with onshore Project construction are anticipated to be negligible. Based on the absence of habitat, seabeach amaranth, piping plover, roseate tern, and red knot are unlikely to be present in the onshore Project Area. Sea turtle nesting habitat is also absent in the onshore Project Area. Peregrine falcons nest in urban environments and have the potential to be present in the vicinity of the submarine export cable route and the onshore Project facilities; however, falcons nesting in urban environments adjacent to the Project would be expected to be habituated to human activity and noise, and are unlikely to be affected by the Project.

Additionally, the Project does not cross any designated important habitats with the exception of EFH, which is further described in Section 4.6.

Protected marine species, including marine mammals, sea turtles, and sturgeon, may be present in or near the offshore Project Area. Disturbance caused by construction of the submarine export cables is expected to have minor to negligible effects, and may consist of the following potential impacts:

- Short-term, minor disturbance of habitat and loss of prey species for protected fish, marine mammals, and sea turtles;
- Short-term, negligible increase in construction-related lighting;
- Short-term, negligible increase in marine debris;
- Short-term, minor increased risk of entanglement and entrapment in Project-related equipment;
- Short-term, minor increase in Project-related underwater noise (including vibration);
- Short-term, minor increased risk for vessel strike due to the increase in vessel traffic; and
- Short-term, minor potential for a change in water quality, including due to the possibility of oil spills.

The Applicant proposes to implement the following measures to avoid, minimize, and mitigate impacts to protected species during construction of the Project:

- Siting of Project components to avoid and minimize direct and indirect impacts to habitats of high value;
- The development and enforcement of an OSRP; and
- Appropriate Project-related personnel onboard Project vessels will be provided with relevant training; this training includes wildlife sighting, recording and reporting procedures, vessel-strike avoidance and minimum separation distances, and awareness training to emphasize individual responsibility for protected wildlife awareness and protection, as necessary.

Short-term disturbance of habitat and loss of prey species. Installation of the submarine export cable will result in the temporary disturbance of the seafloor during construction activities. The actual area of disturbance at any one time is expected to be localized, since cable installation will be linear over time. Construction activities may also temporarily disturb local prey species, due to short-term disturbance of benthic habitat and increased water turbidity, as well as from underwater sound from construction vessels and equipment. Construction may therefore temporarily and indirectly impact the ability of marine wildlife to forage in these specific areas. As described is Section 4.6, there is a large amount of available, similar quality alternative habitat in the vicinity of the Project, indicating that the temporary displacement of individuals will not necessarily result in a loss of available habitat and prey resource; therefore, the impact of this disturbance is anticipated to be minor. The seafloor is expected to return to pre-construction conditions following construction, but timeframe will be variable based on site-specific seabed conditions (benthic recovery is discussed further in Section 4.6).

Marine mammals feed throughout the water column from seafloor to surface, and preferences vary by species and prey availability. Seabed preparation for submarine export installation primarily has the potential to impact invertebrate prey in the benthic (seafloor) habitat. The marine mammals typical of the area primarily target copepods, small schooling fish such as capelin, mackerel, or herring; mesopelagic (intermediate depths below the surface) migrators such as squid; or benthic species including crustaceans, cephalopods, and all species of flounders. Copepods, the right whale’s preferred prey, are planktonic organisms that remain in the water column and are not likely to be impacted by Project-related construction activities (including noise and turbidity). Localized Project-related construction activities should only temporarily displace prey species.

While most sea turtle species in the Project Area are likely to occur near the continental shelf edge, it is possible that some adults and juveniles could occur near the onshore portions of the Project. Areas where eelgrasses and small invertebrates are located may contain the preferred diet of juvenile sea turtles (NYSERDA 2017b; Morreale and Standora 1998; Burke et al. 1994; Morreale et al. 1992); however, there are no identified eelgrasses along the Project route.

Atlantic sturgeon and shortnose sturgeon feed on benthic invertebrates such as isopods, crustaceans, worms, and mollusks (NOAA Fisheries 2014; NMFS 1998; Stein et al. 2004; Bain 1997), which could be present in benthic habitats temporarily disturbed by in-water construction.

Marine mammals, sea turtles, and the adult, subadult, and juvenile life stages of sturgeons are highly mobile; as such, they can move away and have been observed moving away from the temporary construction areas and return when construction is complete. Thus, no permanent disturbance to or displacement from suitable habitat in the Project Area is anticipated. In siting the submarine export cable, the Applicant has actively avoided sensitive benthic habitats (including eelgrasses) where feasible, further minimizing the disturbance of sensitive habitat features, preferred prey, and food resources, especially in shallow water and nearshore areas adjacent to the submarine export cable corridor.

Increase in construction-related lighting. Project-related construction and support vessels will contain deck and safety lighting. This lighting has the potential to impact sea turtles, although effects vary by species and by age (Gless et al. 2008). Loggerheads show more attraction to lighting than leatherbacks (Wang et al. 2007), especially with younger animals. Impacts from lighting are most harmful as hatchlings leave the natal beach for the open ocean; however, as no sea turtle species nest in the Project Area or its vicinity, lighting is not expected to affect this life stage of sea turtles. Project-related vessel deck and safety lighting is not expected to have an effect on sea turtle activities and behavior.

Introduction of marine debris. Marine debris has the potential to be introduced to the marine environment during construction activities, for example from Project-related construction vessels. This results in the potential for marine wildlife to become entangled in and/or ingest debris which could result in injury or death; impacts from marine debris and entanglement are well documented (e.g. Carr 1987; Bjorndal et al. 1994; Bugoni et al. 2001; Lazar and Gračan 2011, Laist 1987, 1997; Derraik 2002; Gregory 2009; NOAA Marine Debris Program 2014; Gall and Thompson 2015). As offshore personnel and vessel contractors will be required to implement appropriate debris control practices and protocols, the release of marine debris into Project Area waters is not anticipated. Furthermore, Project-related vessels will operate in accordance with laws regulating the at-sea discharges of vessel-generated waste.

Entrapment and entanglement. During construction, seabed preparation and the installation of the Project's submarine export cable could lead to the entrapment and entanglement of marine wildlife due to the potential presence of installation equipment in the water column. Entanglement occurs when marine wildlife is caught inadvertently, captured, or restrained by strong, flexible, anthropogenic materials such as fishing line or buoy lines. The lines that will be deployed in support of the Project will be associated with the construction barge anchor cables and cable plow/trencher towing cables and umbilicals.

Due to the weight of the lines and the tension under which they will be operating, it is unlikely that Project construction materials and activities will entangle marine mammal, sea turtle, or sturgeon species. In addition, Project installation activities will be short-term and localized, and the area of risk will be a very small portion of available habitat. Entrapment and entanglement are also known impact sources on sea turtles. Such impact is unlikely, however, because it would only occur if an individual were in the direct path of the jet plow activities (Murray 2011) or pre-sweeping activities. While the majority of sea turtles located in the Project Area during cable-laying operations would be expected to be capable of moving out of the area, in the very unlikely event that any species are caught (entrained) or restricted in movement by this equipment, they could experience injury or mortality. Measures in place to avoid marine mammal, sea turtle, or sturgeon vessel collisions will also act to reduce the risk of entanglement and entrapment.

Underwater noise. Construction activities such as jet-plowing, Project-related vessel noise, and sheet pile cofferdam installation with a vibratory hammer will temporarily increase underwater noise in the Project Area. This increase in noise would have the potential to impact marine mammals, sea turtles, and marine fish behaviorally and/or physiologically.

All marine mammals use sound to forage, orient, socially interact with conspecifics, or detect and respond to predators. Sound is important to marine mammals for communication, individual recognition, predator avoidance, prey capture, orientation, navigation, mate selection, and mother-offspring bonding. Potential effects of anthropogenic noise to marine mammals can include behavioral modification (changes in foraging or habitat-use patterns), and masking (the prevention of marine mammals from hearing important sounds; Nowacek at al. 2007). Extended exposure to mid-level noise or brief exposure to extremely loud sound can cause a permanent threshold shift, which leads to long-term loss of hearing sensitivity. Less-intense noise may cause a temporary threshold shift, resulting in short-term reversible loss of hearing acuity (Buehler et al. 2015).

Little is known about how sea turtles use sound in their environment. Due to insufficient data on the hearing capabilities of sea turtles, the impacts of sound on sea turtles are not well documented. Available data does suggest that sea turtles detect objects within the water column (e.g., vessels, prey, predators) via some combination of auditory and visual cues and can respond to acoustic cues (Piniak et al. 2012). Research examining the ability of sea turtles to avoid collisions with vessels shows they may rely more on their vision rather than auditory cues (Hazel et al. 2009). Sea turtles may rely on acoustic cues (e.g. from breaking waves) to identify nesting beaches, but they also likely rely on non-acoustic cues for navigation, such as magnetic fields and light. Sea turtles are not known to produce sounds underwater for communication.

Sudden loud noises can cause behavioral changes, permanent or temporary threshold shifts, injury, or death in marine fish and invertebrates (Popper and Hastings 2009; Popper et al. 2014; Popper and Hawkins 2016; Andersson et al. 2017; Southall et al. 2019). However, in their Biological Opinion for the Tappan Zee Bridge Replacement (now known as the Gov. Mario M. Cuomo Bridge) (NOAA Fisheries 2016), NOAA concluded that acoustic stressors associated with sheet pile installation with a vibratory hammer would be unlikely to adversely affect Atlantic sturgeon or their prey. If impact hammer installation is required additional consultation with NOAA Fisheries would be conducted to determine required mitigation measures to minimize temporary impacts.

Baseline (ambient) oceanic noise sources occur from various sources around the world and can have varying levels, depending on location. For example, baseline oceanic noise will have higher levels closer to a shoreline or a shipping channel (Hatch and Wright 2007) due primarily to vessel traffic. During Project construction, vibratory hammers used to install the landfall cofferdam would temporarily elevate underwater sound pressure and particle velocities, which could impact marine wildlife in the vicinity. Based on the location of the cofferdam at the bulkhead at SBMT (which is located between two existing piers), the unlikely presence of marine mammals, sea turtles, or sturgeons in the immediate vicinity of the Brooklyn shoreline, and the expected sound emissions during vibratory pile driving, the potential impact from cofferdam installation is expected to be minimal. In the unlikely event that marine wildlife are present, it is reasonable to assume that they would respond to the increased activity by moving away from the zone of influence.

Except where anchored cable lay barges may be used to install the submarine export cables, a specialist vessel designed for laying and burying cables maintains its position throughout the cable lay process (fixed location or predetermined track) by means of its propellers and thrusters using a global positioning system, which describes the ship's position by sending information to an onboard computer that controls the thrusters. The underwater noise produced by subsea trenching operations depends on the equipment used and the nature of the seabed sediment but will be predominantly generated by vessel thruster use. Dynamic positioning thruster noise is non-impulsive and continuous in nature, and therefore is not expected to result in harassment. The Applicant does not expect the use of directional thrusters to impact marine species in any material way.

Underwater noise generated from Project-related vessels used during construction can be a stressor to marine mammals. Many studies have documented short-term responses to both vessel sound and vessel traffic in whales (Watkins 1986; Baker et al. 1983; Magalhães et al. 2002). Noise from vessel traffic may affect sea turtles, but the effects are expected to be minimal. Impacts from vessel traffic noise may elicit behavioral changes in individuals near vessels, such as diving, changing swimming speed, or changing direction in order to avoid the noise. The frequency ranges for vessel noise overlap with sea turtles' known hearing ranges (less than 1,000 hertz [Hz]) and are expected to be audible but would be within the typical conditions in sea turtles' ocean environments, especially within the Project Area, which is located within New York Harbor.

Construction vessel noise does not differ substantively from noise generated by other commercial vessels moving slowly while trawling or idling in an area. The New York Bight is known to have a significant baseline noise level due to heavily transited shipping lanes that occur in the area (Muirhead et al. 2018; Estabrook et al. 2019. Construction of the Project will cause an insignificant increase in vessel traffic, and the noise impact of vessel traffic from Project construction vessels will be short-term and negligible.

Collisions from construction vessel traffic. An increase in Project-related construction and support vessel traffic along the submarine export cable route is anticipated during construction, causing a short-term and insignificant increase of vessel traffic in the area above baseline conditions. Marine wildlife near surface waters within these areas would be susceptible to vessel strikes or collisions, physical disturbances, and disturbance from vessel noise, all of which may inflict disturbance or injury, or may result in mortality.

Vessel strike occurs when marine wildlife and vessels fail to detect one another and collide, causing injury and/or mortality. All species of marine mammal are at risk of vessel strike: however, large whale species (right whale, humpback whale, fin whale, sei whale, and minke whale) are more prone to vessel strike. Smaller dolphin and seal species are less vulnerable to vessel strike, due to their agility in the water and ability for fast-moving responses to vessel traffic. Vessel strike is a growing issue for most marine mammals due to increases in vessel traffic, and has the potential to significantly affect the population of a species (Laist et al. 2001; Van Waerebeek et al. 2007; Conn and Silber 2013; Van der Hoop et al. 2013; Laist et al. 2014). Factors that influence the potential for collision include vessel speed, vessel size, and visibility. Research indicates that most vessel collisions that result in serious injury or death to marine mammals occur at speeds of over 14 knots (25.9 km/h) and with vessels that are 262 ft (80 m) or greater in size (Laist et al. 2001; ASCOBANS 2003; Silber et al. 2014; Conn and Silber 2013; Van der Hoop et al. 2013; Laist et al. 2014). Lethal vessel strikes dramatically increase as vessel speed increases, with a statistically significant reduction in lethal vessel strike at speeds below 10 knots (18.5 km/h). Vanderlaan and Taggart (2007) found the probability of a strike resulting in mortality increased from 20 percent to 100 percent at speeds between 9 and 20 knots (16.7 and 37 km/h). Lethality from vessel strike increased most rapidly between 10 and 14 knots: 35 to 40 percent at 10 knots (18.5 km/h), 45 to 60 percent at 12 knots (22.2 km/h), and 60 to 80 percent at 14 knots (25.9 km/h). Studies showed that increased vessel speed also increased the hydrodynamic draw of vessels that could result in right whales being pulled towards vessels, making them more vulnerable to collisions (Silber et al. 2010; Conn and Silber 2013; Laist et al. 2014).

Sea turtles can detect approaching vessels, likely by sight rather than by sound, and seem to react more to slower-moving vessels (2.2 knots [4.1 km/h]) than to faster vessels (5.9 knots [10.9 km/h] or greater) (Hazel et al. 2009). Although sea turtles likely hear and see approaching vessels, they may not be able to avoid all collisions, and high-speed collisions with large objects can be fatal. Stranding data frequently documents mortality from vessel collision; however, these collisions tend to occur in shallow coastal and inshore waters (bays and estuaries) with higher densities of vessels traveling at accelerated speeds (CH2M Hill 2018). Additionally, as sea surface temperatures drop in the fall and winter months, it is common for sea turtles, in particular loggerhead and Kemp's ridley turtles, to be affected by the drop in water temperature and become cold-stunned. The cold affects their diving capacities and constrains them to floating motionless at the surface, becoming more prone to vessel strike (Meylan and Sadove 1986; Burke et al. 1991; Hochscheid et al. 2010). The Applicant proposes to implement measures to avoid, minimize, and mitigate the impacts of vessel collisions through the measures in place for marine mammals (described below in this section), which will also reduce impacts to sea turtles.

Sturgeons are susceptible to vessel strikes, when at the surface. Vessel strikes have also been noted as threats to the New York Bight DPS (Brown and Murphy 2010; Balazik et al. 2012). In the lower Hudson River, 69 Atlantic sturgeon mortalities between 2007 and 2015 were suspected of being attributed to vessel strikes (NOAA Fisheries 2016). However, vessel strikes may not be as important a factor for shortnose sturgeon due to their relatively small size compared to Atlantic sturgeon (Shortnose Sturgeon Status Review Team 2010). As is the case for sea turtles, the Applicant proposes to implement measures to avoid, minimize, and mitigate the impacts of vessel collisions through measures in place for marine mammals (described below in this section), which also reduce impacts to sturgeon.

The Ship Strike Reduction Rule (50 CFR § 224.105) restricts vessel speeds of 10 knots (18.5 km/h) or less between November 1 and April 30 in the SMAs for right whales. The restrictions apply to all vessels greater than or equal to 65 ft (20 m) in overall length and subject to the jurisdiction of the United States and/or entering or departing a port or place subject to the jurisdiction of the United States. Note that these restrictions do not apply to U.S. vessels owned or operated by, or under contract to, the federal government or to law enforcement vessels of a state, or political subdivision thereof, when engaged in law enforcement or search and rescue duties. Vessel strike deaths in U.S. waters averaged about one per year during the 18 years of documentation before the 2008 rule. Since the 2008 rule, vessel strike deaths have averaged less than half (i.e., 0.47 deaths per year) for right whales, even including two recent deaths (MMC 2018). In 2017 there was one confirmed vessel strike mortality of a right whale in U.S. waters, which appears to have been caused by lack of speed restrictions and increased vessel traffic (NOAA Fisheries 2018c).

Vessels during construction will consist of both large, slow-moving installation support vessels and smaller, faster moving vessels that will be required for transit within the Project Area. As a small portion of the Project Area transects with the New York Bight SMA, Project-related vessels that are larger than 65 ft (20 m) in length transiting within these SMAs will be required to abide by the above-described speed restrictions. The New York shipping channel designated TSS navigation lanes entering and exiting New York Harbor are highly trafficked areas under current existing conditions. Dynamic Management Areas (DMAs) are areas of temporary protection established by NOAA for particular marine mammal species, in an effort to respond to movements of high-risk whale species (such as right whale), and are determined by sighting reports made through vessel traffic in the New York Bight and the larger Northern Atlantic. These DMAs are coordinated through marine communication systems and publish any active areas on their government website. In particular, the Right Whale Sighting Advisory System, a statutory requirement to reduce the risk of right whale collisions, is in place for any DMA or SMA and will be applicable in the Mid-Atlantic U.S. SMA where crossed by the Project. The Right Whale Sighting Advisory System is a NOAA Fisheries program designed to reduce collisions between ships and the critically endangered right whale.

Change in water quality, including oil spills. Construction activities, including submarine export cable installation, would result in short-term increases in turbidity and sedimentation in the Project Area, and would be localized as the construction area moves. As studies indicate that marine mammals and sturgeon often inhabit turbid waters (Hanke and Dehnhardt 2013) and are able to forage in low-visibility conditions (Fristrup and Harbison 2002; Shortnose Sturgeon Status Review Team 2010; Cronin et al. 2017), this temporary increase in turbidity and sedimentation is not expected to have any long-term impacts to these species.

In addition to turbidity, water quality has the potential to be impacted through the introduction of contaminants, including oil and fuel spills. During jet plow, dredging, or mass flow excavation activities, there is also the potential to re-release contaminants due to resuspending sediment; however, the Applicant has sited the submarine export cable route to avoid current and historic dumping grounds to the extent practicable. The Applicant has also completed initial chemical analysis of the sediment that is expected to contain contaminants and will take measures to minimize impacts during installation activities at locations where high concentrations of contaminants may be present (see Section 4.2).

Oil spills pose a risk to marine wildlife through direct contamination and destruction of foraging and reproductive habitats. Most petroleum products that would be carried on the construction vessels would be light and would remain on the surface of the water and evaporate in the event of a spill. Oil spills would be expected to adversely affect any marine mammals in the area that are co-located with the toxins. Heavier petroleum products that create a sheen and remain on the water surface could affect marine wildlife diving through the water surface when breathing or looking for food. Because sea turtles must break the surface regularly in order to breathe air, floating oil slicks could be encountered by the same turtle over and over again during their normal breathing cycles, causing ingestion of oil through the respiratory tract as well as through the digestive tract.

The Applicant has developed an OSRP, which details measures that will be implemented to avoid inadvertent releases and spills. The OSRP also includes a protocol to be implemented should a spill event occur.

Furthermore, Project-related vessels will operate in accordance with laws regulating the at-sea discharges of vessel-generated waste.

4.7.3.2 Operations and Maintenance

As described in Sections 4.7.1 and 4.7.2, due to the placement of the onshore portion of the Project within a highly developed area, potential impacts to protected species and important habitat associated with onshore Project operations and maintenance are anticipated to be negligible. During operations, the potential impact-producing factors to protected aquatic species in the offshore Project Area may include the presence of new buried submarine export cables and vessel traffic associated with operation and maintenance of the Project, which may be associated with the following potential impacts:

- Long-term, minor modification of aquatic habitat;
- Long-term, minor Project-related EMF;
- Long-term, minor, Project-related underwater noise;
- Short-term, minor changes in water quality during routine maintenance activities or in the case of oil spills;
- Short-term, negligible increase in construction-related lighting; and
- Long-term, negligible increased risk for vessel strike due to the increase in vessel traffic.

During operations, the Applicant proposes to implement the following measures to avoid, minimize, and mitigate potential impacts:

- The development and enforcement of an OSRP; and
- Vessel lighting that minimizes illumination of the sea surface where feasible and in compliance with regulatory requirements.

Modification of habitat. The installation of cable protection measures will result in the conversion of some of the seafloor to hardbottom habitat, which will be relatively small in comparison to the amount of available habitat. As described in Section 4.6, in addition to the remaining equivalent habitat in the Project Area, alternate equivalent habitats exist outside of the Project Area. Converting sandy bottom habitat to "hard" habitat areas as a result of cable and scour protection could effectively create artificial reef habitat, or what is known as "reef effect." The formation of hard habitat for biofouling sessile invertebrates attracts benthic and pelagic fish species to the area, which can in turn increase prey availability for marine mammals (Miller et al. 2013; Langhamer et al. 2009). However, given the relatively small areas of cable protection along the Project route, this effect is anticipated to be negligible.

Cable protection measures have the potential to affect sea turtles by both reducing the available habitat for bottom-foraging individuals and by creating new hardbottom habitat. As seagrass and other submerged aquatic vegetation are not present in the Project Area, long-term impacts to sea turtle habitat are not anticipated. Artificial hardbottom habitat is likely to attract sea turtles, as it would provide beneficial conditions for foraging as well as options for sheltering and would potentially serve as a structure for cleaning flippers or carapaces (CH2M Hill 2018). NOAA Fisheries concluded that any individual Atlantic sturgeon that migrated through an operational wind farm in this region would likely benefit from the increased prey associated with rock armoring (NOAA Fisheries 2015).

Project-related EMF. The installation of submarine export cable in the Project Area may result in the introduction of EMF. Literature suggests that cetaceans can sense and use the geomagnetic field during migrations, although it is not clear which components they are sensing or how potential disturbances to the geomagnetic field caused by EMF near the buried submarine export cables in the Project Area may affect marine mammals (Normandeau et al. 2011) or other wildlife. There is no evidence indicating magnetic sensitivity in seals, but other marine mammals appear to have a detection threshold for magnetic sensitivity gradients of 0.1 percent of the Earth's magnetic fields and are likely to be sensitive to minor changes (Normandeau et al. 2011, Walker et al. 2003, Kirschvink 1990). However, HVAC cables, which are proposed for the Project, are not as significant a concern for variations of the geomagnetic field as compared to direct-current cables (Gill et al. 2005) (see Section 4.13 for additional discussion of EMF).

Indirect effects on marine mammals from alterations in prey due to EMF are also unlikely, as the average magnetic-field strengths in the vicinity of the submarine export cables are below levels documented to have adverse impacts to fish behavior. Mid-water fish species, including small schooling fish (e.g., mackerel, herring, capelin) consumed by marine mammals, would not be affected by the EMF associated with Project cables. Modeling determined that the intensity of the magnetic fields generated by the submarine export cables is expected to be low and localized (see **Appendix F Electric- and Magnetic-Field Assessment**). Generally, electric and magnetic fields are not considered to directly affect marine mammals.

Available research suggests that sea turtles in all life stages orient to the Earth's magnetic field to position themselves in oceanic currents, which helps them locate seasonal feeding and breeding grounds and to return to their nesting sites. However, sea turtles are less sensitive than marine mammals (Tethys 2010). Cable-related EMF is generally considered to be less intense than the Earth's geomagnetic field, and it is generally assumed that sea turtles will not be affected by this EMF (NJDEP 2010). Potential impacts of exposure to electric and magnetic stressors are not expected to result in substantial changes to an individual's behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment, and are not expected to result in population-level impacts.

Numerous studies of EMF emitted by subsea alternating current cables reported no interference with the movement or migration of fish or invertebrates (Hutchison et al. 2018; Love et al. 2017; Rein et al. 2013); no adverse or beneficial effect on any fish or invertebrate species has been found to be attributable to EMF (Snyder et al. 2019; Copping et al. 2016). A review of the effects of EMF on marine species in established European offshore wind farms suggested that heat generated by electrified cables should be further investigated (Rein et al. 2013). Follow-up analysis of thermal effects of subsea cables on benthic species concluded that effects were negligible because cable footprints are narrow, and the small amount of thermal output is easily absorbed by the sediment overlying buried cables (Taormina et al. 2018; Emeana et al. 2016). Thermal gradients do not form above the buried cables because the overlying water is in constant motion. At the Block Island Wind Farm off the Rhode Island coast, buried subsea cables were determined to have no effect on Atlantic sturgeon or on any prey eaten by whales or sea turtles (NOAA Fisheries 2015), which includes most fish and macroinvertebrates.

The Applicant has conducted engineering surveys to identify areas where sufficient cable burial is likely to be achievable, with target burial depths from a minimum of 6 ft (1.8 m). Burial will act as a buffer between EMF and marine wildlife, further reducing exposure levels. In areas where sufficient burial is not feasible, and where additional cable protection is deemed necessary, surface cable protection will provide an additional barrier to EMF (see Section 4.13).

Change in water quality, including oil spills. During operations, routine maintenance activities have the potential to result in temporary increases in turbidity and sedimentation in the Project Area, which may directly or indirectly affect marine wildlife. Potential impacts to water quality resulting from turbidity are further discussed in Section 4.2. As shown, the increase in turbidity and/or release of contaminants from re-suspended sediment is not expected to exceed background levels during natural events and will be short-term and temporary in nature. As such, marine wildlife are not expected to be exposed to conditions exceeding their existing environment.

In addition to turbidity, water quality has the potential to be impacted through the introduction of contaminants, including oil and fuel spills. For reasons described earlier, such spills have impacts on marine mammals. The Applicant has developed an OSRP, which details the measures proposed to avoid inadvertent releases and spills and a protocol to be implemented should a spill event occur.

Underwater noise. Operations and maintenance activities will result in a slight increase in the ambient underwater noise in the Project Area. Noise from Project-related operations and support vessel traffic is not anticipated to be greater than the ambient noise levels in the Project Area, as vessel traffic is expected to have an insignificant increase above the existing baseline conditions as a result of the Project. Nearshore vessel activity generally will be concentrated in established shipping channels and near industrial port areas and will be consistent with the existing noise environment in those areas. Therefore, impacts from underwater sound due to Project construction, including vessel activity, will be negligible and are unlikely to affect biological resources in the Project Area.

Increase in construction-related lighting. Project-related operations and support vessels will contain deck and safety lighting. Potential impacts during operations would be similar to those described in Section 4.7.3.1 for construction activities. As no sea turtles nest in the Project Area or its vicinity, lighting is not expected to affect this life stage of sea turtles, and Project-related vessel deck and safety lighting is not expected to have an effect on sea turtle activities and behavior. The Applicant will work with the appropriate regulatory agencies on lighting requirements.

Project-related vessel traffic. The increase in Project-related operations and support vessel traffic is anticipated to be negligible in comparison to the average traffic observed in the Project Area, due to the presence of high traffic shipping lanes throughout the New York Bight. Marine wildlife near surface waters within these areas would be susceptible to vessel strike, which may inflict injury or result in mortality, and disturbance that may alter behavior; however, the increase in this risk due to Project operations is negligible. A final construction and vessel traffic protocol will be outlined and assessed by NOAA Fisheries, and any associated mitigation measures will be outlined in the NOAA Fisheries IHA for the Project.

4.8 Cultural and Historic Resources

Cultural resources include archaeological sites, historic standing structures, buildings, objects, districts, and traditional cultural properties that illustrate or represent important aspects of prehistory (before circa anno Domini 1600), history (after circa anno Domini 1600), or that have important and long-standing cultural associations with established communities or social groups. Significant archaeological and architectural properties are generally defined by the eligibility criteria for listing on the National Register of Historic Places (NRHP) and/or New York State Register of Historic Places (SRHP). NRHP-listed and -eligible resources are defined as *historic properties*.

Section 106 of the National Historic Preservation Act (NHPA) (54 U.S.C. § 306108) is triggered when projects require federal permits, receive federal funding, or occur on federal lands. Such federal undertakings require consultation by federal agencies with the state historic preservation office (SHPO) and interested Native American Tribes. In 2016, BOEM executed a Programmatic Agreement with the OPRHP in its role as the New York SHPO (NY SHPO), as well as the State Historic Preservation Officer of New Jersey, the Shinnecock Indian Nation, and the Advisory Council on Historic Preservation, to formalize agency jurisdiction and coordination for the review of offshore renewable energy development regarding cultural resources (BOEM 2016b). The Programmatic Agreement recognized that issuing renewable energy leases in the OCS constituted an undertaking subject to Section 106 of the NHPA. BOEM, as lead federal agency in this process, has the authority to initiate consultations with the NY SHPO, and to consult with interested Native American Tribes. These consultations identify the area of potential effects (APE) and potential impact-producing factors to archaeological, architectural, or other cultural resources that are listed on, or are potentially eligible for listing on, the NRHP and/or SRHP. The APE, as defined by 36 CFR § 800.16(d), is "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist."

Discussion in this section is limited to the portions of the Project APE within New York State. This section addresses the requirements of 16 NYCRR § 86.5 regarding historic areas.

4.8.1 Cultural and Historic Studies and Analysis

In December 2018, the Applicant provided the NY SHPO with an introductory letter that detailed the proposed methodology for the terrestrial archaeological, historic architectural, and underwater archaeological surveys, including the proposed APE and file review search radius for each of these cultural resources (Study Area).

As detailed in this December 2018 letter, the original proposed terrestrial archaeological Study Area radius extended approximately 1 mi (1.6 km) around areas where ground-disturbing activity may take place, including the onshore substation, onshore cable corridor, and cable landfall area. In December 2018, the NY SHPO provided confirmation that the proposed methodology was found to be acceptable and noted that the agency would accept a reduction to a 0.25 mi (0.4 km) on each side of the proposed onshore cable routes, for a 0.5-mi (0.8-km) buffer total. (see **Appendix A**) This reduction in the Study Area along the onshore cable routes was implemented into the next steps of the assessment for the onshore cable route.

The terrestrial archaeological APE is defined as the portion of the Study Area with the potential to be directly and/or indirectly affected by Project-related construction activities. For known and potential archaeological resources, the direct effects terrestrial archaeological APE is the area of ground disturbance associated with the Project's construction, operations, and maintenance. Indirect effects to archaeological resources are less common but could include visual or auditory impacts that would adversely affect the character and setting of a significant archaeological site. The site file review undertaken for this application established that there are no

NRHP- or SRHP-listed or eligible sites within the Study Area, precluding any indirect effects to terrestrial archaeological resources caused by Project activities; therefore, the terrestrial archaeological APE is equivalent to the area of potential ground disturbance (**Figure 4.8-1**).

As discussed in detail in 4.8.1.1 below, the marine archaeological Study Area consists of a 1.0-mi (1.6-km) buffer around the submarine cable export corridor. The marine archaeological APE is defined as the portion of the Study Area potentially affected by bottom-disturbing activity along the 15.1-nm (28.0-km) long submarine export cable corridor of variable width, beginning where it crosses into New York State waters (see **Exhibit 2**). Within the submarine export cable corridor, direct disturbance for installation will be up to approximately 26 ft (8 m) wide for each cable, including approximately 5 ft (1.5 m) for the width of the burial tool penetrating the seafloor, plus the additional width of seafloor contact and sediment sidecast. The cables will be buried to a target depth of 6 ft (1.8 m) in general and up to 15 ft (4.5 m) deep below authorized dredge depth in the federally maintained areas. Cable installation activities will be located within the cable corridor for the Project based on final micrositing of the submarine export cable route (**Figure 4.8-2**).

The historic properties Study Area encompassed by a computer-generated viewshed (see Section 4.9 and **Appendix I Visual Impact Assessment** for additional information on the viewshed analysis) indicated that the onshore substation would have a maximum theoretical visibility up to 4 mi (6.4 km) away, including portions of Brooklyn, Manhattan, Staten Island, and New Jersey. The theoretical limit of visibility often exceeds the actual visibility or what is experienced in real life, due to factors such as haze, ocean waves, limits to human visual acuity, the contrast and reflectivity of the object, and light conditions.

From the maximum theoretical visibility, an APE for the analysis of visual effects on historic properties (AVEHP) was refined (**Appendix H Analysis of Visual Effects on Historic Properties**). The AVEHP APE represents the areas from which actual views of the proposed onshore substation would be visible (**Figure 4.8-3**). Since the other components of the Project will be installed underground and their visual impacts to historic properties will be short-term during the construction phase, those underground components were excluded from the analysis. This historic properties Study Area and AVEHP APE were established through desktop review including viewshed analysis, agency engagement, and field work, as further described in Section 4.8.1.3. The NY SHPO concurred with the approach in the AVEHP in a letter dated December 27, 2018 (**Appendix A**).

4.8.1.1 Terrestrial Archeological Resources

To assess the Project's potential impacts to terrestrial archaeological resources, a phased approach was used to identify documented terrestrial archaeological resources and to evaluate the Study Area for its potential to contain undocumented archaeological resources that might be eligible for listing on the NRHP and/or SRHP. The phased approach included:

- A literature review and background research to provide environmental and historical context for assessing the archaeological sensitivity of the Study Area;
- A review of site files and survey reports, both of which are held by the NY SHPO, for the Study Area; and
- A Phase I terrestrial archaeological survey including pedestrian reconnaissance of the proposed onshore cable corridors.

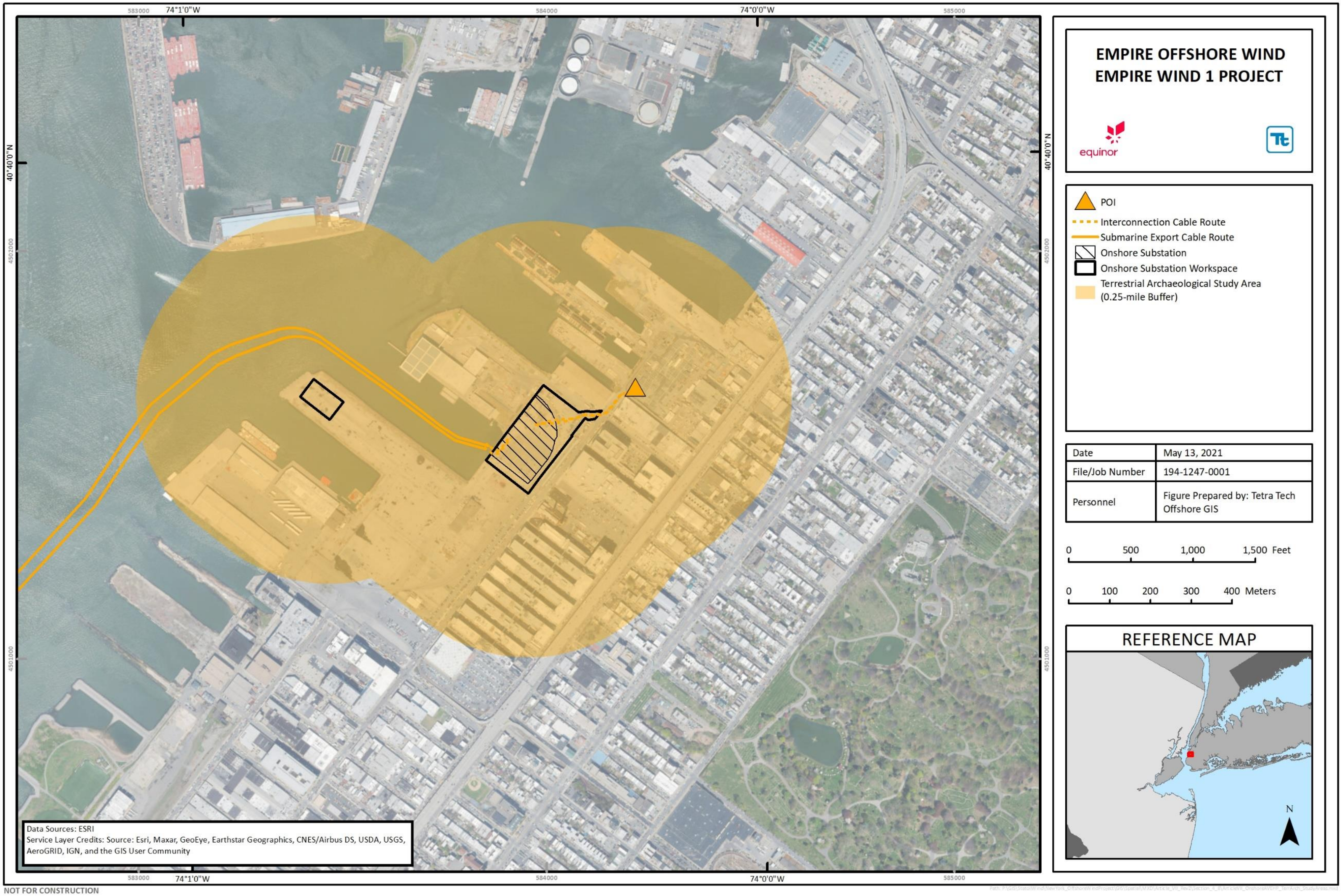


Figure 4.8-1 Terrestrial Archaeological Resources Study Area

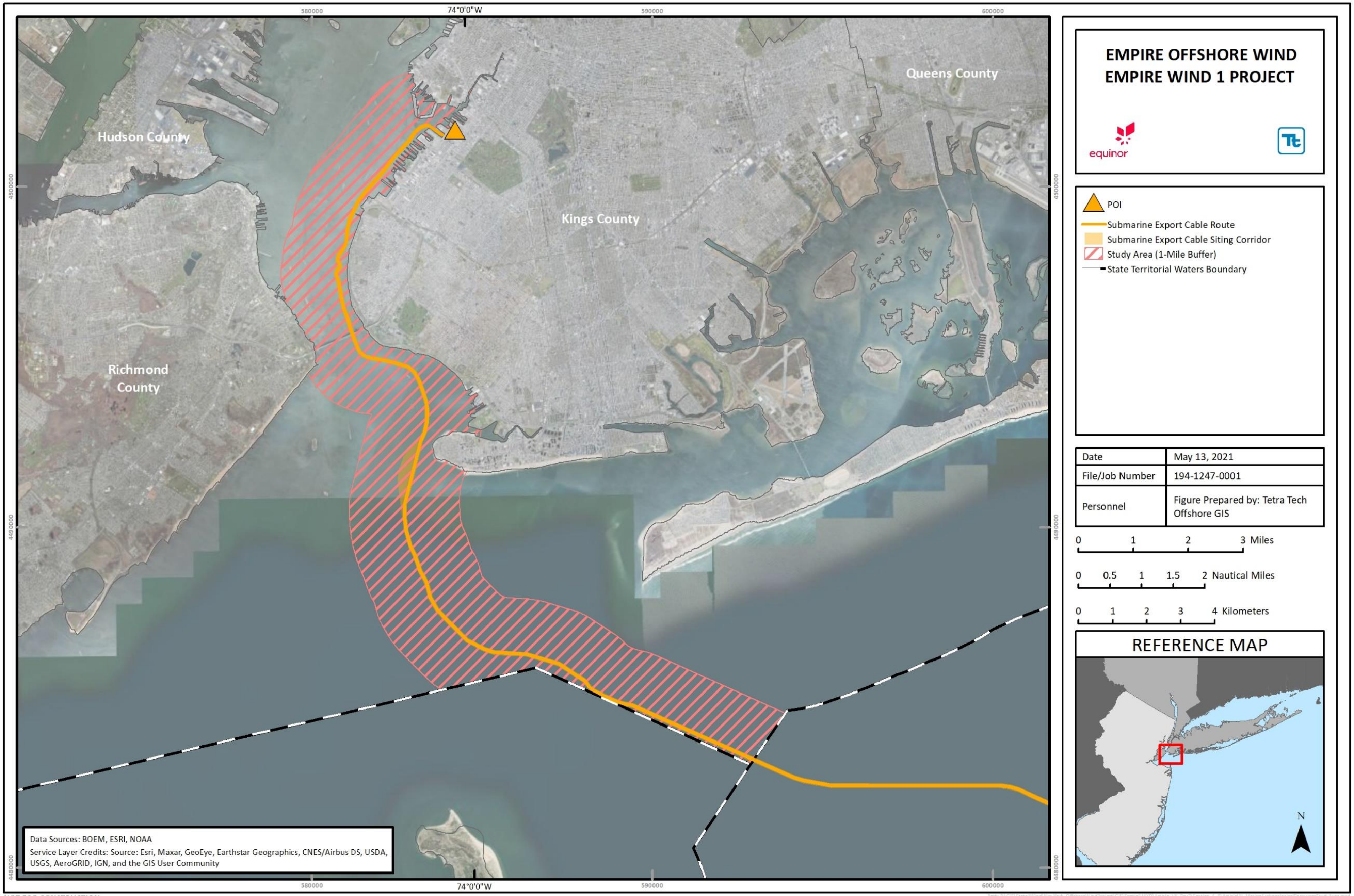
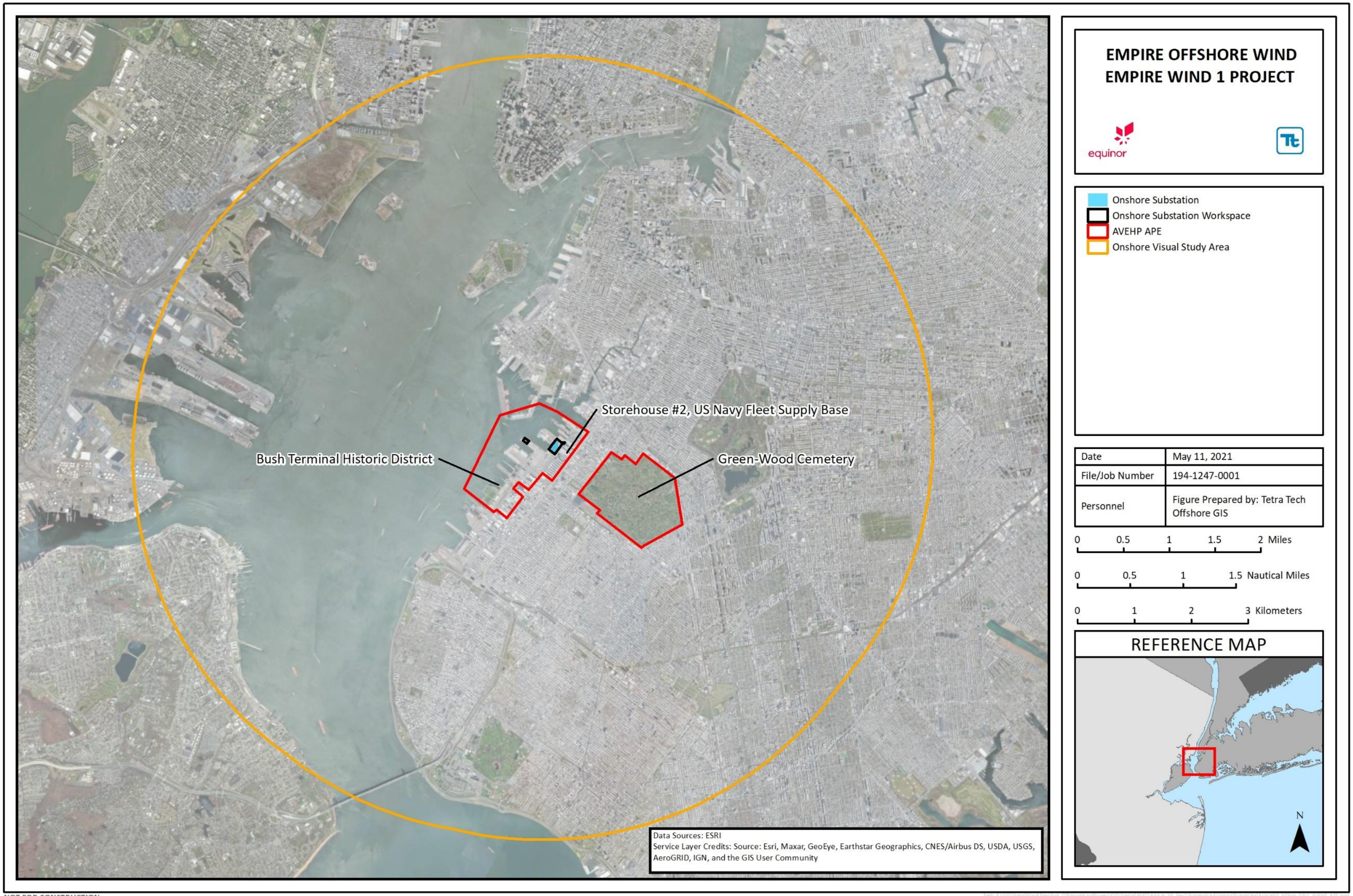


Figure 4.8-2 Marine Archaeological Resources Study Area



NOT FOR CONSTRUCTION

Figure 4.8-3 Analysis of Visual Effects on Historic Properties Study Area and APE

After completing the literature review, site file review, and pedestrian surveys, the Applicant submitted an update to the NY SHPO on August 22, 2019 for the onshore cable route and onshore substation. The update included the archaeological consultant's conclusion that the onshore cable route and onshore substation are located on filled land, and the recommendation that the NY SHPO not require an additional archaeological survey. The NY SHPO filed a response via the New York State Cultural Resource Information System (CRIS) dated August 30, 2019, concurring with the recommendation that Phase IB archaeological surveys do not need to be completed for the onshore cable route and the onshore substation (see **Appendix A** and **Appendix G Phase I Terrestrial Archaeological Survey** for additional information).

4.8.1.2 Marine Archaeological Resources

The marine archaeological resources survey was developed in accordance with BOEM guidelines (2017) for offshore renewable energy projects. To assess the Project's potential impacts to marine archaeological resources, a phased approach was used to identify documented marine archaeological resources and to evaluate the submarine export cable corridor for its potential to contain undocumented archaeological resources that might be eligible for listing on the NRHP and/or SRHP. The phased approach included:

- A literature review and background research to provide environmental, pre-contact, and historical context for assessing the archaeological sensitivity of the Study Area; and
- A full marine archaeological analysis including review of geophysical and geotechnical survey methods and data analysis.

Marine archaeological analysis included a full assessment of gradiometer data, side-scan sonar imagery, sub-bottom profiler data, and select geotechnical investigations. The geophysical and geotechnical survey plans were developed with the assistance of a Qualified Marine Archaeologist who participated in pre-survey meetings, as required. An evaluation of all data was used to identify potential submerged cultural resources. The archaeological information derived from site-specific surveys was used to identify archaeological areas of interest (targets) and geological features with pre-contact period archaeological potential. For historic resources, evaluation relied heavily on magnetometer data and side-scan sonar imagery, while pre-contact resources are commonly identified using sub-bottom profiler imagery and geotechnical investigations. Additionally, the geological ground model was a valuable resource for identifying large-scale geological trends throughout the APE, which can be helpful in detecting landforms with pre-contact period archaeological potential.

Additional survey results will be available in late 2021 for portions of the submarine export cable corridor that were not included in the 2018 and 2019 survey efforts, and the Applicant will provide a Marine Archeological Survey Report when available.

4.8.1.3 Historic Architectural Properties

Historic architectural resources are defined as districts, buildings, structures, objects, or sites that are at least 50 years old or older and are listed in, or potentially determined to be eligible for, inclusion in the NRHP and SRHP. The identification of historic architectural resources was based on standard practices such as review of high-resolution digital photographs, and review of historic properties in the New York CRIS application and engagement through meetings and correspondence with relevant federal and state agencies. Based on this analysis and outreach with regulatory agencies, the following approach was undertaken to define the Project's onshore Study Area and APE, and to identify and evaluate historic architectural resources:

- A desktop analysis to identify known/listed sites in the vicinity of the Project, utilizing resources from National Park Service (NPS) and the NY SHPO (New York CRIS) in 2018 and 2019;

- The completion of a viewshed analysis computer model to allow for refinement of the proposed APE;
- Preliminary fieldwork and desktop research to ground-truth and refine the proposed AVEHP APEs, based on local topography and landscape features (i.e., intervening vegetation, visual screening by existing buildings, the alignment of view corridors along streets, and other factors), including an initial field visit to the AVEHP Study Area between November 4 and November 13, 2018; and
- An additional field visit between June 3 and June 6, 2019, for the proposed onshore cable corridor.

Based on the Project desktop research, viewshed computer model, ground-truthing and the field visits, the Study Area and APE were defined as shown in **Figure 4.8-3**. Since submarine export cables will be entirely subsea, and the onshore cable route would be entirely underground, except where within the onshore substation at SBMT, and because visual impacts to historic resources would be temporary during the construction phase, the proposed submarine export and onshore cable routes were not included in this analysis.

The historic architectural resources analysis and AVEHP (**Appendix H**) were coordinated with the Visual Impact Assessment (VIA) discussed in Section 4.9. The viewshed analysis informed the identification of the historic resources recommended for an evaluation of visual impacts. Many of the identified resources were subsequently included as a type of visual resource.

4.8.2 Existing Cultural and Historic Resources

This section discusses existing terrestrial archeological, marine archaeological, and historic architectural resources within and surrounding the offshore and onshore portions of the Project, based on the defined Study Areas and APEs.

4.8.2.1 Terrestrial Archeological Resources

Following concurrence of the methodology from NY SHPO, site file review was undertaken via CRIS, an online database maintained by the NY SHPO (NYSOPRHP 2019). The review identified recorded archaeological resources within the Study Area. In addition, information regarding previously conducted archaeological surveys within the Study Areas was gathered via CRIS and the New York City Landmarks Preservation Commission's online archives (LPC 2019). Following the review of recorded archaeological resources within the Study Area, qualified, professionally registered archaeologists conducted pedestrian and windshield reconnaissance of the onshore cable route. The goal of the reconnaissance was to identify specific areas along the onshore cable route that appeared to have evidence of significant ground disturbance, or that possessed archaeological sensitivity based on observations of fine-grained terrain characteristics not depicted on standard aerial imagery or topographic maps. These findings inform the consideration of the need for a Phase IB archaeological survey.

Archaeological surveys previously conducted in the Study Area concluded that Gowanus Bay waterfront lots possess low archaeological sensitivity. A review of nineteenth century maps of the Brooklyn shoreline indicates that the Study Area occurs on filled land constructed into Gowanus Bay in the late nineteenth and early twentieth centuries (NYPL 2019). Pedestrian reconnaissance was conducted by registered professional archaeologists on October 30, 2018, as part of Phase I archeological investigations, to assess the archaeological sensitivity of the Study Area. Based on the site file review and pedestrian reconnaissance, the archaeological consultant concluded that no further archaeological investigations were warranted for the landfall and onshore export and interconnection cable routes. In a response dated August 30, 2019, NY SHPO concurred with the Applicant's archaeological consultant that a Phase IB field survey would not be necessary. **Table 4.8-1**provides additional information on the previously conducted archaeological surveys.

Table 4.8-1 Previous Cultural Resource Surveys within the Study Area

NY SHPO Survey Report No.	Report Title	Results/ Recommendations	Author/Date
85SR61925	Survey Level Study, 31st Street Pier, Brooklyn, NY	Recommended NRHP-not eligible/ No further work is needed.	Michael Raber 1985
08SR58199	South Pier Improvement Project, Phase IA Cultural Resource Survey, Brooklyn, NY	No adverse effects/ No further work is needed.	Douglas McVarish, Patrick Heaton, and Joel Klein (John Milner) 2008

4.8.2.2 Marine Archeological Resources

Marine archaeological resources that have the potential to be identified in the marine archaeological resources APE may range from pre-contact to submerged historic resources. Geologic interpretation completed during the marine archaeological assessment also identified the existence of two epochs with the potential to contain evidence of human habitation: the Late Pleistocene Epoch and the Holocene Epoch.

The marine archaeological desktop study for the Project assessed the potential for submerged archaeological resources to exist within the Study Area. There are seven targets resembling potential submerged archaeological resources along the Project's submarine export cable corridor based on assessment of 2018 and 2019 geophysical survey data (**Table 4.8-2**). Additional targets may be identified when survey results become available (anticipated in late 2021) for portions of the submarine export cable corridor not included in 2018 and 2019 survey activities.

Table 4.8-2 2018 and 2019 Survey Targets Representing Potential Submerged Archaeological Resources within the Study Area

Remote-Sensing Target	Seafloor Impact Area	Possible Source	Recommended Avoidance Buffer (m)
Target-07	submarine export cable route	Unknown	50
Target-08	submarine export cable route	Unknown	50
Target-09	submarine export cable route	Unknown	50
Target-10	submarine export cable route	Unknown	50
Target-11	submarine export cable route	Unknown	50
Target-12	submarine export cable route	Unknown	50
Target-13	submarine export cable route	Unknown	50

4.8.2.3 Historic Properties

The NRHP/SRHP criteria are used for determining the eligibility of a resource for inclusion in the NRHP and/or SRHP (36 CFR § 60.4 and NPS 2002). The same eligibility criteria are used for both the NRHP and SRHP. To be historically significant, a resource must meet one of the following basic criteria:

A. The resource must be associated with events that have made a significant contribution to the broad patterns of our history;

B. The resource must be associated with the lives of persons significant in our past;
C. The property must embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction; and
D. The property must show, or be likely to yield, information important to history or prehistory (NPS 2002).

Research identified one NRHP-listed individual property, one NRHP-listed historic district, and one NRHP-eligible historic district within the Study Area and APE (see **Figure 4.8-4**). **Table 4.8-3** lists the properties within the Project's Study Area and APE, their NRHP numbers, the NRHP/SRHP eligibility criteria, and the reasons for their NRHP designation.

Table 4.8-3 Historic Property Data within the APE

Resources	Location	NRIS No.	Status	NRHP/ SRHP Criteria a/	Reason for NRHP Designation
Bush Terminal Historic District	Brooklyn, NY	USN 04701019392	NR-Eligible	A, C	The property is noted as "the first American example of the complete integration of the commercial and industrial functions of manufacturing and warehousing with both rail and water transportation in one terminal under a unified management."
Storehouse #2, US Navy Fleet Supply Base	Brooklyn, NY	13000026	NR-Listed	A, C	The property is listed both for its role in supplying the military and for its Classical Revival style design.
Green-Wood Cemetery	Brooklyn, NY	97000228	NR-Listed NHL NYC-Landmarked	C	The property is listed for the outstanding merits of the landscape design of David Bates Douglass, the cemetery architecture of Richard Upjohn & Sons, and the sculptural quality of the monuments.

Note:
a/ NRHP Criteria: A. The resource must be associated with events that have made a significant contribution to the broad patterns of our history; B. The resource must be associated with the lives of persons significant in our past; C. The property must embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction; and D. The property must show, or be likely to yield, information important to history or prehistory (NPS 2002).

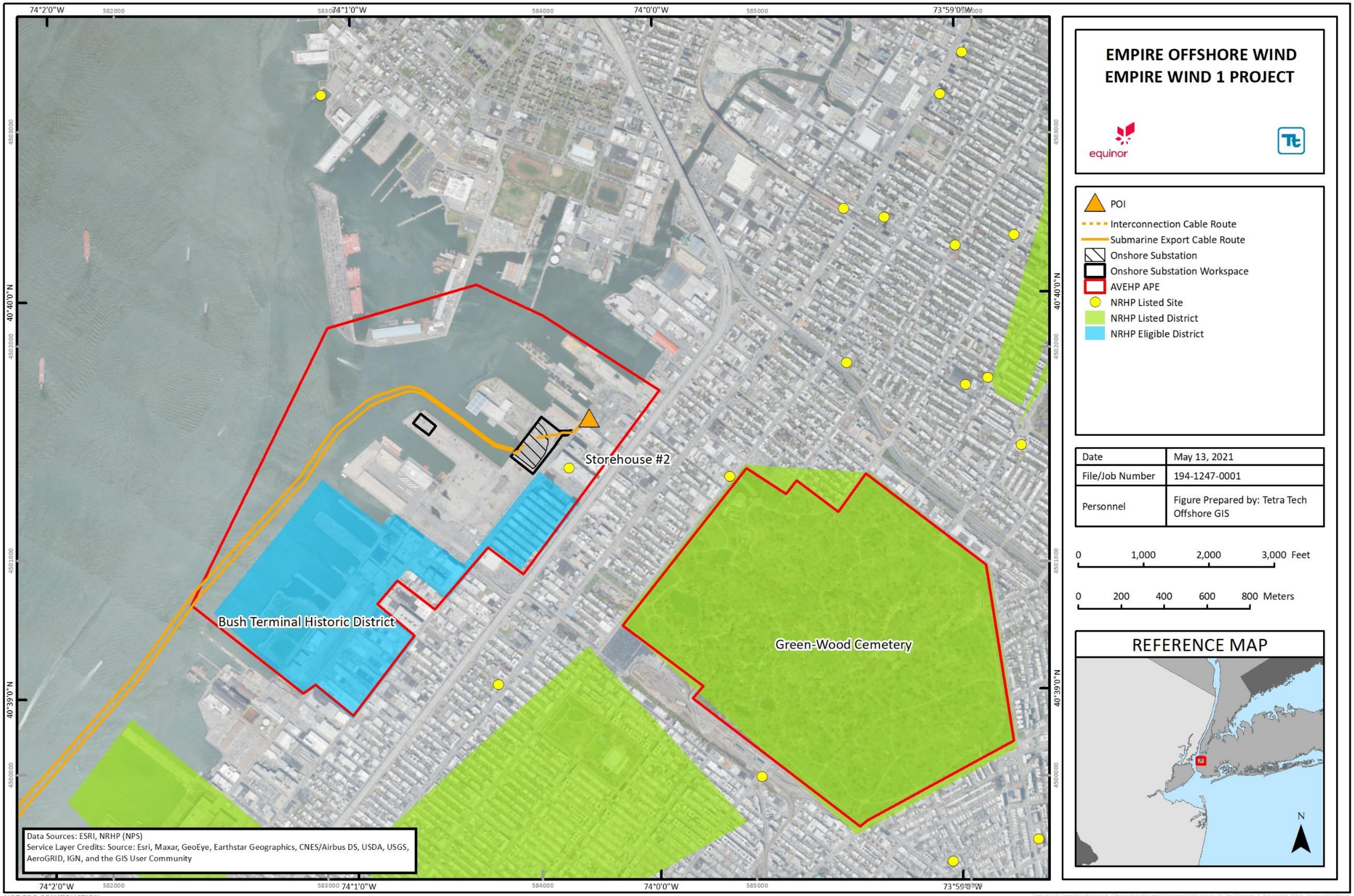


Figure 4.8-4 Previously Identified Historic Properties within the APE and Surrounding Area

4.8.3 Potential Cultural and Historic Resources Impacts and Proposed Mitigation

This section details the potential impacts to marine and terrestrial archeological resources and historic properties resulting from construction, operation, and decommissioning of the Project. It also describes the Project-specific measures that the Applicant has adopted to avoid, minimize, and/or mitigate potential impacts. As described in Section 4.8.2, marine archaeological resources that have the potential to be identified in the marine archaeological resources APE may range from pre-contact to historic submerged resources. The findings of the site file review, background research, and pedestrian surveys indicate that major portions of the potential terrestrial archaeological APE have been subject to various episodes of significant ground disturbance or land-making. As a result, it is unlikely that significant and undocumented terrestrial archaeological resources would be discovered in these areas of the onshore APE. One NRHP-listed individual property, one NRHP-listed historic district, and one NRHP-eligible historic district were identified within the AVEHP APE.

4.8.3.1 Construction

During construction, the impact-producing factors for cultural and historic resources include:

- Construction of the onshore cables, including ground disturbance within the terrestrial archaeological APE;
- Construction of a new onshore substation within the terrestrial archaeological and AVEHP APEs; and
- Construction of the submarine export cables within the marine archaeological APE, including the anchoring of working vessels and installation of Project infrastructure.

The potential impacts associated with these factors are described in the subsections below for terrestrial archaeological resources, marine archaeological resources, and historic properties.

Terrestrial Archaeological Resources

Ground-disturbing activities, including the construction and installation of underground features (e.g., joint vaults, onshore cables, site grading) and the onshore substation, have the potential to uncover and impact buried terrestrial archaeological resources. However, the likelihood of unanticipated discoveries is low because the area occurs entirely on artificially filled land constructed into Gowanus Bay in the late nineteenth and early twentieth centuries. Temporary construction workspaces and laydown areas will be evaluated for terrestrial archaeological sensitivity prior to the start of construction. The Applicant proposes to implement the following measures to avoid, minimize, and mitigate potential impacts to terrestrial archaeological resources:

- Site Project components in existing ROW and previously disturbed areas, to the extent practicable; and
- Prepare and implement an Unanticipated Discoveries Plan, which outlines the procedures to follow if archaeological materials or human remains are discovered during construction activities, including contact information and reporting protocols if unanticipated discoveries occur.

Marine Archaeological Resources

During construction, the impacts to marine cultural resources have the potential to include disturbance to known and/or unknown submerged marine archaeological resources. The installation of the submarine export cable, as well as vessel anchoring, will result in the short-term disturbance of the seafloor and the potential for the long-term disturbance of marine archaeological resources. Based on the results of the survey activities and marine archaeological analysis completed to date, potential sources of marine archaeological resources have been identified within the submarine export cable corridor (**Table 4.8-2)**. However, a Qualified Marine

Archaeologist will evaluate the submarine export cable corridor prior to final cable routing to identify avoidance of any known resources.

In order to avoid and minimize potential impacts, marine archeological targets will be avoided by a horizontal buffer of at least 164 ft (50 m) from the extent of the magnetic anomalies or acoustic contacts, unless further investigation and/or consultation with the appropriate authorities deems this unnecessary.

Historic Properties

During construction, the potential impacts to historic properties will be limited to short-term visual impacts during offshore and onshore construction activities. Direct impacts to historic resources during construction are not expected.

Visual impacts during offshore construction activities. During Project construction, Project-related vessels will be present within and transiting to/from the submarine export cable corridor. Since vessel traffic is common along the Atlantic Coast, it is anticipated that the vessels will not substantially increase traffic around New York Harbor or along the southern and eastern coasts of New York. Vessels that will be used for Project construction will be similar in size and form to existing commercial vessels.

Installation of the submarine export cables in nearshore waters will introduce Project-related vessels relatively close to shore in the areas near the cable landfall. While these vessels will be easily visible from shore, they will not remain in any area for more than several weeks. Because of the relatively short duration that they will be in any single location, they are not anticipated to adversely affect onshore historic resources.

Nighttime construction activities are also proposed. Navigation lights associated with large vessels (i.e., barges and jack-up vessels) and lights necessary to perform construction activities may be visible from coastal vantage points. However, visual effects resulting from nighttime construction activities will be limited to a few geographical locations. These visual effects will also be short-term, since the large vessels and lights necessary to perform construction activities will not be present overnight once construction is complete.

Visual impact during onshore construction activities. During construction of the onshore substation, potential short-term visual effects would result from construction activities and the presence of construction equipment and work crews. Construction activities would include surveying; clearing the construction site; stockpiling soil; grading, forming, and construction of substation foundations; placement and erection of substation equipment and buildings; placement of perimeter fencing; and restoration of temporarily disturbed workspace and laydown areas.

It is anticipated that some visual impact would be introduced during Project construction of the onshore substation primarily for views to the north and west from residential areas located directly south and east of the proposed onshore substation, where the presence of construction equipment, materials, and crews would be dominant in the foreground. However, the construction-related visual effects would be temporary because construction equipment and crews would be removed once construction is complete. Views of Project construction from areas not immediately adjacent to the onshore substation site would be mostly screened by buildings and structures.

The construction of other Project onshore components, including the submarine and onshore cables, will occur at grade and will produce temporary views of construction equipment only to areas immediately adjacent to the construction.

During construction, the following avoidance, minimization, and mitigation, measures will be implemented:

- Siting Project components in highly developed and previously disturbed areas; and
- Continuing outreach and engagement with the local community, relevant agencies, interested Tribes, and other stakeholders throughout the construction process.

4.8.3.2 Operations and Maintenance

During operations and maintenance, the potential impact-producing factor to historic resources is the presence of new fixed structures onshore (e.g., onshore substation). As a busy maritime center with vessels, barges, ferries and cranes present throughout the year, vessels used for inspections or repairs associated with Project operations and maintenance are considered negligible as an impact-producing factor for cultural resources.

Terrestrial Archaeological Resources

During operations and maintenance, no impacts to terrestrial archaeological resources are anticipated because additional ground-disturbing activities are not proposed. In the event of non-routine repair to onshore cables, ground disturbance is anticipated to be within the area previously disturbed for Project construction. Indirect impacts to terrestrial archaeological resources in the form of operational noise, emissions, or visibility are not anticipated, based on the absence of recorded sites within the Study Area that are NRHP- and SRHP–listed, NRHP- and SRHP-eligible or potentially eligible.

Marine Archaeological Resources

During operations and maintenance, activities that disturb the seabed (i.e., repairing of the submarine export cables or the utilization of a jack-up vessel) have the potential to disturb submerged marine archaeological resources. However, these activities will be limited to areas previously assessed for potential resources. Therefore, no additional impacts are anticipated. In order to avoid and minimize any potential impacts, buffers will be implemented around identified potential submerged contacts, to the extent practicable.

Historic Resources

During operations and maintenance, long-term visual impacts resulting from the presence of a new onshore substation may occur. There is one NRHP-listed individual property, one NRHP-listed historic district, and one NRHP-eligible district within the APE (**Table 4.8-4**). The Bush Terminal Historic District (NRHP-eligible) and Storehouse #2 (NRHP-listed) are both located near the proposed onshore substation. The onshore substation will be an industrial-style building with a roof peak of 49 ft (15 m)[7]. This building type and roof elevation will be commensurate with the existing local industrial built environment. Because the Bush Terminal Historic District and Storehouse #2 are already located in an active, modern waterfront, the introduction of an additional modern component to this setting will not adversely affect either resource because their significance does not derive from their historic maritime setting being preserved.

Green-Wood Cemetery (NRHP-listed) is located at the outer margin of the 0.5-mile (0.8-km) APE, 0.47 miles (0.75 km) east-southeast of the onshore substation (see **Figure 4.8-3**). Green-Wood Cemetery, in addition to being NRHP-listed, is a National Historic Landmark. The cemetery's 25th Street gates, Weir Greenhouse, Fort Hamilton Parkway Gate, and chapel are separately NYC-Landmarked. There will be an expected partial view of the onshore substation from the ridge (glacial moraine summit) within Green-Wood Cemetery. The onshore substation will appear between existing multi-story warehouses at a distance of around 0.9 mi (1.4 km). Green-Wood Cemetery is nationally significant because of its association with the development of the rural cemetery

[7] Subsequent to initial efforts, the Applicant continues to refine the design of the onshore substation. This is informed by analysis including visual simulations, acoustic modeling, and other field surveys, as well as engagement with municipalities and other stakeholders.

movement within the urban context, and because of its outstanding architecture, funerary art, and landscaping. The addition of new structures to the viewshed outside the cemetery limits does not diminish the feeling, association or craftsmanship of the cemetery itself. There are expected to be no adverse effects to Green-Wood Cemetery by the introduction of the onshore substation.

The Applicant is conducting ongoing consultation with NY SHPO and is in the process of identifying any other interested parties and determining if any further actions are needed to ensure that there will be no significant adverse impacts to these resources. Additional information on visual effects of the Project are provided in Section 4.9 and the Visual Impact Assessment in **Appendix I**.

Table 4.8-4 Historic Properties within the APE

Resources (Figure#/HP#)	NRIS/CRIS No.	Status	NRHP Criteria a/	Assessment of Effect
Bush Terminal Historic District (Fig 6.3-6/#1)	USN 04701019392	NR-Eligible	A, C	No adverse effect
Storehouse #2, U.S. Navy Fleet Supply Base (Fig 6.3-6/#2)	13000026	NR-Listed	A, C	No adverse effect
Green-Wood Cemetery (Fig 6.3-6/#37)	97000228	NHL	C	No adverse effect

Note:
a/ NRHP Criteria: A. The resource must be associated with events that have made a significant contribution to the broad patterns of our history; B. The resource must be associated with the lives of persons significant in our past; C. The property must embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction; and D. The property must show, or be likely to yield, information important to history or prehistory (NPS 2002).

4.9 Visual and Aesthetic Resources

Pursuant to 16 NYCRR § 86.5, this section describes and analyzes visual and aesthetic resources within and surrounding the Project Area. Potential impacts to visual resources resulting from construction and operation of the Project are discussed. This section also describes proposed Project-specific measures that the Applicant will implement to avoid, minimize, and/or mitigate potential impacts. Cultural and historic resources are described in Section 4.8. A VIA is attached as **Appendix I**, and an AVEHP is attached as **Appendix H.**

4.9.1 Visual and Aesthetic Resources Studies and Analysis

The visual resources study area (Visual Study Area) for the Project was defined based on locations from which the onshore Project facilities are potentially visible and noticeable to the casual observer.[8] A 4-mi (6.4-km) Visual Study Area was established, within which potential effects to visual and aesthetic resources were evaluated. The use of a 4-mi (6.4-km) Visual Study Area for this Project was determined by the location of the onshore substation within a heavily developed area but adjacent to open water (i.e., Upper Bay). For onshore substations in a relatively flat area that is heavily developed and/or wooded, such as the ones proposed for the Project, a smaller visual study area of 2 mi (3.2 km) would typically be used to assess potential visibility. The use of the larger Visual Study Area captures the western shore of the bay, where visual receptors may have unobstructed views toward the Project across open water. This means a greater number of sites were identified; however, this area is heavily developed, and views are likely to be blocked in most areas by existing development. The submarine export and onshore cables will be entirely underwater or underground and therefore will not be visible once installed. The Visual Study Area focuses on the onshore substation, but visual impacts related to construction and operation of the submarine export and onshore cables are included in the analysis.

Figure 4.9-1 depicts the extent of the Visual Study Area for the Project.

The VIA (**Appendix I**) was coordinated with the AVEHP (see Section 4.8 and **Appendix H**). The following sections provide a summary of the visual impact analysis detailed in the VIA.

4.9.1.1 Existing Visual and Aesthetic Resources

The affected existing environment is defined as the coastal area where key viewer groups in the Visual Study Areas might experience the visual effects of the Project. In general, the types of viewers present within the Visual Study Areas are classified as local residents, travelers, tourists and recreational users. Distinctions among user groups and their expected sensitivity to landscape changes based on activity types and viewing characteristics were also analyzed.

[8] The "casual observer" is considered an observer who is not actively looking or searching for the Project facilities but is engaged in activities at locations with potential views of the Project, such as hiking or strolling, driving on a scenic road, or relaxing in a park or on a beach.

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Figure 4.9-1 Visual Study Area

4.9.1.2 Regional Landscape Character

The existing landscape character provides the context for assessing the effects of changes to the landscape. Landscape character is identified and described by the combination of the scenic attributes that make each landscape identifiable or unique. A region's landscape character creates a sense of place and describes the visual image of an area. To assess impacts to the landscape's visual character and quality, it is important to establish the context for the visual environment at both a regional and project-specific level.

U.S. Environmental Protection Agency Level IV ecoregions of New York were used to develop a description of the existing landscape character within the Visual Study Area. Ecoregions provide a convenient foundation for describing visual character at the regional level because ecoregions are defined based on multiple elements similar to those used in the Bureau of Land Management (BLM)'s Visual Resource Management for inventorying and assessing scenic quality (BLM 1986). These factors include physiographic elements of landform, vegetation, water, and cultural modifications defined as human/artificial modifications to the landscape. The Level IV ecoregions of New York and New Jersey that cross the Visual Study Area include: New England Coastal Plains and Hills, Long Island Sound Coastal Lowlands, and Glaciated Triassic Lowlands. Landscape conditions within these Level IV ecoregions are discussed below.

Southern New England Coastal Plains and Hills

The northern portion of the Visual Study Area in New York is within the Southern New England Coastal Plains and Hills ecoregion which is characterized by irregular plains with some low hills. Ponds, small lakes, reservoirs, streams, and wetlands are abundant throughout the ecoregion (Bryce et al. 2010). Elevation for this ecoregion ranges between 40 to 800 ft (12.2 to 243.8 m) AMSL. Vegetation type consists of Appalachian oak-pine forests and hardwoods, swamps, and vegetation associated with small river floodplains, including oak, sycamore, and maples. Cultural modifications include urban, suburban, and rural residential land, and some crop lands.

The portion of the Visual Study Area that is within this ecoregion includes Manhattan Island, New York. This area is heavily developed with small pockets of dispersed natural areas and parks.

Long Island Sound Coastal Lowland

The eastern half of the Visual Study Area is within a portion of the Long Island Sound Coastal Lowland ecoregion which is characterized by flat to irregular plains, coastal beaches, bays, tidal flats, and low gradient streams (Bryce et al. 2010). Elevation is less than 250 ft (76.2 m) AMSL. Vegetation types consists of oak-hickory or oak-tulip forests in upland areas; red maple, sweet gum and pin oak occur in wetter areas. Coastal bluffs consist of pitch pine, eastern red cedar, oaks, and hickory. Low dunes consist of beach grass and goldenrod, and low marshes consist of cordgrass and spike grass. Cultural modifications include urban, dense suburban, and some rural residential development. Coastal resorts and development associated with coastal tourism and sport and commercial fishing also occur in this ecoregion.

Portions of the Visual Study Area that are within this ecoregion include the western portion of Brooklyn and Governors Island, New York. This area is heavily developed with pockets of dispersed natural areas and parks.

Glaciated Triassic Lowlands

The western portion of the Visual Study Area in New Jersey is within the Glaciated Triassic Lowlands ecoregion which consists of flat to irregular plains, moist depressions, low hills, ridges, and streams (Bryce et al. 2010). Vegetation types consist of fragmented woodlands, transitional between Appalachian oak forest and hemlock-northern hardwood forests, serpentine barrens-grassland-savanna communities, and swamps with cottonwood and oaks. Cultural modifications include mostly urban areas in New Jersey with some agriculture and nursery crops.

The portion of the Visual Study Area that is within this ecoregion includes New Jersey. This area is heavily developed with small pockets of dispersed natural areas and parks.

4.9.1.3 Project Area

The Project Area includes the submarine export cable corridor in New York, the onshore substation and the onshore cable corridor. The onshore substation will be located in an approximately 4.8-ac (1.9-ha) area at the north end of SBMT, which is located west of 2nd Avenue between 29th and 39th streets in Brooklyn, New York, a highly urbanized area characterized by several warehouses, commercial buildings, and industrial facilities.

The existing Gowanus 345-kV Substation, which will support the interconnection of the Project to the existing electrical grid, is located approximately 400 ft (122 m) to the northeast of SBMT. The onshore substation site is relatively flat and ranges from approximately 5.9 ft (1.8 m) to 10.8 ft (3.3 m) elevation NAVD88 (CIRES 2014). The parcel on which the onshore substation is proposed to be located consists of a paved parking lot and storage area. The onshore substation site is adjacent to Sims Municipal Recycling, which encompasses a large warehouse to the north, a parking lot, 2nd Avenue and commercial and industrial buildings to the east, open asphalt area and warehouse to the south, and Upper Bay to the west. A railroad also runs along the eastern boundary of the onshore substation site.

Vegetation is limited in and adjacent to the Project Area and includes scattered green grasses and bushy shrubs along the shore of the bay ranging from approximately 10 to 15 ft (3 to 5 m) in height and 3 to 8 ft (1 to 2 m) in width and weeds that have grown up through cracks in the pavement.

4.9.1.4 Visual Study Area Description

A 4-mi (6.4-km) Visual Study Area was used to review potential visibility of the Project facilities.

Viewer distance from an area is a key factor in determining the level of visual effect, with perceived impact generally diminishing as distance between the viewer and the affected area increases (BOEM 2007). The BLM Visual Resource Management categorizes views into distance zones of foreground/middleground (0 to 5 mi [8 km]), background (5 mi to 15 mi [8 to 24 km]), and seldom seen (beyond 15 mi [24 km]). These distance zones provide a frame of reference for classifying the degree to which details of the viewed Project will affect visual resources.

Onshore Project components will be primarily within the foreground/middleground distance zone for most viewers. Due to dense urban development in the area, it is anticipated that there will be no views of the onshore Project components in the background and seldom seen distance zones.

The Visual Study Area for the onshore substation predominantly covers Brooklyn, New York, but includes portions of Manhattan and Staten Island, as well as the shores of Bayonne and Jersey City in New Jersey (see **Figure 4.9-1**). The Visual Study Area incorporates the majority of New York Upper Bay as well as the river mouths of the Hudson and East Rivers where they join at the tip of Manhattan, the mouth of the Kill Van Kull, and a small piece of New York Lower Bay south of the Verrazzano-Narrows Bridge. Additional discussion of land use in the vicinity of the onshore Project Area is provided in Section 4.10.

4.9.1.5 Scenic and Aesthetic Resources of Significance

NYSDEC Policy DEP-00-2: Assessing and Mitigating Visual Impacts provides guidance for the evaluation of visual impacts of proposed projects (NYSDEC 2019j). Per this policy, scenic and aesthetic resources of statewide significance may be derived from one or more of the following categories:

- Properties on or eligible for inclusion in the National Register of Historic Places or State Register of Historic Places;
- State Parks;
- New York State Heritage Areas (formerly Urban Cultural Parks);
- State Forest Preserves;
- National Wildlife Refuges, State Game Refuges, and State Wildlife Management Areas;
- National Natural Landmarks;
- Sites on the National Park System, including Recreation Areas, Seashores, and Forests;
- National or State Wild, Scenic, or Recreational Rivers;
- Sites, areas, lakes, reservoirs, or highways designated or eligible for designation as scenic;
- Scenic Areas of Statewide Significance (SASS);
- State or federally designated trails, or one proposed for designation;
- Adirondack Park Scenic Vistas;
- State Nature and Historic Preserve Areas;
- Palisades Park;
- Bond Act Properties purchased under Exceptional Scenic Beauty or Open Space Category; and
- National Heritage Areas.

The Applicant reviewed the presence of visually sensitive and aesthetic resources in the Visual Study Area for the purposes of assessing the visual impacts and identifying Key Observation Points (KOPs). Significant aesthetic resources were identified in accordance with the NYSDEC's Program Policy DEP-00-2 (NYSDEC 2019j). The VIA (**Appendix I**) also considered locations representing the most critical viewpoints (i.e., views from communities, residential areas, recreational areas, and scenic areas specifically identified in planning documents) for selection of KOPs.

The majority of the types of aesthetic resources of statewide significance listed in NYSDEC's Program Policy DEP-00-2 are not found within the highly urban and developed Visual Study Area. However, there are properties on or eligible for inclusion in the NRHP within the Visual Study Area (see **Appendix H**), as well as one state park, seven National Parks, Recreation Areas/Seashores/Forests, two resources of statewide or regional significance, and eight locally important resources.

Table 4.9-1 lists the scenic and aesthetic resources of statewide significance identified within the Visual Study Area. As described in Section 4.9.1, the use of a 4-mi (6.4-km) Visual Study Area for this Project is conservative and was determined by the proximity to views across open water (i.e., Upper Bay). This means a greater number of sites were identified than if a smaller radius were evaluated; however, this area is heavily developed, and views are likely to be blocked in most areas by existing development. Note that the theoretical limit of visibility is determined by the distance between the viewer and the structure, the height of the structure, the elevation of the viewer, and the curvature of the earth (BOEM 2007). However, the theoretical limit of visibility often exceeds the actual visibility or what is experienced in real life.

Table 4.9-1 Scenic and Aesthetic Resources of Significance within the Visual Study Area

Site	Location	Distance to Project mi (km)	Project Visibility
Properties on or eligible for inclusion in the National Register of Historic Places or State Register of Historic Places a			
Greenwood Cemetery	Brooklyn, NY	0.5 (0.8)	Possible Views
Bush Terminal Piers Park	Brooklyn, NY	0.1 (0.2)	Possible Views
State Parks			
Hudson River Park	Manhattan, NY	3.7 (6.0)	No Views
New York State Heritage Areas (formerly Urban Cultural Parks)			
Battery Park	Manhattan, NY	2.5 (4.0)	Possible Views
Empire Fulton Ferry	Brooklyn, NY	2.9 (4.7)	No Views
Harbor Waters	Brooklyn, NY	0 (0)	Possible Views
Pier A	Manhattan, NY	2.8 (4.5)	Possible Views
South St. Seaport	Manhattan, NY	2.8 (4.5)	Possible Views
Sites on the National Park System, including Recreation Areas, Seashores, and Forests			
Castle Clinton National Monument	Manhattan, NY	2.7 (4.3)	Possible Views
African Burial Ground National Monument	Manhattan, NY	3.5 (5.6)	No Views
Governors Island National Monument	Manhattan, NY	1.8 (2.9)	Possible Views
Gateway National Monument	Staten Island, NY	3.7 (6.0)	Possible Views
Statue Of Liberty National Monument	Manhattan, NY	2.4 (3.9)	Possible Views
Federal Hall National Monument	Manhattan, NY	3 (4.8)	No Views
Ellis Island National Monument	Manhattan, NY	2.8 (4.5)	Possible Views
Other Resources of Importance b/			
Fort Hamilton	Brooklyn, NY	2.9 (4.7)	Possible Views
Brooklyn Veterans Hospital	Brooklyn, NY	3.3 (5.3)	Possible Views
Locally Important Resources b			
Dyker Beach Park	Brooklyn, NY	2.7 (4.3)	No Views
East River Park	Manhattan, NY	3.4 (5.5)	No Views
Red Hook Park	Brooklyn, NY	0.4 (0.6)	Possible Views
Shore Road Park	Brooklyn, NY	1.3 (2.1)	Possible Views
Prospect Park	Brooklyn, NY	1.3 (2.1)	Possible Views
Staten Island September 11th Memorial	Staten Island, NY	3.1 (5.0)	Possible Views
Harbor View Park/Teardrop Memorial	Bayonne, NJ	2.7 (4.3)	Possible Views
Columbia Street Esplanade	Brooklyn, NY	0.1 (0.2)	Possible Views

Notes:
a/ Multiple locations can be found in Appendix H, Analysis of Visual Effects to Historic Properties.
b/ These are not considered resources of statewide significance as identified in VIA Inventory of Aesthetic Resources (NYSDEC 2019); however, they are important local resources.

4.9.1.6 Visual Resource Inventory and Analysis

A viewshed analysis was completed for the onshore substation to identify areas within the Visual Study Area where it may be visible. The onshore viewshed used building footprints within New York City, Suffolk County, and Nassau County in New York and Monmouth County in New Jersey to identify areas within the Visual Study Area where potential screening may be provided by buildings[9]. This analysis was used to identify prospective field visits and KOPs locations to be analyzed for potential visual effects. Potential visibility results based on the viewshed analysis that was conducted for the onshore substation are shown in **Figure 4.9-2**.

An inventory of visual resources was conducted considering the existing landscape and scenery and the viewers and KOPs within the Visual Study Area. A field visit to the Visual Study Area was conducted to properly assess the existing visual character of the landscape and to inventory current conditions at a set of sensitive viewing locations. The field inventory included three components: (1) identification and photo-documentation of sensitive viewing locations; (2) classification of visual sensitivity at the locations visited; and (3) description of expected Project visibility from locations visited. Following the field inventory, a subset of the sensitive viewing locations was selected as representative KOPs for use in the impact evaluation. Criteria used to select KOPs for onshore Project components included:

- Locations representing the most critical viewpoints (i.e., views from communities, residential areas, recreational areas, and scenic areas specifically identified in planning documents); and
- Geographic distribution representing locations closest to the onshore substation and at various distances within the Visual Study Area.

Table 4.9-2 includes a list of KOPs within the Visual Study Area and potential visibility of the Project based on the results of the viewshed. KOPs within the Visual Study Area for the onshore substation are shown in **Figure 4.9-3**. Photographic simulations were created for a select number of KOPs in the VIA in **Appendix I**.

Each KOP was evaluated based on several factors and the results are summarized in the following narrative.

2nd Avenue KOP

This KOP is located on the corner of 2nd Avenue and 32nd Street in Brooklyn, New York within the commercial/industrial area directly east of the onshore substation. 2nd Avenue begins just north of 28th Street and extends south-southwest approximately 2 mi (3.2 km) to the Belt Parkway and provides access to several commercial and industrial developments along the waterfront. The landscape surrounding this local road is densely urban and includes heavy industrial and commercial development. Upper Bay is located approximately 0.6 mi (1 km) to the west.

<u>Existing View</u>

This KOP is within the Long Island Sound Coastal Inland ecoregion. The landscape surrounding this location is characterized by dense urban development. Views from this location toward the Project include industrial buildings, a recycling center, a parking lot and associated lighting, a perimeter chain-link fence and a wind turbine (unrelated to the Project) adjacent to the parking lot in the foreground, with peek-a-boo views of the Upper Bay and buildings in lower Manhattan in the background. Vegetation is limited to scattered trees within the South Brooklyn Marine Terminal.

[9] Vegetation was not accounted for in the viewshed due to the lack of vegetation and the dense urban landscape surrounding the site. Buildings are more likely to provide screening than the limited vegetation found in the Visual Study Area.

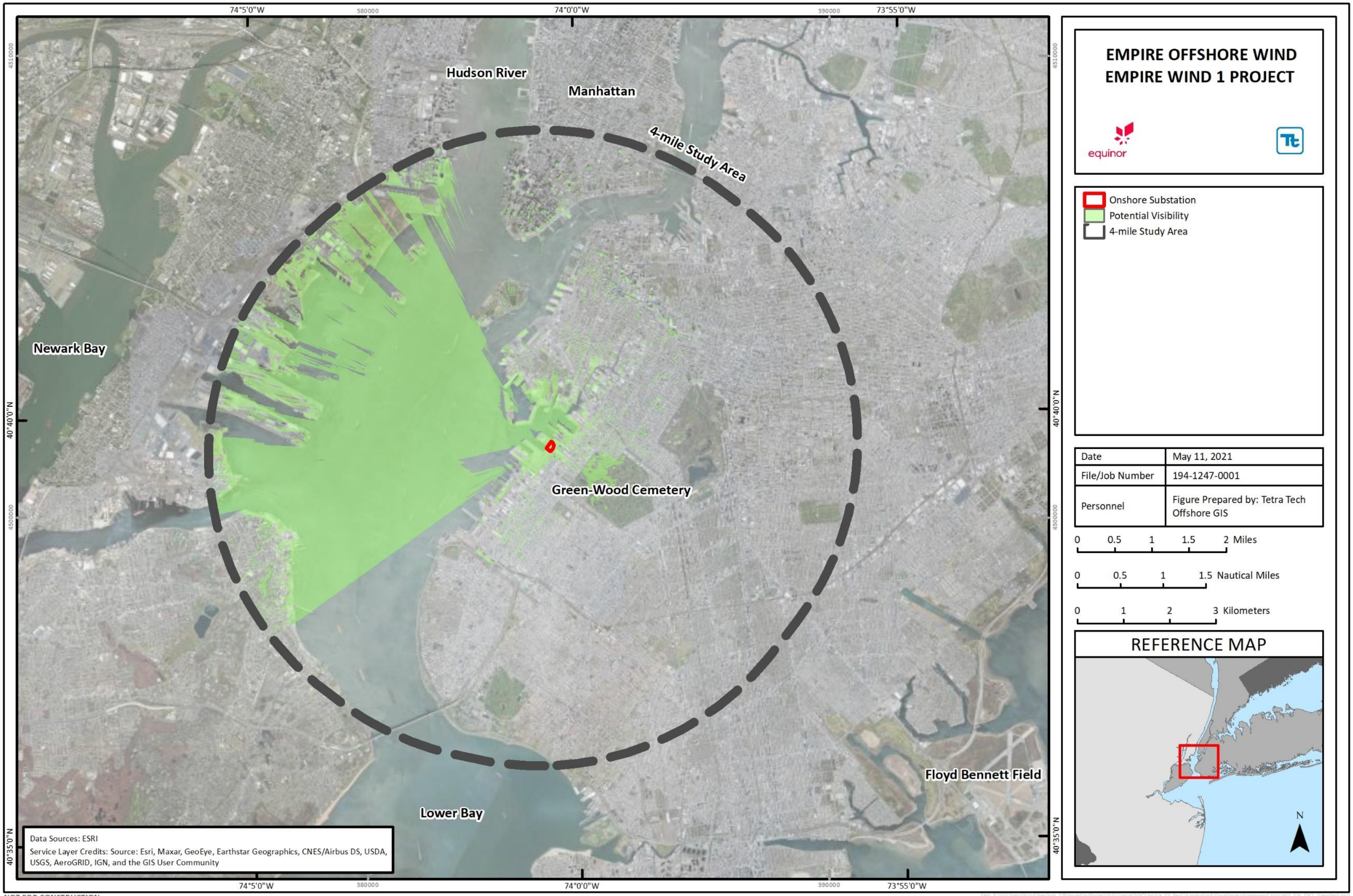

Figure 4.9-2 Viewshed Analysis

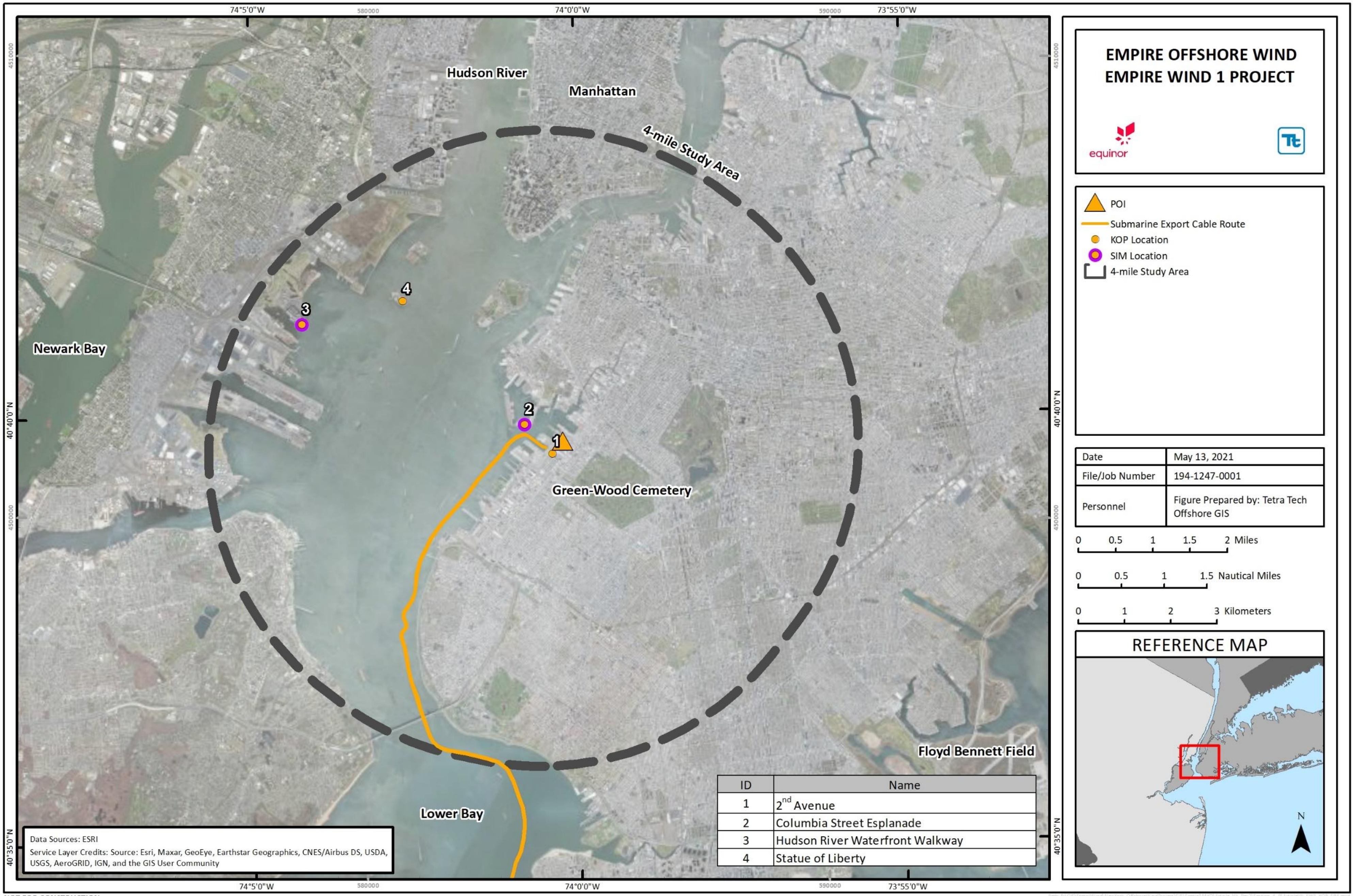

Figure 4.9-3 Key Observation Points within the Visual Study Area

Table 4.9-2 List of Key Observation Points within the Onshore Visual Study Area

Map ID Number a/	Name	Location	Resource Type	Distance to Project mi (km)	Project Visibility
EW 1 Onshore Substation					
1	2nd Avenue	Brooklyn	Travel way	100 ft (30.5 m)	Visible
2	Columbia Street Esplanade	Brooklyn	Public Recreation	0.4 (0.6)	Partially Visible
3	Hudson River Waterfront Walkway	Hoboken, New Jersey	Public Recreation	3.7 (6.0)	Visible
4	Statue of Liberty	New York City	Tourist Destination, Historic (National Monument, NRHP, NYC Landmark, NJRHP)	2.8 (4.5)	Partially Visible

Note:
a/ See **Figure 4.9-3**.

<u>View with the Project</u>

This location represents drivers along 2nd Avenue and viewers in adjacent buildings[10]. Views towards the onshore substation from this location are unobstructed. The onshore substation will be seen in the context of other existing development including a recycling center, parking lot, warehouse, an onshore wind turbine adjacent to the parking lot, and lighting associated with parking areas. Although the surrounding area is heavily developed, the area within SBMT primarily includes paved areas with one warehouse located south of the onshore substation. The proposed buildings associated with the onshore substation will be larger than the existing warehouse to the south. Furthermore, the onshore substation will be seen in front of the recycling center and closer to potential viewers on 2nd Avenue. Due to the proximity of the onshore substation to the road (approximately 100 ft [31 m]) and the size of the proposed buildings, the onshore substation will attract attention and dominate the view. As such, the Project will introduce strong visual contrast from this KOP.

Columbia Street Esplanade KOP

Columbia Street Esplanade is located at the end of Columbia Street in Brooklyn, New York. The esplanade is a walkway that runs along the east side of a pier that extends out into Gowanus Bay. Amenities include benches, lighting, and a bikeway. The esplanade is privately owned and maintained but is open and accessible to the public (NYCDCP 2019a). The landscape surrounding the esplanade includes warehouses along the pier to the west and north, and Gowanus Bay east and south, with SBMT located on the eastern side of the bay.

[10] This view represents viewers at the ground level of adjacent buildings; it does not represent views from upper stories of nearby buildings.

Existing View

This KOP is within the Long Island Sound Coastal Inland ecoregion. The landscape surrounding this location is characterized by open water and dense urban development. Because of the dense development along the eastern side of Gowanus Bay, views from the esplanade are limited primarily to buildings and other development in the foreground. However, the Green-Wood Cemetery, Sunset Park, and some taller buildings can be seen in the middle ground rising above some of the development along the coast. Vegetation includes trees and shrubs scattered along the shoreline of the bay and trees associated with Green-Wood Cemetery and Sunset Park. From this KOP views toward the onshore substation are partially screened by development.

View with the Project

This location represents recreational viewers associated with the esplanade. Views toward the onshore substation from this location are partially screened by the existing recycling center that is located directly west of the site. Portions of the proposed buildings that rise above or extend beyond the recycling center will be visible. The light beige color and rectangular form of the buildings within the onshore substation will be similar in form and color to several other warehouses and commercial buildings along the coast. The scale of the proposed buildings will also be similar to several of the existing buildings. The outdoor electrical equipment will mostly be screened by the recycling center and portions that are visible will not be noticeable or perceived. Substation facilities that are visible will be seen in the context of the recycling center, which is a prominent feature in the view, and other commercial and industrial development along the western shoreline of Brooklyn, New York. At a distance of 0.4 mi (0.6 km), although the substation buildings will attract attention, the recycling center located closer to the viewer will remain a dominant feature. As such, the Project will create weak visual contrast from this KOP.

A simulation representing the view of the substation buildings from this location is included in **Appendix I**.

Hudson River Waterfront Walkway KOP

This KOP is located along the Hudson River Waterfront Walkway, specifically at the eastern end of Chapel Avenue in Jersey City, New Jersey. The Hudson River Waterfront Walkway is a 30-ft (9.1-m)-wide, paved pathway that extends 18.5 mi (29.8 km) along the western shore of the Upper Bay and Hudson River from Bayonne, New Jersey to the George Washington Bridge. The walkway follows the general contour of the shoreline and traverses residential, commercial, and industrial development, including re-developed piers, and wetlands. The walkway was developed to provide connectivity between municipalities and to provide public access to the water's edge. There are several parking areas and points of interest along the walkway route. According to the Hudson River Waterfront Conservancy,[11] "The walkway was adopted into New Jersey Administrative law in 1988. It requires the construction and maintenance of the Walkway by the owner of the waterfront land. It also requires free, unobstructed access to the Walkway 24 hours a day. An easement conveys the conservation restriction to the NJ Department of Environmental Protection which is responsible for the enforcement of the regulation." (HRWC 2019). The landscape surrounding the walkway includes the Upper Bay and Hudson River to the east and a variety of land uses to the west, including industrial, residential, and commercial.

[11] The Hudson River Waterfront Conservancy is a non-profit organization that works with the New Jersey Department of Environmental Protection to monitor the construction, maintenance, and usage of the walkway.

Existing View

This KOP is within the Glaciated Triassic Lowlands ecoregion. The landscape surrounding this location is characterized by open water and dense urban development. Expansive views of the water and the skyline of New York, including Brooklyn, can be seen from the walkway. From this KOP, views toward the onshore substation are primarily unobstructed. However, the bay is heavily traveled by large marine vessels, including cargo ships, cruise ships and ferries, and the eastern shoreline is sometimes screened by passing ships.

View with the Project

This location represents viewers associated with the walkway, such as pedestrians, bikers and anglers. Views across the Upper Bay toward the Project are unobstructed. However, the northern portion of the onshore substation will be partially screened by the recycling center located directly west of the site. Portions of the onshore substation that are visible include the outdoor electrical equipment area and buildings to be located near the southern portion of the site. The large light beige color and rectangular form of the buildings within the onshore substation will be similar in form and color to several warehouses and commercial buildings along the coast. The scale of the proposed buildings will also be similar to several of the existing buildings. The outdoor electrical equipment, which will consist of transformers and shunt reactors, will most likely be surrounded by fire walls that will screen most of the equipment itself. The firewalls will be gray and appear rectangular in form and will be smaller in size than the proposed buildings. Substation components that are visible will be seen in the context of other commercial and industrial development along the western shoreline of Brooklyn, New York. At a distance of approximately 4 mi (6.4 km), the onshore substation will blend into the existing landscape setting. Due to the distance of the onshore substation and the densely developed industrial/commercial coastline, the onshore substation may attract attention but would appear as a subordinate feature in the heavily developed landscape setting and will not change the characteristic of the view. As such, the Project will introduce weak visual contrast from this KOP. Marine vessels, including cargo and cruise ships, may also temporarily screen the onshore substation as they travel to and from port.

A simulation representing the view of the substation buildings from this location is included in **Appendix I**.

Statue of Liberty KOP

This KOP is located on the southeast side of the Statue of Liberty, which is on Liberty Island within New York Harbor. The Statue of Liberty is a copper statue that was a gift from the people of France to the people of the United States. The statue was dedicated on October 28, 1886. The statue is part of the Statue of Liberty National Monument, which includes the statue and Ellis Island. The statue is owned and operated by the National Park Service and was listed on the NRHP in September 2017 (NPS 2017). The statue is also designated as a United Nations Educational, Scientific, and Cultural Organization World Heritage Site, U.S. National Monument, NJNRHP, and New York City Landmark. The landscape surrounding this location includes open water with dense urban development along the mainland of New York and New Jersey.

Existing View

This KOP is within the Long Island Sound Coastal Lowland ecoregion. The landscape surrounding this location is characterized by open water and dense urban development. Expansive views of the water and the New York and New Jersey skyline can be seen from Liberty Island. Vegetation is limited to parks and vegetation along the waterfront. From this KOP views toward the onshore substation are partially obstructed by piers and other development along the southern coast of Brooklyn.

View with the Project

This location represents views by tourists visiting a widely known and highly popular landmark. Views from this location across Upper Bay toward the Project are partially obstructed. A pier that extends out into the water is located between the Liberty Island and the Project. The New York Police Department Erie Auto Pound is located on the pier, as is the Columbia Street Esplanade. There is also an existing recycling center located directly west of the onshore substation site that will partially screen the proposed substation buildings. Portions of the proposed buildings that rise above or extend beyond the recycling center will be visible. The light beige color and rectangular form of the buildings within the onshore substation will be similar in form, scale and color to several warehouses and commercial buildings along the coast. The onshore substation's outdoor electrical equipment will be mostly screened by the recycling center and portions that are visible will not be noticeable or perceived. Marine vessels, including cargo and cruise ships, may also temporarily screen the onshore substation as they travel to and from port. Substation facilities at the onshore substation site that are visible will be seen in the context of other commercial and industrial development along the western shoreline of Brooklyn, New York. At a distance of approximately 2.8 mi (4.5 km) the substation facilities will blend into the existing landscape setting. Due to the distance of the onshore substation from the viewer and screening by existing development, the substation will not attract attention or be perceived. Therefore, the Project will not change the characteristic of the view from this KOP or introduce visual contrast.

4.9.2 Potential Visual and Aesthetic Resources Impacts and Proposed Mitigation

4.9.2.1 Construction

During construction of Project facilities, the potential impact-producing factors to visual resources may include construction activities for installation of the submarine export cables and onshore cables, and construction of the onshore substation. The following potential direct and indirect impacts from construction of onshore facilities may occur as a consequence of factors identified above:

- Short-term, minor, direct impacts associated with offshore construction activities; and
- Short-term, minor, direct impacts associated with onshore construction activities.

Visual Impacts During Offshore Construction Activities

During construction, Project-related vessels will be present within and transiting along the submarine export cable route. As vessel traffic is common along the Atlantic Coast, it is anticipated that the vessels required will not substantially increase traffic around New York Harbor or along the southern and eastern coasts of New York. Most of the vessels used for Project construction will be similar in size and form to existing commercial vessels.

Installation of the submarine export cables in nearshore waters will introduce Project-related vessels relatively close to shore in the areas near the cable landfall. While these vessels will be easily visible from shore, it is not uncommon to see vessel traffic in this area and they will not remain in any area for more than several weeks. Because of the relatively short duration that they will be in any single location, these Project-related installation vessels are not anticipated to adversely affect onshore historic resources.

Nighttime construction activities are also proposed to occur within the Project Area. Navigation lights associated with large vessels (i.e., barges and jack-up vessels) and lights necessary to perform construction activities may be visible from coastal vantage points. However, visual effects resulting from nighttime construction activities will be limited to a few locations within the Project Area. These visual effects will also be short-term, as the large vessels and lights necessary to perform construction activities will not be present overnight once construction is complete.

Visual Impacts During Onshore Construction Activities

Short-term visual effects will occur during construction of the onshore substation and along the onshore cable corridor and will result from visual evidence of construction activities and the presence of construction equipment and work crews. Construction activities will include surveying; preparation of the construction site (e.g., removal of pavement, existing buildings, grading); forming and construction of the foundations for the buildings and outdoor electrical equipment; placement and erection of buildings and electrical equipment; placement of perimeter security fencing; and restoration. It is anticipated that contrast will be introduced during Project construction primarily for viewers adjacent to the onshore substation site and interconnection cable corridor, where the presence of construction equipment, materials, and crews will be dominant in the foreground.

Along the onshore cable corridor, short-term impacts are anticipated during construction. The roadway will be repaired and repaved post-construction. Unless paving of the entire roadway occurs, contrast in color (new vs. old paving) may be noticeable; however, contrast is expected to be minimal and viewers are unlikely to notice such changes in an urban environment.

For the onshore substation, short-term visual effects during construction may be noticeable by viewers associated with commercial and industrial buildings along the east side of 2nd Avenue, Columbia Street Esplanade[12], and marine vessels in Gowanus Bay. However, these visual effects will be short-term because construction equipment and crews will be removed once construction is complete. Views of Project construction from areas not immediately adjacent to the onshore substation will be mostly screened by residential, commercial or industrial buildings, vegetation and/or topography.

4.9.2.2 Operations

Long-term visual effects during operation of the onshore substation will result from the visibility of the aboveground components associated with the onshore substation buildings, outside electrical equipment, static masts, and perimeter security fence. The onshore substation will introduce tall, rectangular forms and vertical and geometric structures into the landscape setting already highly developed with similar forms and structures. The onshore interconnection cables will be placed under an existing roadway and will therefore have no significant long-term effects. Maintenance workers may also be required to work at the onshore substation infrequently, which could cause some minor temporary visual effects from the presence of equipment and disturbance of ground and/or pavement during work activities.

The onshore substation site is located within a landscape setting that has been heavily modified by commercial and industrial development. Furthermore, the site on which the proposed onshore substation will be located has also been modified. Based on the results of the viewshed analysis and subsequent field visit, potential views of the onshore substation will be primarily from the northwest, west and southwest. Areas to the north, east and south of the onshore substation will be screened by dense development associated with Brooklyn, New York. Viewers along 2nd Avenue adjacent to the onshore substation and in buildings[13] to the east will have views that are mostly unobstructed. The onshore substation will be seen in the context of other existing development

[12] Columbus Street Esplanade is a boardwalk along Columbus Street which is located on Gowanus Bay approximately 0.4 mi (0.6 km) west of the onshore substation site.
[13] This is based on viewers at the ground level of adjacent buildings; it does not represent views from upper stories of nearby buildings.

including a recycling center, parking lot, warehouse, an onshore wind turbine adjacent to the parking lot, and lighting associated with parking areas. The surrounding area is heavily developed, and the area within SBMT where the onshore substation is located primarily includes paved areas with a warehouse located just south of the onshore substation. The proposed buildings associated with the onshore substation will be larger than the existing warehouse to the south. Furthermore, the proposed onshore substation will be located in front of the recycling center and closer to 2nd Avenue and potential viewers. Due to the proximity of the proposed onshore substation to the road (approximately 100 ft [30.5 m]) and the size of the proposed buildings, the onshore substation will attract attention and dominate the view. As such, the Project will introduce strong visual contrast in views from the east.

Viewers located to the west, within the Upper Bay and along the western side of the Upper Bay on the coast of New Jersey, will have views that range from unobstructed to partially screened by development. The light beige color and large, rectangular form of the buildings within the onshore substation will be similar in form, color, and scale to other warehouses and commercial buildings along the coast. The outdoor electrical equipment, which will consist of transformers and shunt reactors, will most likely be surrounded by fire walls that will mostly screen views of the equipment itself. Due to the distance of the onshore substation to the New Jersey coastline (approximately 3.0 mi [4.8 km] or more) and the densely developed industrial/commercial coastline, an onshore substation at SBMT would appear as a subordinate feature in the heavily developed landscape setting and will not change the characteristic of the view. As such, the Project will introduce weak visual contrast.

4.9.2.3 Mitigation

The undergrounding of the onshore cables will mitigate many of the potential visual effects of the Project that would otherwise occur. For the onshore aboveground Project components (the onshore substation), the following mitigation measures will be incorporated into the Project design to minimize visual contrast:

- Construction Phase:
  - A Fugitive Dust Control Plan will be implemented to minimize dust (visual pollution);
  - The onshore Project Area will be maintained free of debris, trash, and waste to the extent possible during construction; and
  - Areas temporarily disturbed during construction will be restored to the conditions required by state and/or local permits.

- Operation Phase:
  - The onshore cables and joint bays will be located underground primarily under roadways and will not be visible during Project operation and maintenance, except that newly paved roadway areas may be differently colored than previously paved areas;
  - There will be minimal operations impact resulting from the presence of crews and equipment conducting maintenance activities;
  - The onshore substation site is located within the jurisdiction of the New York City's Waterfront Revitalization Program; therefore, a pre-engineered building system with prescribed architectural elements incorporated into the design will be used to ensure the Project meets the Waterfront Revitalization Program policies; and
  - Lighting at the onshore substation will be designed to reduce light pollution where feasible (e.g., downward lighting, motion-detecting sensors).

4.10 Land Use

This section describes the existing land uses and local zoning for the onshore portions of the Project, including the onshore substation, cable landfall and onshore cable routes to the POI. As the submarine export cables will be located entirely underwater and installed under or along the seabed, land use does not apply to the offshore portions of the Project. The Applicant reviewed the Project's consistency with the applicable land use regulations, policies, and present and future planned land uses. A detailed assessment of local ordinances for New York City is included in **Exhibit 7**.

4.10.1 Land Use Studies and Analysis

Existing land uses in the Project Area were reviewed based on a desktop assessment using aerial photography and the National Land Cover Database (USGS 2016), as well as the land use and zoning data taken directly from the local jurisdiction. Zoning maps were obtained from New York City's Zoning and Land Use Map. The Applicant also evaluated New York State Coastal Zone Management requirements and land use plans, local comprehensive plans, and the New York City Waterfront Revitalization Program (WRP).

4.10.1.1 Land Use Plans and Policies

A summary and description of the state and local land use plans and policies potentially applicable to the Project Area in Kings County is provided in **Table 4.10-1**. Discussion of consistency and conformance with state and local land use plans and policies is included in Section 4.10.3.

Table 4.10-1 Summary of Land Use Plans and Policies

Land Use Plans	Land Use Plan Description
State Land Use Plans	
2016 New York State Open Space Conservation Plan (NYSDEC 2016c)	The Open Space Conservation Plan is a comprehensive statewide plan that describes current open space conservation goals, actions, tools, resources, and programs administered by state and federal agencies and conservation nonprofits. Its stated goals include protecting water quality, outdoor recreation, habitat, education, and scenic, historic, and cultural resources. The plan was developed by NYSDEC and the New York State Office of Parks, Recreation and Historic Preservation, in conjunction with Regional Advisory Committees and other state agencies. The plan also identifies priority conservation projects for each of NYSDEC's nine administrative regions; Kings County is within Region 2. Specifically, Project 14, Brooklyn/Queens East River Waterfront, addresses open spaces and proposed greenways along the 20-mile waterfront from the Brooklyn Army Terminal to the Astoria Power Station. Project 140, Statewide Small Projects, includes preserving waterway access.
2015 New York State Energy Plan (New York State Energy Planning Board 2015), updated in 2020.	The State Energy Plan serves as a roadmap to New York's energy policy, Reforming the Energy Vision. It is meant to guide the State's efforts to advance new energy technologies, promote clean energy financing, and modernize energy infrastructure, including offshore wind, for a clean energy economy. The plan was adopted by the New York State Energy Planning Board and is guided by statutory requirements of Article 6 of the Energy Law. An Amendment to the 2015 State Energy Plan was adopted on April 8, 2020.
New York State Coastal Management Program (NYSDOS 1982)	New York's Coastal Management Program, run by the New York State Department of State, manages the state's coastal resources under the federal Coastal Zone Management Act of 1972. The Coastal Management Program contains 44

Land Use Plans	Land Use Plan Description
	statewide policies to prevent impairment of coastal resources and promote their beneficial use. New York State's Waterfront Revitalization of Coastal Areas and Inland Waterways Act, passed in 1981, enables local communities to adopt their own Local Waterfront Revitalization Programs. The *New York City Waterfront Revitalization Program*, which provides a refinement of the state coastal policies to reflect considerations specific to New York City, including Kings County, is discussed further below.
Local Land Use Plans	
North Brooklyn Industry and Innovation Plan (NYC Department of City Planning (NYCDCP) 2018)	The North Brooklyn Industry and Innovation Plan identifies strategies to better align local land use policy in the North Brooklyn Industrial Business Zone with the needs of local businesses. A main goal of the plan is to support growth in both industrial/manufacturing sectors and office sectors, by identifying subareas suited to each business and increasing job density in targeted areas, thereby reducing competition for space and potential for conflicts between industrial and non-industrial businesses. The plan also aims to identify potential improvements to transportation and infrastructure that would support growth in economic activity.
NYC Waterfront Revitalization Program (NYCDCP 2016)	The New York City WRP is the City's principal Coastal Zone management tool. The Program is used to maximize the benefits derived from economic development, environmental conservation, and public use of the waterfront, while promoting activities appropriate to varying waterfront locations. This local WRP is authorized by New York State's Waterfront Revitalization of Coastal Areas and Inland Waterway Act, which stems from the Federal Coastal Zone Management Act. This version of the WRP was updated in June 2016, with updates to guidance implementing Policy 6.2 made in November 2018. Examples of projects that undergo WRP review include re-zonings, private shoreline construction projects, and public infrastructure projects. A proposed project may be deemed consistent with the WRP when it will not substantially hinder and, where practicable, will advance one or more of the ten WRP policies, which include such goals as supporting maritime and industrial development, providing public access, and protecting ecological, scenic, and cultural resources.
OneNYC 2050: Building a Strong and Fair City (City of New York 2015b)	OneNYC 2050 is New York City's long-term strategic plan, created under the requirements of Local Law 84 of 2013. The Plan is an extension of the City's previously implemented strategic plan, PlaNYC, which was created under the Bloomberg administration in 2007. OneNYC focuses on environmental sustainability, economic equality, and social justice, and consists of 8 goals and 30 initiatives that together comprise a strategy to prepare New York City for the future.
Vision 2020: New York City Comprehensive Waterfront Plan (NYCDCP 2011)	New York City's Comprehensive Waterfront Plan, released every ten years, provides guidance on expanding the use of New York City waterfront areas for parks, housing and economic development and opening up the waterways for transportation, recreation, and natural habitat. The current plan provides citywide policies and site-specific recommendations and is organized into eight overarching goals with strategies for achieving them. New York City is in the process of its 10-year update and started public outreach for the waterfront plan in May 2019. A public workshop focused on north Brooklyn was held on October 26, 2020. Draft goals and strategies for the 2030 plan were published April 2021 (NYCDCP 2021).

4.10.2 Existing Land Use

The majority of the Project is located in a highly developed urban area within the SBMT. The onshore substation will occupy approximately 4.8 ac (1.9 ha) within the 88-ac (36-ha) SBMT site, owned by the City of New York and leased by the NYCEDC. The Sims Municipal Recycling Facility is located to the immediate north of the Project Area within the SBMT site. SBMT also contains several rail infrastructure features, including a rail spur for break-bulk along the 39th Street shed, two new rail sidings for auto rack loading and unloading, and a rail extension from the Bush Terminal to the Sims facility (NYCEDC 2011).

The western portion of SBMT is covered by a lease awarded by the City in 2018 to Sustainable SBMT, L.P. (SSBMT), with a stated goal of reactivating SBMT for maritime shipping. The approximately 66-ac (27-ha) lease covers the two southern piers and an upland area of the SBMT parcel to the southwest of the Project Area (NYCEDC 2018).

A 16-building complex known as "Industry City" is located immediately to the southeast of the proposed substation and across 2nd Avenue, with another portion (Bush Terminal) located along the shoreline south of SBMT. The Industry City complex is comprised of a wide variety of uses, including retail, business, and manufacturing (Menchaca 2019).

The existing Gowanus 345-kV Substation, where the electricity transmitted by the Project will be connected to the electric grid, is located less than 0.2 mi (0.3 km) to the northeast of the Project's onshore substation site.

The NLCD 2016 (Dewitz 2019), land use types surrounding the onshore cable route and onshore substation were assessed within a 0.25-mi (0.4-km) buffer around the onshore Project Area. Almost all land within the 0.25-mi buffer is developed, predominantly classified as "Developed, High Intensity" (**Table 4.10-2**; **Figure 4.10-1**).

Table 4.10-2 Land Use within 0.25 mile of the Onshore Project Area

NLCD Land Use Type	Acres	Percent of Study Area
Barren Land	3.8	1.2%
Developed, High Intensity	193.8	59.5%
Developed, Low Intensity	3.2	1.0%
Developed, Medium Intensity	24.2	7.4%
Developed, Open Space	14.4	4.4%
Herbaceous	2.9	0.9%
Open Water	83.3	25.6%
Total	**325.5**	**100%**

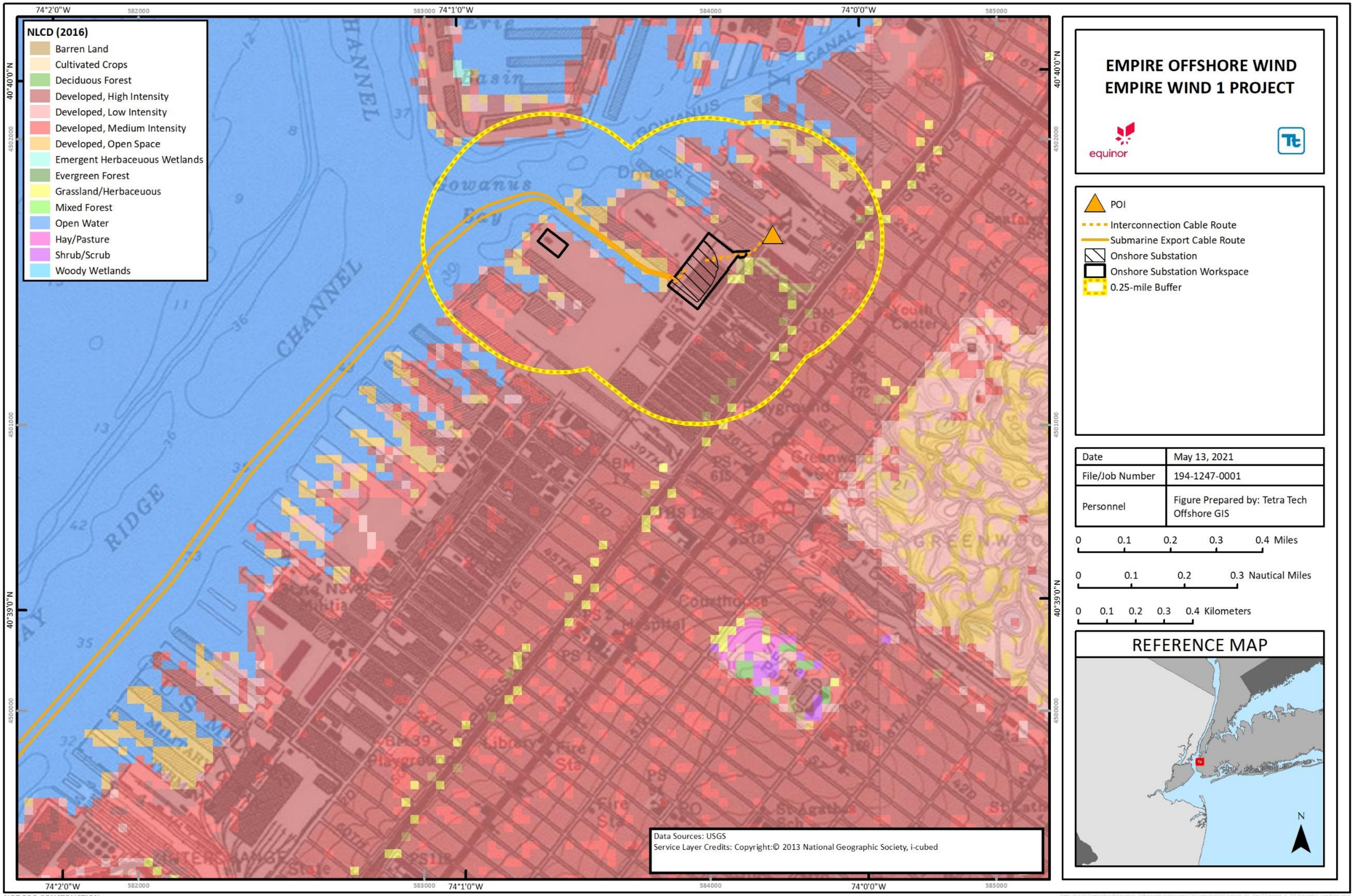

Figure 4.10-1 Land Uses in the Vicinity of the Project Area

4.10.2.1 Zoning

Zoning maps were obtained from New York City's Zoning and Land Use Map. These maps depict the zoning districts for the Project Area. The Project Area is zoned for manufacturing (District M3-1) with other manufacturing zones adjacent (M2-1, M1-2; see **Figure 4.10-2**; NYCDCP 2019b).

- M1 districts are designated for areas with light industries. Examples of M1 districts range from the Garment District in Manhattan and Port Morris in the Bronx with multistory lofts, to parts of Red Hook or College Point with one- or two-story warehouses characterized by loading bays. M1 districts are often buffers between M2 or M3 districts and adjacent residential or commercial districts. M1 districts typically include light industrial uses, such as woodworking shops, repair shops, and wholesale service and storage facilities. Nearly all industrial uses are allowed in M1 districts if they meet the stringent M1 performance standards. Offices, hotels, and most retail uses are also permitted. Certain community facilities such as hospitals are allowed in M1 districts only by special permit, but houses of worship are allowed as-of-right (i.e. they comply with all applicable zoning regulations and do not require any discretionary action by the City Planning Commission or Board of Standards and Appeals).
- M2 districts occupy the middle ground between light and heavy industrial areas. Required performance standards in all M2 districts are lower than in M1 districts. Except when M2 uses border on a residence district, higher levels of noise and vibration are allowed, industrial activities need not be entirely enclosed, and smoke is permitted.
- M3 districts are designated for areas with heavy industries that generate noise, traffic, or pollutants. Like M2 districts, M3 districts are usually located near the waterfront and buffered from residential areas. Typical uses include power plants, solid waste transfer facilities and recycling plants, and fuel supply depots. Electric substations and utilities of any size are permitted as-of-right in M3 districts. Even in M3 districts, uses with potential nuisance effects are required to conform to minimum performance standards.

4.10.2.2 Floodplains

FEMA data indicates that portions of the Project are situated within Special Flood Hazard Areas (FHAs) associated with the Upper New York Bay, including Zone AE and Zone X. The majority of the onshore substation is located in Zone AE (the 1-percent-annual-chance floodplain) (FEMA 2016) per the effective 2007 FEMA FIRMs. FEMA's 2015 preliminary FIRMs additionally identify a portion of the 4.8-ac (1.9-ha) onshore substation as within the Coastal A Zone. Section 4.4 provides additional information and mapping of Special FHAs crossed by the Project.

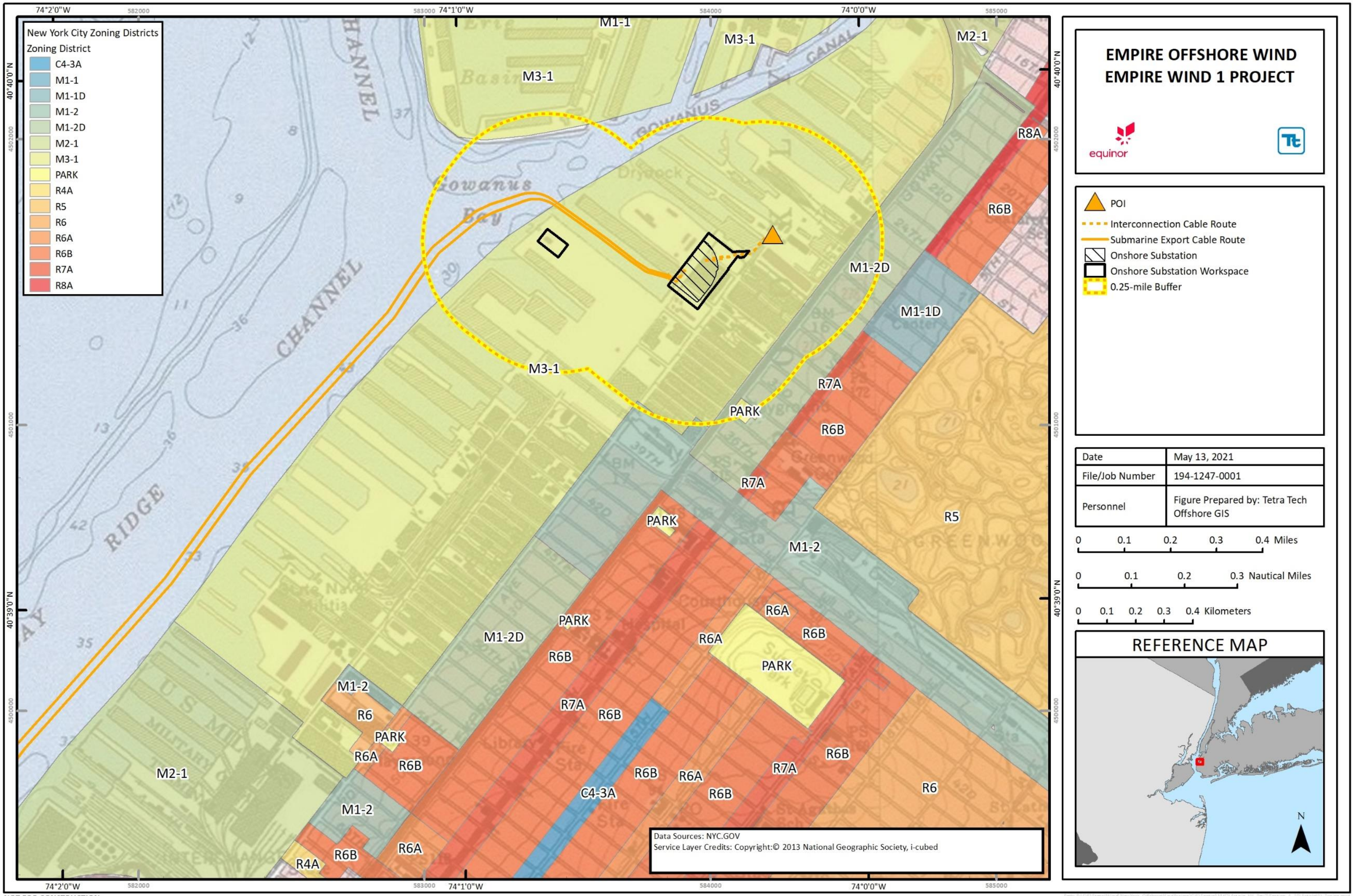

Figure 4.10-2 Zoning in the Vicinity of the Project Area

Zoning for Coastal Flood Resiliency is a set of recommendations for a zoning text amendment to foster flood-resistant buildings and incorporate sea level rise in their designs as projected by the New York City Panel on Climate Change. The initiative was designed to improve upon and make permanent zoning provisions that were adopted on a temporary basis in 2013, following Hurricane Sandy, to reduce flood risks in the city's most vulnerable areas. The recommendations include allowing building owners to measure height standards from a higher reference plane to account for future sea level rise projections (NYCDCP 2019b). The temporary zoning rules applied to buildings located wholly or partially within the 1-percent-annual-chance floodplain; Zoning for Coastal Flood Resiliency expands the applicability to the 0.2-percent-annual-chance floodplain. The preliminary recommendations were published in 2019. The New York City Department of City Planning completed a Final Environmental Impact Statement in March 2021, and the City Planning Commission approved Zoning for Coastal Flood Resiliency on March 17, 2021. The text amendment went into effect May 12, 2021 upon adoption by the City Council.

4.10.2.3 Agricultural Districts

Article 25-AA of the Agriculture and Markets Law authorizes the creation of local agricultural districts to encourage land improvement and use for production of food and other agricultural products. The Agricultural Districts Law and the Agricultural and Farmland Protection programs have influenced municipal comprehensive plans and zoning regulations and protect farmers against local laws that may unreasonably restrict farm operations located within an agricultural district. There are no agricultural districts in the vicinity of the Project Area (Cornell IRIS and NYS Department of Agriculture and Markets 2019).

4.10.2.4 Parks and Recreational Resources

No parks or recreational areas occur within the Project Area; however, there are several parks and recreational resources near the Project (**Figure 4.10-3**). Closest to the Project is D'Emic Playground, the only designated recreational area within 0.25 mi of the Project Area. D'Emic Playground is located on the other side of the Industry City complex and I-278 (Brooklyn-Queens Expressway), approximately 0.2 mi (0.4 km) from the Project. Bush Terminal Park, Martin Luther Playground, Pena Herrera Playground, Gonzalo Plasencia Playground, and the Red Hook Recreation Area are other recreational areas in the Sunset Park area; the prominent Prospect Park is located approximately five miles to the east of the Project.

4.10.3 Potential Land Use Impacts and Proposed Mitigation

The Project will not conflict with current or planned land uses within the Project Area and will have at most a minimal impact on any future planned uses. This section discusses potential impacts related to land uses.

4.10.3.1 Construction

During Project construction, the potential impact-producing factors to existing land uses may include the installation of the onshore cable system and construction of the onshore substation. Construction of the Project will result in minor, short-term impacts, including a short-term increase in construction vehicle traffic and activity, as well as the short-term implementation of safety zones.

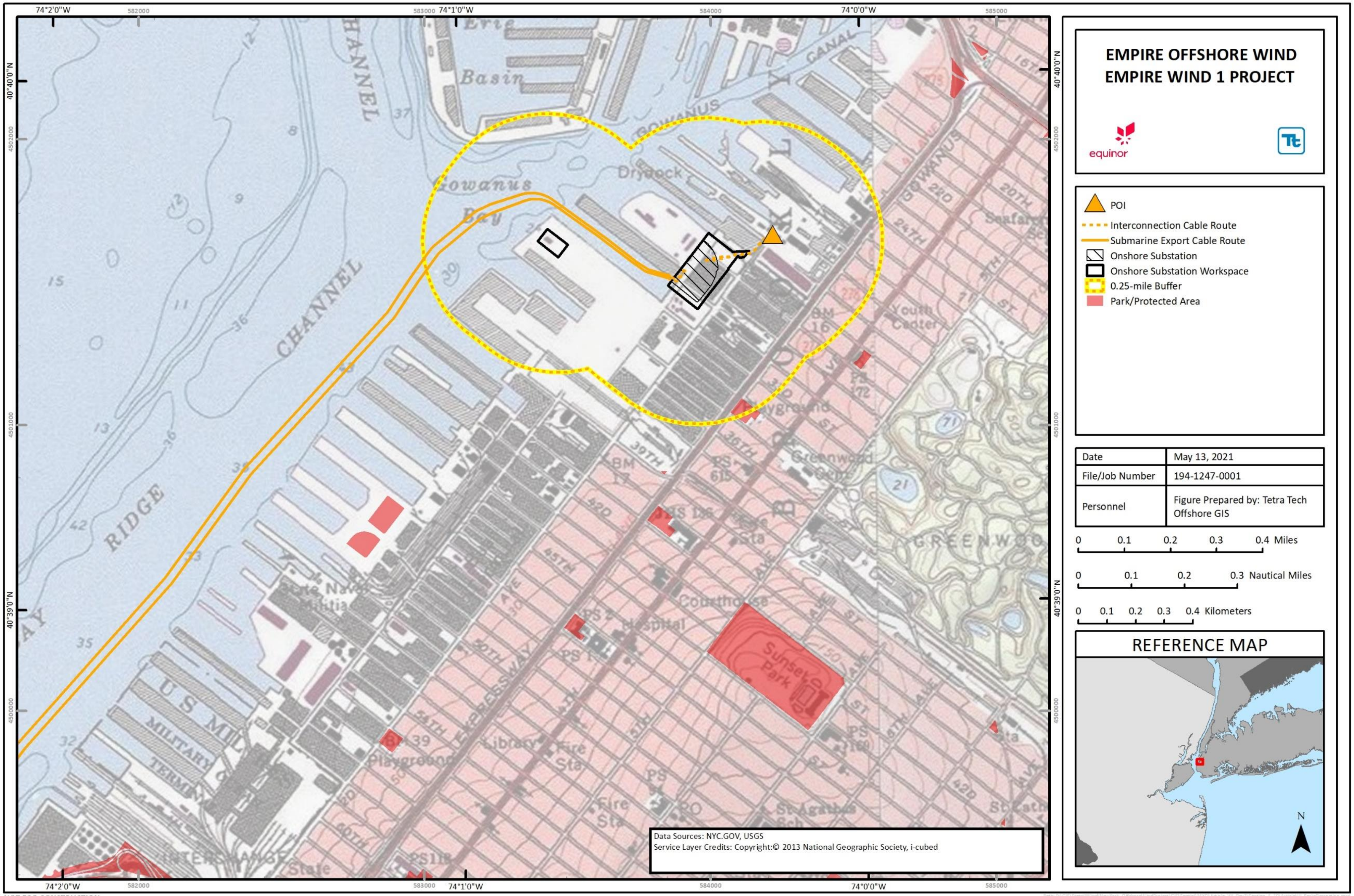

Figure 4.10-3 Parks and Recreational Resources in the Vicinity of the Project Area

Increase in construction vehicle traffic and activity. An increase in Project-related construction, support, and workforce vehicle traffic along the onshore cable route and to the onshore substation is anticipated during construction. As the Project utilizes existing roads, ROWs, and infrastructure, impacts resulting from construction activities will be minimized to the extent practicable and are anticipated to be similar in nature to other utility installations or road improvement works carried out in the area. This increase in vehicle traffic and activity is expected to be temporary and localized to the active construction sites; therefore, the increased traffic will be consistent with the existing uses. To further minimize potential construction effects, adjacent landowners will be provided timely information regarding the planned construction activities and schedule, and work will also be coordinated with New York City Department of Transportation.

Implementation of safety zones. To ensure the safety of the public during onshore construction activities, public access to construction staging areas will be restricted. As the Project utilizes existing roads, ROWs, and infrastructure, impacts resulting from construction activities will be minimized to the extent practicable. Existing land uses may be restricted by the application of these safety zones; however, these restrictions will only be temporary. The Applicant proposes to implement the following measures to avoid, minimize, and mitigate impacts:

- The addition of security measures to monitor and properly mark active construction sites;
- The development of a Traffic Management Plan, to be developed in coordination New York City Department of Transportation and provided in the Environmental Management and Construction Plan; and
- Implementation of the Project's Public Involvement Plan (see **Appendix D**), including regular updates to the local community through social media, public notices, the Project website, and/or other appropriate communications tools.

Areas temporarily disturbed during installation of the onshore cables will be restored in-kind, as applicable. A detailed assessment of the Project's compliance with local zoning and other ordinances is provided in **Exhibit 7**.

4.10.3.2 Operations and Maintenance

During operations, no impacts are anticipated to land use and zoning, as the Project's underground cables will utilize existing roads, ROWs, and infrastructure to the extent practicable, and the onshore Project is consistent with the existing land use and zoning of the area. With the exception of the onshore substation and some minor features of the onshore cables (e.g. link boxes), the Project will be located underground. As such, after construction, the existing landscape will be restored and preserved, will not present any excessive conflict with present or future planned uses within the Project Area, and will have at most a minimal impact on any future planned uses. Additional discussion of future planned uses is described in Section 4.14.

The Project's onshore substation will include concrete foundations, gravel lots, fencing, and associated structures in FHAs AE and X. Changes in elevations and grades, and the placement of structures, have the potential to impact flood flows and flood storage; however, these impacts will be minor and mitigated through appropriate facility design consistent will all applicable laws and other requirements. The new Project structures proposed to be constructed will not have an impact on the floodplain, as they will not appreciably change elevation and will be designed in accordance with applicable flood zone requirements. Impacts due to the long-term presence of structures will be avoided, minimized, and mitigated by implementing the following measures:

- Onshore components will be sited in previously disturbed areas, existing roadways, and/or ROWs to the extent practicable;

- The design of the facilities will address NYSDEC requirements governing construction within mapped floodplains, including locating aboveground structures at base flood elevation plus two feet.
- The design of the facilities will address New York City flood-resistant construction standards.

4.10.3.3 Compliance with State and Local Plans and Policies

2016 New York State Open Space Conservation Plan

The Project will be consistent with the Open Space Conservation Plan. Project 14, Waterfront Access in Brooklyn/Queens East River Waterfront, and Project 140, Statewide Small Projects, which both include protecting and promoting access to the waterfront and state waterways. The existing area is not a public-access waterfront or waterway, and the Project will not impact public access to state waters. Furthermore, the Project will not adversely affect groundwater or surface water (see Section 4.3 and Section 4.4). No land that is proposed to be acquired by the Open Space Conservation Plan will be impacted by the construction or operation of the Project.

2015 New York State Energy Plan

The State Energy Plan contains a number of initiatives designed to help New York State meet its energy goals, including a strong focus on renewable energy. The Plan seeks to encourage the private sector market to provide clean energy solutions to communities and individuals in New York State, create jobs, and drive local economic growth. The Project will provide a local source of clean, affordable energy to local communities, and will provide additional economic benefits via short-term and long-term job creation and materials purchasing (see **Exhibit 6: Economic Effects of Proposed Facility**). As such, the Project is consistent with the State Energy Plan's goals of renewable energy, sustainable and resilient communities, and energy infrastructure modernization.

In addition, the Project will help New York State achieve its Climate Leadership and Community Protection Act renewable energy mandates, including the requirements that the State obtain 70 percent of its electricity from renewable sources by 2030 and 100 percent by 2040, and that New York have 9 gigawatts of offshore wind capacity by 2035.

New York State Coastal Management Program

The New York State Coastal Management Program contains 44 statewide policies to prevent the impairment of coastal resources and promote their beneficial use. The Project is consistent with these each of these policies, as detailed in **Appendix C**.

North Brooklyn Industry and Innovation Plan

The Project is consistent with the North Brooklyn Industry and Innovation Plan's goals to promote industrial jobs and retain industrial areas. Specifically, the plan includes goals to "retain areas that can support and grow industrial/manufacturing jobs that provide essential services to the city and offer significant jobs;" and "create a balanced strategy that channels businesses into different subareas where they can thrive and reduces competition for space and potential for conflicts between industrial/manufacturing and non-industrial businesses" (NYCDCP 2018). The Project is consistent with the existing industrial character of the area, and construction and operation of the Project will create industrial jobs that provide essential services to the city in the form of clean, sustainable energy.

NYC Waterfront Revitalization Program

The WRP defines the City's policies regarding use of the waterfront from a development and recreational perspective and provides a framework for determining the appropriateness of proposed uses. The Project is consistent with these each of these policies, as detailed in **Appendix C**.

OneNYC 2050

The Project will be consistent with the goals and initiatives of the OneNYC 2050 long-term strategic plan. OneNYC focuses on environmental sustainability, economic equality, and social justice. The renewable energy provided by the Project will directly support Initiative 20: "Achieve carbon neutrality and 100 percent clean electricity." In addition, the economic benefits provided by the Project are in alignment with Initiative 22: "Create economic opportunities for all New Yorkers through climate action" and Initiative 5: "Grow the economy with good-paying jobs and prepare New Yorkers to fill them" (see **Exhibit 6**).

Vision 2020

The City's current Comprehensive Waterfront Plan includes eight goals for the waterfront area, such as increasing attractiveness and public access, improving wetlands and water quality, supporting economic development, and pursuing resilience to climate change. The Project is located in an industrial area and is aligned with Goal 3: "Support economic development activity on the working waterfront."

Additionally, the Project is consistent with the draft goals and strategies published in April 2021, for the upcoming Comprehensive Waterfront Plan under development. In particular, the Project directly supports investments in waterfront areas and a 21st century working waterfront and promotes long-term climate mitigation by curbing greenhouse gas emissions and providing clean, renewable energy.

4.11 Noise

This section addresses the requirements of 16 NYCRR § 86.5 relative to noise disturbances, including a description of the regulatory framework for in-air sound, the affected sound environment, and potential impacts to the sound environment resulting from construction and operation of the Project. This section also describes the Project-specific measures that the Applicant will implement to avoid, minimize, and/or mitigate potential impacts resulting from in-air noise. Information on the potential effects of underwater noise and specific details of potential noise effects on marine organisms are discussed in Section 4.6 and Section 4.7.

4.11.1 Noise Studies and Analysis

This section outlines the applicable noise standards for New York State and New York City and describes the noise assessment methodology used to determine potential impacts from the Project's construction and operations. The complete In-Air Acoustic Assessment conducted for the Project is provided in **Appendix J In-Air Acoustic Assessment**.

4.11.1.1 Applicable Noise Standards and Guidelines

New York State

The NYSDEC guidelines are defined in the publication "Assessing and Mitigating Noise Impacts" (2001). This document states that when L_P (e.g. sound pressure level) increases from 0 to 3 decibels, A-scale (dBA) should have no appreciable effect on receivers; increases of 3 to 6 dBA may have the potential for adverse impact only in cases where the most sensitive of receptors are present; and increases of more than 6 dBA may require a closer analysis of impact potential depending on existing sound levels and character of surrounding land use. The NYSDEC guidance states that the 6 dBA increase is to be used as a general guideline. Although not explicitly stated in the policy, the 6 dBA increase has been applied to the minimum measured equivalent sound level (L_{eq}) or alternatively the time averaged L_{90} (e.g. noise level exceeded 10 percent of the time) sound level for the licensing of other projects in New York State. There are other guidelines that should also be considered. For example, in settings with low ambient sound levels, NYSDEC guidance has deemed an absolute limit of 40 dBA as adequately protective.

The NYSDEC policy further states that the EPA "Protective Noise Levels" guidance found that an annual day-night sound level (L_{dn}) of 55 dBA was sufficient to protect the public health and welfare, and in most cases, did not create an annoyance. A 55 dBA L_{dn} would be equivalent to a daytime sound level of 55 dBA L_{eq}, and a nighttime sound level of 45 dBA L_{eq}, or a continuous level of approximately 49 dBA L_{eq}. In terms of absolute threshold values, the introduction of any new sound source should not raise ambient levels above 65 dBA L_{eq} in non-industrial settings to protect against speech disturbance or above approximately 79 dBA L_{eq} for industrial environments for associated noise-related health and safety reasons. In most cases, NYSDEC recommends that projects exceeding either of these threshold levels or resulting in an increase of 10 dBA consider avoidance and mitigation measures.

In March 2021, the New York State Department of Public Service (NYSDPS) shared with the Applicant "General Recommendations for Applications for Substations, Stations, and Converter Stations under Article VII" (NYSDPS 2020), which details recommendations on what type of information an Article VII application should include, such as design goals for operation, sound power level information for mechanical and electrical equipment and proposed buildings, sound levels generated by a project's operation, and an evaluation of minimization of environmental noise impacts and conformance with the project's design goals and local regulations, if any. It also recommends that sound produced during construction be analyzed, along with plans for the minimization of noise impacts during construction. Lastly, it recommends an evaluation of ambient pre-construction baseline noise conditions by using the L_{90} statistical and the L_{eq} energy-based noise descriptors, and by following the recommendations included in ANSI/ASA S3/SC 1.100 -2014-ANSI/ASA S12.100-2014 American National Standard *Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas*. The guidance details specifications for computer noise modeling, tonality assessment, and specific design goals including the following:

1. 35 dBA $L_{eq\text{-}1\text{-}hour}$ maximum equivalent continuous average sound level from the station outside any residence within the 35 dBA noise contour from any tonal noise sources, (e.g., transformers), on the presumption that a 5 dBA prominent tone penalty applies to a basic design goal of 40 dBA.

2. 40 dBA $L_{eq\text{-}1\text{-}hour}$ maximum equivalent continuous average sound level from the station outside any residence from any other operational sound sources associated with the station not included in (1). If the sound emissions from these sources are found to contain a prominent discrete tone at any residence whether through modeling, calculation, or pre-construction field testing, then the sound levels at the receptors will be subject to a 5 dBA penalty; thus, a reduction in the permissible sound level to 35 dBA $L_{eq\text{-}1\text{-}hour}$. Tonality evaluation should follow the guideline recommendations. If no manufacturer's information or pre-construction field tests are available, sounds should be assumed to be tonal for those noise sources.

3. 45 dBA $L_{eq\text{-}1\text{-}hour}$ maximum equivalent continuous average sound level from the station across all properties, except for delineated wetlands and utility rights of way. This should be demonstrated with modeled sound contours and discrete sound levels at worst-case locations. No penalties for prominent tones should be added in this assessment.

NYSDPS representatives subsequently recommended that Empire also consider the Section 94-C regulations issued by the New York Office of Renewable Energy Siting in March 2021 to support their new renewable energy siting process, which replaced the previous PSL Article 10 process for applicable renewable generating facilities. Section 900-2.8 of those regulations details the requirements relating to noise and vibration for renewable energy generating projects. Empire has considered the Section 94-C regulations, even though they are not required as part of the Article VII process; the design goals described in Section 94-C are relatively consistent with those identified above and therefore are not separately assessed herein.

New York City

Title 24, Chapter 2 of the New York City Administrative Code (the New York City Noise Control Code, or "NYC Code") regulates sound by the existing land use of receiving property, not its zoning designation. There are two separate regulations that apply to Project operation (not construction): (1) absolute octave band limits at residential and commercial property, and (2) incremental limits for all off-site locations. Construction noise is governed by a separate set of provisions, which address both continuous (i.e., non-impulsive) and impulsive sound sources.

Construction

According to the New York City Noise Control Code, construction is limited to Monday through Friday from 7:00 am to 6:00 pm, unless otherwise authorized. A noise mitigation plan must be completed for any construction activity before construction begins. Also, a noise mitigation plan must be in place before any authorization to work outside of the construction window is granted. The following provisions are given for construction devices, including both continuous (i.e., non-impulsive) and impulsive sound sources.

<u>NYC Code § 24-228 Construction devices</u>

> *(a) No person shall operate or use or cause to be operated or used a construction device or combination of devices in such a way as to create an unreasonable noise. For the purposes of this section unreasonable noise shall include but shall not be limited to sound that exceeds the following prohibited noise levels*:
>
> *(1) Sound, other than impulsive sound, attributable to the source or sources, that exceeds 85 dB(A) as measured 50 or more feet from the source or sources at a point outside the property line where the source or sources are located or as measured 50 or more feet from the source or sources on a public right-of-way.*
>
> *(2) Impulsive sound, attributable to the source, that is 15 dB(A) or more above the ambient sound level as measured at any point within a receiving property or as measured at a distance of 15 feet or more from the source on a public right-of-way. Impulsive sound levels shall be measured in the A-weighting network with the sound level meter set to fast response. The ambient sound level shall be taken in the A-weighting network with the sound level meter set to slow response.*

As noted above, construction activities may take place during the hours of 7:00 a.m. to 6:00 p.m. on weekdays. If a waiver for after-hours work is granted, the Project would be subject to the substantive provisions of § 24-223.

<u>NYC Code § 24-223 After hours work authorization</u>

> *(d) During the time that an after-hours authorization is in effect, notwithstanding full compliance with the noise mitigation plan the department shall issue an advisory or a violation where aggregate sound levels from the site exceed the following limits*:
>
> *(1) 8dB(A), and on or after January 1, 2020, 7 dB(A) above the ambient sound level as measured in any residential receiving property dwelling unit with windows and doors that may affect the measurement closed, or*
> *(2) The noise levels specified in section 24-228(a) of this code on a construction site that is not within 200 feet of a residential receptor, or*
> *(3) Except as provided in paragraph (4) of this subdivision, 80dB(A), and on or after January 1, 2020, 75 dB(A) as measured 50 or more feet from the source or sources at a point outside the property line where the source or sources are located or as measured 50 or more feet from the source or sources on a public right-of-way when that source is within 200 feet of a residential receptor, or*
> *(4) 85dB(A) as measured 50 or more feet from the source or sources at a point outside the property line where the source or sources are located, or as measured 50 or more feet from the source or sources on a public-right-of-way when the source is street construction.*

In addition, within the Rules of the City of New York, Chapter 28 "Citywide Construction Noise Mitigation" provides prescriptive noise mitigation strategies for various construction activities, including options for source controls and noise pathway controls. As Project construction plans progress and are refined, the Applicant will evaluate the need for construction noise mitigation and appropriate controls, as needed, to minimize offsite impacts. In addition to noise, the New York City Zoning Resolution specifies vibration limits for both continuous and impulsive sound sources, which are applicable at the adjacent lot lines. **Table 4.11-1** provides the maximum permitted vibration limits for continuous sound sources for the three manufacturing districts (M1, M2, and M3).

Table 4.11-1 Maximum Permitted Steady State Vibration Displacement (inches)

Frequency (cycles per second)	District		
	M1	M2	M3
10 and below	.0008	.0020	.0039
10 - 20	.0005	.0010	.0022
20 - 30	.0003	.0006	.0011
30 - 40	.0002	.0004	.0007
40 - 50	.0001	.0003	.0005
50 - 60	.0001	.0002	.0004
60 and over	.0001	.0001	.0004

Table 4.11-2 provides the maximum permitted vibration limits for impulsive sound sources.

Table 4.11-2 Maximum Permitted Impact Vibration Displacement (inches)

Frequency (cycles per second)	District		
	M1	M2	M3
10 and below	.0016	.0040	.0078
10 - 20	.0010	.0020	.0044
20 - 30	.0006	.0012	.0022
30 - 40	.0004	.0008	.0014
40 - 50	.0002	.0006	.0010
50 - 60	.0002	.0004	.0008
60 and over	.0002	.0002	.0008

For Project operations, the octave band limits in Administrative Code Section 24-232 are summarized in **Table 4.11-3** and apply to residential/commercial property as measured inside a room with the windows open. The octave band limits are prescribed in linear or unweighted decibels. They are equivalent to broadband limits of 45 dBA for residential use and 49 dBA for commercial use.

Table 4.11-3 New York City Noise Code Section 24-232 Octave Band Limits (dBA)

Octave Band (Hz) a/	Limits for Residential Property Receiver	Limits for Commercial Property Receiver
31.5	70	74
63	61	64
125	53	56
250	46	50
500	40	45
1k	36	41

Octave Band (Hz) a/	Limits for Residential Property Receiver	Limits for Commercial Property Receiver
2k	34	39
4k	33	38
8k	32	37

Note:
Octave band limits shown as unweighted and are equivalent to 45 dBA and 49 dBA respectively, when converted to A-weighting and summed.

The incremental limits in Administrative Code Section 24-218 prohibit an increase in the "ambient sound level" of 7 dBA or more during the nighttime hours of 10:00 p.m. to 7:00 a.m. at any receiving property. Ambient sound is defined in Section 24-203 of the Administrative Code as the total sound level "at a location that exists" excluding "extraneous sounds," which are defined as "intense, intermittent" sounds. Although the Noise Code assigns no sound metric to the term "ambient sound," the standard convention in acoustical assessment is to represent this condition as the average (L_{eq}) sound level.

In addition to the City of New York Noise Code Regulations, the City also has zoning regulations, established by the New York City Department of City Planning, the substantive provisions of which apply to the Project. Sections 42-213 and 42-214 of the City's Zoning Resolution set regulatory limits on octave band sound levels from operation of a facility "at any point on or beyond any lot line." The decibel limits for whole octave bands from 31 Hz to 16,000 Hz differ depending on manufacturing districts. The manufacturing district relevant to the Project will be M3-1, as shown in **Table 4.11-4** given in linear or unweighted decibels.

Table 4.11-4 New York City Zoning Resolution Sections 42-213 & 214 Octave Band Limits (dBA)

Octave Band Frequency (Hz)	Limits for M3-1 District
31.5	80
63	80
125	75
250	70
500	64
1k	58
2k	53
4k	49
8k	46

4.11.1.2 Noise Assessment Methodology

For the purposes of this section, the Study Area includes a 0.25-mi (0.4-km) buffer around the onshore cable route and the onshore substation. **Figure 4.11-1** presents the onshore Study Area. Additional information is available in the In-Air Acoustic Assessment provided in **Appendix J**.

Figure 4.11-1 Onshore Ambient Noise Study Area

This section was prepared in accordance with state and local noise guidance and regulations as outlined above. The objectives of the In-Air Acoustic Assessment include identifying noise-sensitive land uses in the area that may be affected by the Project as well as describing the standards against which the Project will be assessed. To characterize existing ambient conditions at the onshore substation, baseline sound measurements were conducted with an operator present for a minimum of thirty minutes during daytime and nighttime periods in accordance with American National Standards Institute "Quantities and Procedures for Description and Measurement of Environmental Sound – Part 3: Short-Term Measurements with an Observer Present" (ANSI 2013) and ANSI S12.100, "Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas" (ANSI 2014), which is a conservative measurement approach within the urban setting.

Acoustic modeling was then conducted to assess the impacts associated with Project-related construction and operations activities. The acoustical modeling for the Project was conducted with the Cadna-A® sound model from DataKustik GmbH (version 2020 MR1; DataKustik GmbH 2021). The outdoor sound propagation model is based on the International Organization for Standardization "Calculation of the absorption of sound by the atmosphere," (ISO 1993) and Part 2: "General method of calculation," (ISO 1996). It is used by acoustical engineers to accurately describe sound emission and propagation from complex facilities (i.e. more than one sound source) and in most cases yields conservative results of operational sound levels in the surrounding community.

4.11.2 Existing Noise Conditions

4.11.2.1 Baseline Sound Measurements

Ambient sound levels are characterized by different metrics. To take into account sound fluctuations, environmental sound is commonly described in terms of L_{eq}. The L_{eq} value is the energy-averaged sound level over a given measurement period. To describe the background ambient sound level, the L_{90} percentile metric is typically utilized, representing the quietest 10 percent of any time period. Conversely, the L_{10} is the sound level exceeded 10 percent of the time and is a measurement of intrusive noises, such as vehicular traffic or aircraft overflights, while the L_{50} metric is the sound level exceeded 50 percent of the time. The ambient acoustic environment within the Study Area is largely influenced by vehicular traffic. Localized traffic is steady during the daytime hours, with fewer cars traversing local roads at night. Noise from trains and planes is also present during both daytime and nighttime. Natural sounds from birds, trees and other wildlife are also minor sound sources in the area, as are waves in the harbor. The ambient sound monitoring locations within the onshore Study Area and receptor locations are shown in **Figure 4.11-2**. In addition to the short-term measurements collected at monitoring locations NM-1, NM-2 and NM-3, a long-term (3 days) ambient sound measurement, which is identified as LT-1 on **Figure 4.11-2,** was also collected onsite at the SBMT site. The closest residential receptors included in the analysis are TT 14, TT 15, TT 16, TT 17, and the Industry City apartments. Other receptors included in the analysis represent property line locations (EQ-1, EQ-2, EQ-3, EQ-5, and EQ-6). For the purposes of assessing sound levels at the lot line, the onshore substation boundary was used conservatively rather than the SBMT property boundary[14].

[14] The Applicant considers the whole SBMT parcel (Brooklyn, Block 662, Lot 1) to be the Zoning Lot under the New York Zoning Resolution (see **Exhibit 7: Local Ordinances**)

Figure 4.11-2 Ambient Sound Monitoring Locations and Receptor Locations

Table 4.11-5 summarizes the ambient sound measurement results collected at short-term monitoring locations NM-1 and NM-2. For context, a quiet suburban area would typically have nighttime levels in the range of 35 to 45 L_{90} dBA (ANSI 2013). Consistent with the Study Area's location in an urban, industrial setting, measurements completed by the Applicant showed existing daytime and nighttime L_{90} levels in the range of 46 to 66 dBA. **Figure 4.11-3** also displays a time history plot of the long-term measurement data collected at LT-1 monitoring location showing both L_{eq} and L_{90} sound metrics logged over the 3-day period. The time history data supports the tabulated results in **Table 4.11-5** in that ambient sound levels (both L_{90} and L_{eq} metrics) essentially remain above 50 dBA.

Table 4.11-5 Short-term Ambient Sound Measurement Results

Monitoring Location	Location	Time Period	Sound Level Metrics (dBA)			
			L_{10}	L_{50}	L_{90}	L_{eq}
NM-1	630 2nd Avenue	Day	72	67	66	69
		Night	58	55	53	63
NM-2	100 39th Street	Day	67	56	46	65
		Night	69	66	65	67

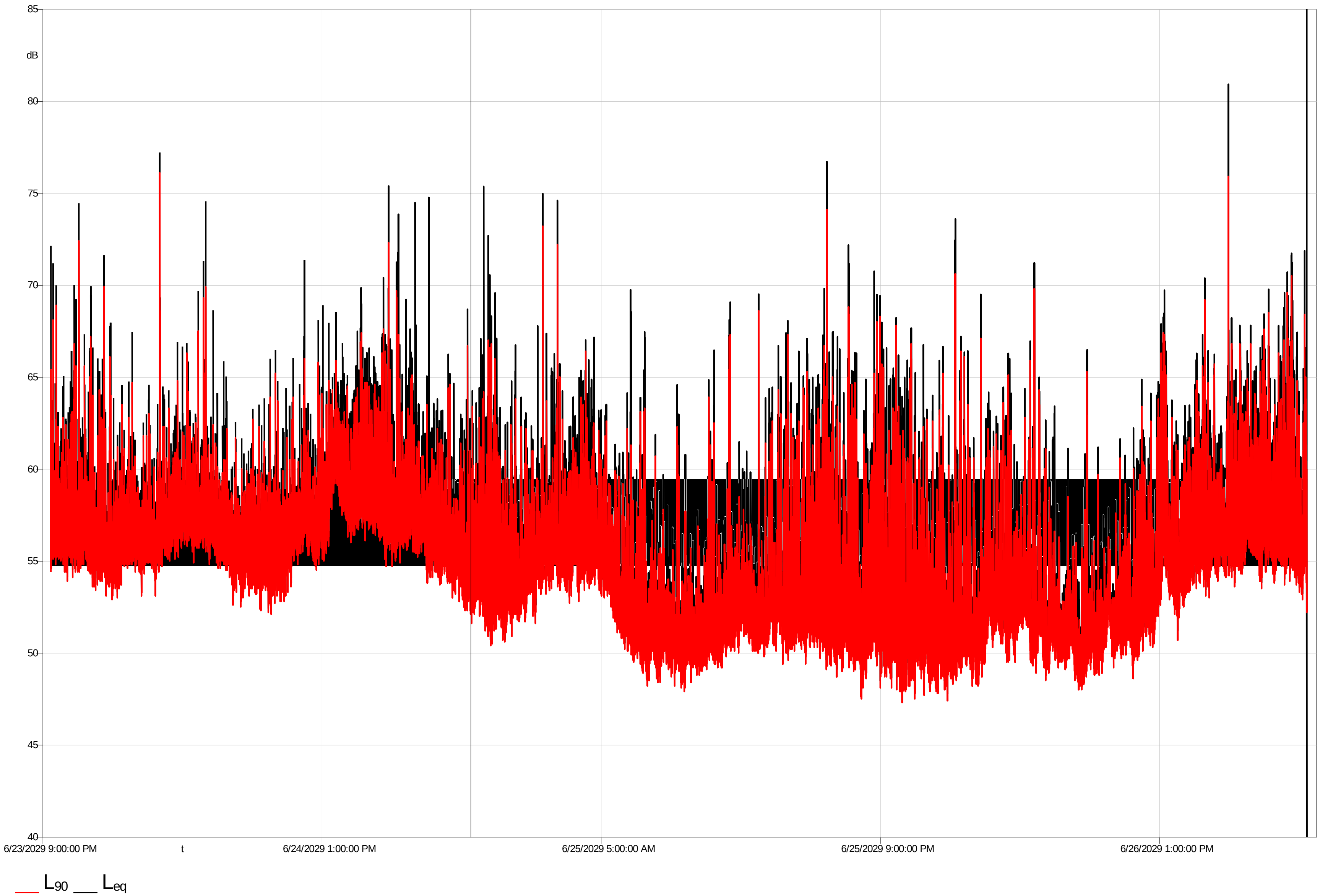

Figure 4.11-3 LT-1 Ambient Sound Level Time History Plot

4.11.3 Potential Noise Impacts and Proposed Mitigation

4.11.3.1 Construction

During construction, the following noise impacts have the potential to occur:

- Short-term, minor increases in in-air noise levels associated with support vessels; and
- Short-term, minor elevated in-air noise levels associated with construction of the onshore substation and installation of the onshore cables.

Increases in in-air noise levels associated with support vessels: During construction, Project-related vessels will be utilized to transport personnel and materials and to install the submarine export cables. Nearshore, installation activities for the submarine export cables move along the cable laterally and will be located relatively far from shoreline noise sensitive areas (NSAs); therefore, no shoreline NSAs will be exposed to significant noise levels for an extended period of time. Due to the relatively short duration, it is not anticipated that construction activities associated with the installation of the submarine export cables will cause any significant noise impact in the communities along the shoreline.

Elevated in-air noise levels associated with construction of the onshore substation and installation of the onshore cables: The construction of the onshore substation and the onshore cables will result in a temporary increase in sound levels near these activities resulting from the use of construction equipment. The noise levels resulting from construction activities will vary greatly depending on factors such as the type of equipment and the operations being performed, and could be periodically audible from off-site locations at certain times. CadnaA was used to evaluate potential construction noise impacts associated with the four phases of construction. **Table 4.11-6** presents the received sound levels generated by construction phase. Results show that construction noise levels of 85 dBA and greater are in close proximity to the substation property. Receptors are shown relative to the onshore substation in **Figure 4.11-2** and **Figure 4.11-4**.

Table 4.11-6 Onshore Substation: Construction Noise Levels

Construction Phase	Received Sound Level (dBA)													
	TT 14	TT 15	TT 16	TT 17	EQ-1 a/	EQ-2 a/	EQ-3 a/	EQ-4	EQ-5 a/	EQ-6 a/	EQ-7	EQ-8	EQ-9	Industry City
Phase 1: Mobilization, Site Clearing and Demolition Work	76	71	75	67	86	88	86	79	80	81	78	73	70	75
Phase 2: Compaction and Earth Work	74	68	72	63	84	86	84	77	77	79	75	70	66	72
Phase 3: Building Foundation and Structure Construction	77	71	75	66	87	89	87	80	80	82	78	73	69	75
Phase 4: Electrical Equipment Installation, Testing and Commissioning	74	68	72	63	84	86	84	77	77	79	75	70	66	72

Note:
a/ Substation boundary location

Pile driving may be required to install the pipe piles associated with the cable landfall area. Pile driving will also be required to install the equipment and building foundations. Assuming the installation of steel piles with a diameter between 24 and 36 inches, an average sound pressure level would correspond to 108 dBA at 50 ft (15 m).

Pile driving activities will occur during daytime hours, but the modelling results show that there may be exceedances of section 24-228 of the NYC Code, which allows for an increase of up to 15 dBA above the ambient sound level. The Applicant is requesting that the Commission not apply this local law, because it is unreasonably restrictive in view of existing technology to the extent that construction and operation activities may result in transient and temporary occurrences of these conditions (see **Exhibit 7**). Pile driving will be temporary and short term, and the Applicant will minimize offsite impacts to the extent practicable using potential mitigation options like temporary nose barriers, pile cap/cushion, trenching, and/or nose shrouds installed in proximity to pile driving.

In accordance with the NYC Code, vibration generated during construction was also reviewed. Vibration levels for activities associated with Project construction were based on source levels in peak particle velocity published with the Federal Transit Administration (2006) Noise and Vibration Manual, which documents several types of construction equipment measured under a wide variety of construction activities.

In addition, pile driving activities will likely generate vibration levels ranging from 0.0025 inches/second to 0.1033 inches/second at the closest NSAs. Since equipment vibratory specifications by frequency are not available, it is not possible to provide a direct comparison between the anticipated construction vibration levels and NYC Code. However, since construction vibration levels at the nearest NSAs show an overall peak particle velocity that is higher than the NYC Code frequency limits, it is reasonable to assume that the Project will generate vibration levels in excess of the limits for a temporary and short-term window during construction activities.

The Applicant is seeking a waiver of NYC Noise Control Code § 24-222 and § 24-223 in order to allow construction activities take place outside the hours of 7:00 a.m. to 6:00 p.m. on weekdays and on weekends (see **Exhibit 7**). In addition, the Applicant proposes to implement the following measures to avoid, minimize, and mitigate impacts:

- Construction equipment will be well-maintained and vehicles using internal combustion engines equipped with mufflers will be routinely checked to ensure they are in good working order;
- Quieter backup alarms would be used for vehicles as feasible;
- Noisy construction equipment will be located as far as possible from NSAs; and
- A noise complaint hotline will be made available to help actively address all noise related issues.

4.11.3.2 Operations

During operations, the following noise impacts have the potential to occur:

- Long-term minor elevated in-air sound levels associated with onshore substation operations; and
- Short-term minor elevated in-air sound levels associated with operations maintenance activities.

Elevated in-air sound levels associated with the operations of the onshore substation: During operations, the onshore substation equipment is anticipated to generate operational sound. Sound modeling of onshore substation components was completed using CadnaA and site-specific inputs support of this application, with the results shown below. As the onshore substation engineering design is only at a conceptual level, it is possible that the final warranty sound specifications could vary slightly. **Table 4.11-7** displays the predicted operational sound levels from the substation and the incremental increase nighttime sound levels at residential receptors (TT 14, TT 15, TT 16, TT 17, Industrial City) and property line receptors (EQ-1, EQ-2, EQ-3, EQ-5, and EQ-6). **Figure 4.11-4** visually displays the received sound levels resulting from substation operation.

Table 4.11-7 Predicted Nighttime Sound Levels (dBA) at the Closest Noise Sensitive Areas

Location	Distance (ft)	Nighttime Ambient Sound Level, L_{90}	Ambient Monitoring Location	Substation Operational Sound Level	Cumulative Sound Level (Ambient + Substation)	Increase Above Existing Ambient
TT 14	278	53	NM-1	44	53	0
TT 15	1,035	53	NM-1	40	53	0
TT 16	435	53	NM-1	34	53	0
TT 17	1,775	65	NM-2	25	65	0
EQ-1 a/	0	53	NM-1	41	53	0
EQ-2 a/	0	53	NM-1	64	64	11
EQ-3 a/	0	53	NM-1	52	56	3
EQ-4	137	53	NM-1	46	54	1
EQ-5 a/	0	53	NM-1	51	55	2
EQ-6 a/	0	53	NM-1	40	53	0
EQ-7	162	53	NM-1	40	53	0
EQ-8	628	53	NM-1	31	53	0
EQ-9	1,160	53	NM-1	27	53	0
Industry City	448	53	NM-1	39	53	0

Note:
a/ Substation boundary location

Received sound levels were evaluated at the closest NSAs (TT 14, TT 15, TT 16, and TT 17) with resultant sound contour plots displaying operational sound levels in **Figure 4.11-4**. Compliance was assessed relative to both state and local noise requirements. Sound produced by substation operations conforms with the NYSDEC 6 dBA incremental increase guideline, which is only applicable at residential receptor locations.

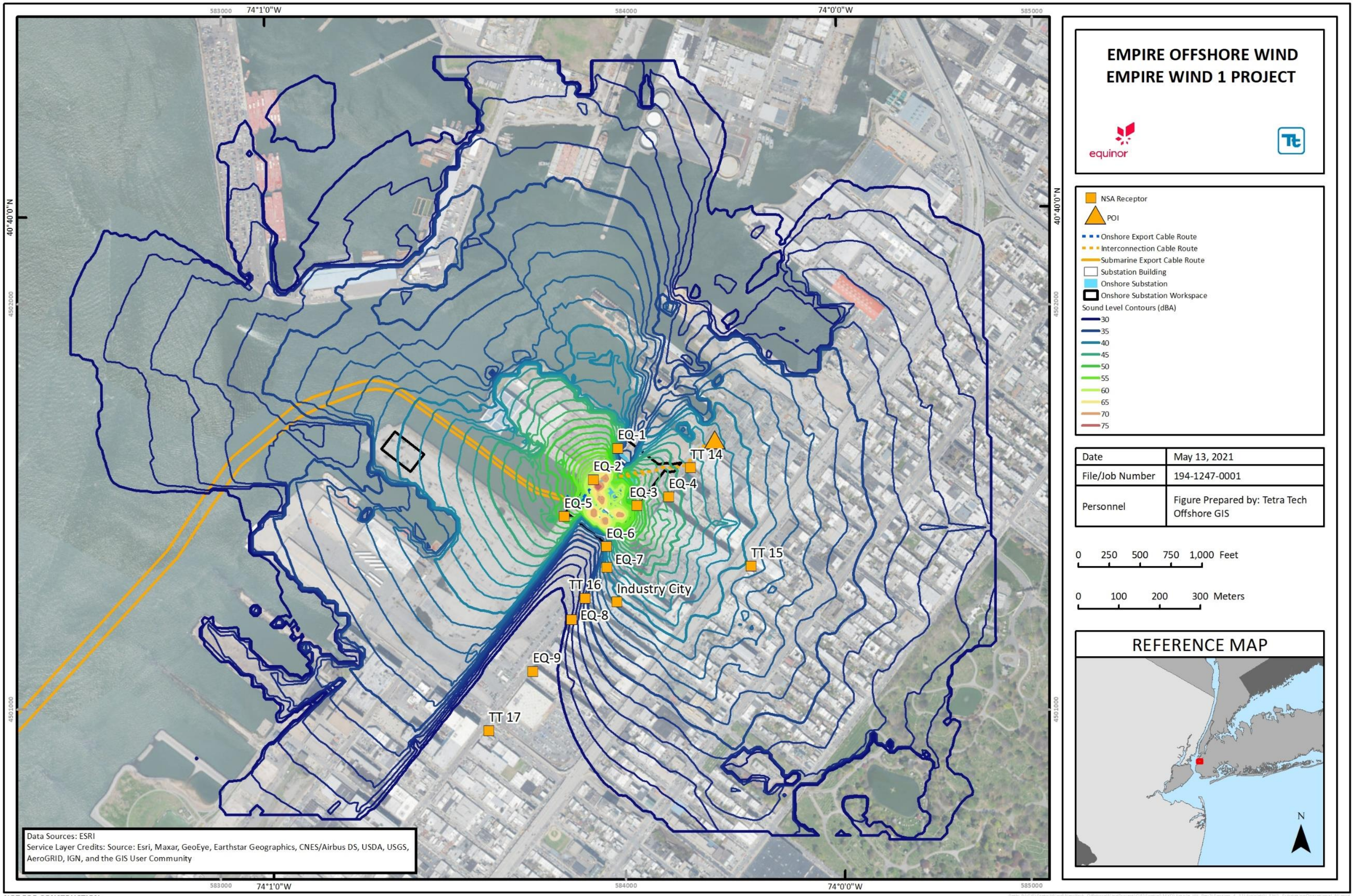

Figure 4.11-4 Onshore Substation Operational Sound Levels

In addition, the NYSDPS "General Recommendations for Applications for Substations, Stations, and Converter Stations under Article VII" (NYSDPS 2020) recommends a 35 dBA acoustic design goal outside any residence, assuming a 5 dBA penalty for prominent tones and a 45 dBA acoustic design goal at the Project property boundary. Modeled results indicate that the Project does not fully conform to the NYSDPS recommended acoustic design goals at TT 14 and TT 15 as well as the property boundary; however, ambient sound levels are consistently higher than those design goals given the urban setting of the SBMT site. With the exception of substation boundary location EQ-2, which abuts the Sims Municipal Recycling Facility, operational sound emissions from the substation will result in minimal to no increase in ambient sound levels. The elevated existing ambient sound source levels in the study area are dominant relative to substation sound levels and will act to mask[15] substation sound. Accordingly, the Applicant believes that an incremental increase criterion, similar to those given by the NYSDEC and New York City Noise Control Code, would be a more appropriate measure for assessing potential noise impacts at NSAs given the elevated ambient acoustic environment within the Project Study Area.

The New York City Noise Control Code, which applies to the onshore substation site, includes an incremental increase limit of 7 dBA at a receiving property relative to ambient nighttime sound levels. **Table 4.11-8** demonstrates that the EW 1 site will comply with the 7-dBA incremental increase limit. **Table 4.11-8** shows that the onshore substation also will comply with New York City octave band noise limits for the M3 district and at residential receivers. Locations EQ-1, EQ-2, EQ-3, EQ-5, and EQ-6 are receptors at the onshore substation boundary and are shown to be in compliance with the M3 district limits.

Elevated in-air sound levels associated with operations maintenance activities: Substation maintenance and repairs would be conducted on an as-needed basis. Noise from these activities would primarily be related to vehicles used to access the substation for inspections or maintenance as well as any equipment that could be used to conduct needed repairs or maintenance. Given the infrequent nature of these activities, the noise impacts would be minimal.

[15] Masking is the interference in the perception of one sound by the presence of another sound.

Table 4.11-8 Onshore Substation: Tonal Sound Levels (dBA) at the Closest Noise Sensitive Areas

Maximum Permitted Sound Pressure Level (in decibels)			Octave Band Sound Pressure Level (dBA)														
Octave Band (cycles per second)	District M3	Limits for Residential Property Receiver	TT 14	TT 15	TT 16	TT 17	EQ-1 a/	EQ-2 a/	EQ-3 a/	EQ-4	EQ-5 a/	EQ-6 a/	EQ-7	EQ-8	EQ-9	Industry City
63	80	70	49	45	41	35	51	67	56	51	54	47	46	40	37	44
125	75	61	50	46	41	35	50	69	58	52	56	46	46	39	36	45
250	70	53	45	41	35	27	43	64	52	47	51	40	41	32	28	40
500	64	46	44	40	34	24	40	64	52	46	50	39	40	31	26	39
1,000	58	40	37	33	27	15	31	58	46	39	44	33	34	24	18	33
2,000	53	36	30	25	20	5	24	53	40	34	38	27	28	17	9	26
4,000	49	34	21	12	10	0	15	47	34	26	31	19	19	5	0	16
8,000	46	33	0	0	0	0	2	38	23	8	14	5	1	0	0	0
		Average (dBA)	44	40	34	25	41	64	52	46	51	40	40	31	27	39

Note:
a/ Substation boundary location

4.12 Air Quality

This section addresses the requirements of 16 NYCRR § 86.5 and describes the regulatory framework for air quality as applicable to the Project and the affected air environment. This section also describes the potential impacts to air quality resulting from construction and operation of the Project, and proposed Project-specific measures that the Applicant will implement to avoid, minimize, and/or mitigate potential impacts to air quality. Emissions-related benefits of the EW 1 Project's renewable energy generation are described in **Exhibit 6**.

4.12.1 Federal Regulations

Under the federal Clean Air Act, the EPA is responsible for developing and enforcing the regulations protecting air quality in the United States. Project emissions associated with construction, operations, and decommissioning will be subject to EPA regulations governing air quality both onshore and offshore.

4.12.1.1 National Ambient Air Quality Standards

The Clean Air Act established the National Ambient Air Quality Standards (NAAQS) for the following common pollutants, known as criteria pollutants: carbon monoxide (CO), lead, nitrogen dioxide (NO_2), ozone, particulate matter, and sulfur dioxide (SO_2). The standards are set by the EPA to protect public health and the environment from harmful air pollutants. To achieve this, the EPA sets both primary and secondary standards. The primary standards protect public health, including the health of sensitive populations, such as asthmatics, children, and the elderly (EPA 2016). The secondary standards protect the environment and public welfare from adverse effects associated with pollution, including decreased visibility and damage to animals, crops, vegetation, and buildings (EPA 2016).

Although many of the criteria pollutants are directly emitted into the atmosphere by industrial and combustion processes, some criteria pollutants form in the atmosphere by chemical reactions. Ozone, for example, is formed in the atmosphere by reactions between VOCs and NO_X, which includes nitric oxide, NO_2, and other NO_X. In this context, VOCs and NO_X, referred to as ozone precursors, are regulated by the EPA to achieve ambient ozone reductions.

Similarly, particulate matter is a mixture of solid particles and liquid droplets of varying size found in the atmosphere. The EPA has established NAAQS for two different particles sizes: particulate matter less than 10 microns in diameter (PM_{10}) and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$). While some particulate matter is emitted directly, $PM_{2.5}$ can form in the atmosphere by chemical reactions between SO_2, NO_X, VOCs, and ammonia. As with ozone, $PM_{2.5}$ precursors are regulated by the EPA to achieve ambient $PM_{2.5}$ reductions.

The NAAQS for each criteria pollutant is presented in **Table 4.12-1**. Every five years, the EPA conducts a comprehensive review of the NAAQS and revises the standards based on the most recent scientific information available, as necessary. The EPA monitors compliance with the NAAQS through a state-wide network of air pollution monitoring stations measuring the concentration of each criteria pollutant. If ambient concentrations do not exceed the NAAQS, the area is designated an attainment area and no further action is required. If ambient concentrations exceed the NAAQS for one or more pollutants, the area is designated a nonattainment area for those pollutants, and the state is required to develop an implementation plan to achieve compliance with the NAAQS. Once a nonattainment area demonstrates compliance with the NAAQS, the EPA will designate the area a maintenance area (EPA 2020a).

Table 4.12-1 National Ambient Air Quality Standards

Pollutant	Averaging Time	Standard
$PM_{2.5}$	24 hours	98th percentile concentration averaged over 3 years ≤ 35 µg/m^3
	1 year	Annual mean, averaged over 3 years ≤ 12.0 µg/m^3 (primary)
	1 year	Annual mean averaged over 3 years ≤ 15.0 µg/m^3 (secondary)
PM_{10}	24 hours	150 µg/m^3, not to be exceeded more than once per year on average over 3 years
Ozone (2008)	8 hours	4th highest daily maximum value, averaged over 3 years ≤ 0.075 ppm
Ozone (2015)	8 hours	4th highest daily maximum value, averaged over 3 years ≤ 0.070 ppm
NO_2	1 hour	98th percentile daily maximum, averaged over 3 years ≤ 0.100 ppm
	1 year	Not to exceed 0.053 ppm
SO_2	1 hour	99th percentile daily maximum, averaged over 3 years ≤ 0.075 ppm
	3 hours	0.5 ppm, not to be exceeded more than once per year
CO	1 hour	35 ppm, not to be exceeded more than once per year
	8 hours	9 ppm, not to be exceeded more than once per year
Lead	Rolling 3-month average	Not to exceed 0.15 µg/m^3

Source: 40 CFR § 50
Notes:
µg/m^3 = micrograms per (standard) cubic meter
ppm = parts per million (by volume)

4.12.1.2 Hazardous Air Pollutants and Greenhouse Gases

In addition to regulating criteria pollutants through the NAAQS, the EPA is also responsible for developing and enforcing regulations governing other air pollutants, including hazardous air pollutants (HAPs) and greenhouse gases (GHGs).

HAPs are pollutants known or suspected to cause adverse health and environmental effects. Adverse health effects associated with exposure to HAPs include increased likelihood of developing cancer and other serious health effects such as reproductive effects, birth defects, or other adverse environmental effects (EPA 2017).

GHGs are gases that trap heat in the atmosphere and contribute to global warming (EPA 2020b). Common GHGs include carbon dioxide, methane, and nitrous oxide, which can be released into the atmosphere through the production, transportation, and burning of fossil fuels, and through emissions from livestock and other agricultural and industrial practices (EPA 2020b). In the United States, carbon dioxide accounted for approximately 82 percent of all GHG emissions in 2017 (EPA 2020c).

Although EPA has not established ambient air quality standards for HAPs or GHGs, emissions of HAPs and GHGs are regulated through national and state emissions standards and permit requirements.

4.12.1.3 New Source Review

EPA's New Source Review (NSR) regulations are a federal pre-construction permitting program responsible for ensuring that new emissions sources do not contribute to a violation of the NAAQS (EPA 2006). Pollutants regulated by the NSR permitting program include the criteria pollutants, VOCs, and other HAPs. In New York, the major source thresholds for attainment areas are 100 tons per year (tpy) for all NSR-regulated pollutants (6 NYCRR 231-13.5), while thresholds are limited to 50 tpy for VOCs and 100 tpy for NO_X in moderate ozone nonattainment areas, and to 25 tpy for VOCs and NO_X in severe ozone nonattainment areas (which includes the counties of the New York Metropolitan Area, 6 NYCRR 231-13.1). The components of the Project located within the onshore and offshore boundaries of New York State will be not be a major source for any NSR-regulated pollutants, because their potential emissions will be less than the major source thresholds.

4.12.1.4 New Source Performance Standards

The emergency generator engine at the onshore substation will be subject to the New Source Performance Standards for compression ignition engines under 40 CFR 60 Subpart IIII. The engine must be certified by the manufacturer to meet the applicable Subpart IIII emission standards for emergency generator engines, based on its rated output and model year. Subpart IIII also requires engines to use diesel fuel that meets the standards for ultra low-sulfur diesel (ULSD) under 40 CFR § 1090.305, which specifies a maximum sulfur content to 15 parts per million by weight, a minimum cetane index of 40, and a maximum aromatic content of 35 percent by volume. Finally, to qualify as an emergency engine under 40 CFR 60 Subpart IIII, the emergency generator is limited to no more than 100 operating hours per year during non-emergency situations, including up to 50 hours per year for maintenance checks and readiness testing.

4.12.1.5 National Emission Standards for Hazardous Air Pollutants

The emergency generator engine at the onshore substation will be subject to the National Emission Standards for Hazardous Air Pollutants for stationary reciprocating internal combustion engines at 40 CFR 63 Subpart ZZZZ. However, as specified at 40 CFR § 63.6590(c)(1), a new engine that has been certified to satisfy the New Source Performance Standards requirements under 40 CFR 60 Subpart IIII, and that is located at a facility that is not major for emissions of HAPs, is not subject to any additional requirements under 40 CFR 63 Subpart ZZZZ.

4.12.2 New York State Regulations

The NYSDEC is responsible for enforcing state environmental regulations established under Title 6 of the New York Codes, Rules and Regulations (6 NYCRR). The state air quality regulations that could potentially apply to the Project are discussed below.

4.12.2.1 6 NYCRR Part 201 Permits and Registrations

The emergency generator engine at the onshore substation will be exempt from the requirements of 6 NYCRR Part 201 because it will qualify as an "emergency power generating stationary internal combustion engine" under 6 NYCRR 201-3.2(c)(6), and will operate for no more than 500 hours of operation per year, limited to emergency situations, routine maintenance, and routine testing. The gas-insulated switchgear at the onshore substation, and the mobile equipment at the associated O&M base, also are not subject to the requirements of 6 NYCRR Part 201.

4.12.2.2 6 NYCRR Part 211 General Prohibitions

The onshore facilities, including the onshore substation, will be subject to the general requirements in 6 NYCRR Part 211.1 and 211.2, which prohibit creating a condition of air pollution that is injurious to health or that "unreasonably interferes with the comfortable enjoyment of life or property," and which prohibit visible emissions with an opacity equal to or greater than 20 percent (six-minute average) except for one continuous six-minute period per hour of not more than 57 percent opacity.

4.12.2.3 6 NYCRR Part 222 Distributed Generation Sources

The emergency generator engine at the onshore substation will be not be subject to the requirements in 6 NYCRR Part 222, because this rule only applies to generators used for "economic dispatch" purposes in the New York metropolitan area, which does not include emergency generators, as specified in 6 NYCRR 222.2(b)(7).

4.12.2.4 6 NYCRR Part 225 Fuel Composition and Use

All fuel-burner equipment at the onshore facilities, including the onshore substation, will be subject to the fuel sulfur limitations of 6 NYCRR Part 225, which restrict distillate fuel to no more than 0.0015 percent sulfur by weight, as specified in 6 NYCRR 225-1.2(g).

4.12.2.5 6 NYCRR Part 227 Stationary Combustion Installations

The emergency generator engine at the onshore substation will be subject to the opacity requirements of 6 NYCRR Part 227-1.3, which limits opacity to no more than 20 percent (six-minute average), except for one six-minute period per hour of not more than 27 percent opacity. The emergency generator engine will not be subject to any other provisions of 6 NYCRR Part 227 because the onshore facilities will remain below all the relevant size thresholds listed in 6 NYCRR 227-1.1 through 226-1.7, and because the onshore substation will not be a major source of NO_X as defined in 6 NYCRR 201-2.1(b)(21)(iv)(b).

4.12.2.6 6 NYCRR Part 231 New Source Review for New and Modified Facilities

The onshore facilities, including the onshore substation, will be exempt from the requirements of 6 NYCRR Part 231, because their potential emissions will be less than the thresholds for a major New Source Review source, as defined in 6 NYCRR 201-2.1(b)(21).

4.12.3 New York City Regulations

4.12.3.1 Rules of the City of New York

Title 15, Chapter 13 of the Rules of New York City contains dust prevention regulations that apply to all construction activities occurring within New York City, including wetting of construction materials to reduce airborne dust; use of chutes, buckets, or hoists to remove demolition material; covering all open trucks when moving dust-producing material; and limiting speeds of vehicles entering and existing construction sites.

Title 15, Chapter 40 of the Rules of New York City previously authorized the NYCDEP to require that a registration be submitted for all emergency generators rated at 40 kilowatts or more. However, this rule was repealed in 2016 and does not appear to have been replaced. (Title 24 of the New York City Administrative Code includes a registration requirement for emergency generators, as noted below).

Additional discussion is provided in **Exhibit 7**.

4.12.3.2 New York City Administrative Code

Title 24 of the New York City Administrative Code, Environmental Protection and Utilities, contains several regulations that may apply to the onshore facilities, including:

- §24-109 Registrations (applies to all emergency generators greater than 40 kilowatts);
- §24-141 Emission of odorous air contaminants;
- §24-142 Emission of air contaminants; standard smoke chart;
- §24-143 Emission of air contaminants from internal combustion engine; visibility standard;
- §24-146 Preventing dust from becoming air-borne; spraying of insulating material and demolition regulated;
- §24-147 Emission of nitrogen oxides (this rule references the requirements of 6 NYCRR Part 227-2, which do apply to the onshore facilities); and
- §24-148 Architectural coatings; solvents.

Additional discussion of New York City Administrative Code is provided in **Exhibit 7**.

4.12.3.3 New York City Zoning Resolution

Article IV, Chapter 2 of the New York City Zoning Resolution contains use regulations for activities located in manufacturing districts that may apply to the onshore facilities, including:

- §42-23 Performance Standards Regulating Smoke, Dust and Other Particulate Matter;
- §42-24 Performance Standards Regulating Odorous Matter; and
- §42-25 Performance Standards Regulating Toxic Noxious Matter.

Additional discussion of New York City Zoning Resolution is provided in **Exhibit 7**.

4.12.4 Air Quality Studies and Analysis

For the purposes of this section, the Air Quality Study Area includes Kings and Queens counties, New York in which the Project construction and operation activities will occur. To assess existing air quality conditions, the Applicant reviewed the NYSDEC Division of Air Resources monitoring station data (NYSDEC 2019k).

4.12.5 Existing Air Quality Conditions

This section describes the affected environment, inclusive of the onshore and offshore areas potentially impacted by Project construction and operations activities; this includes areas associated with operational Project facilities, as well as areas that will temporarily host construction activities. These areas include onshore and offshore portions of Kings and Queens counties in New York State, which are both part of the New York-Northern New Jersey-Long Island, NY-NJ-CT Air Quality Control Region.

The NYSDEC Division of Air Resources is responsible for ensuring clean air and managing the state and federal air pollution control programs in New York. Within this division, the Bureau of Air Quality Surveillance operates 58 air pollution monitoring stations collecting meteorological data and ambient concentrations of criteria pollutants, VOCs, and other air toxics across the state (NYSDEC 2020c). The data collected at these monitoring stations inform air pollution control programs and policies. Of the 58 monitoring stations, 24 stations collect air quality data in the New York City metropolitan area, including Rockland County, Westchester County, Nassau County, Suffolk County, and the five counties within New York City (NYSDEC 2020c).

Kings and Queens counties are currently designated as the following: serious ozone nonattainment with respect to the 2008 ozone standard and moderate ozone nonattainment areas with respect to the 2015 ozone standard; maintenance areas for the 1971 CO standard; maintenance areas for the 1997 annual $PM_{2.5}$ standard; and maintenance areas for the 2006 24-hour $PM_{2.5}$ standard. The monitors demonstrate compliance with the NAAQS for other criteria pollutants.

In addition to monitoring criteria pollutants in order to determine compliance with the NAAQS, NYSDEC operates an air toxics monitoring program to monitor the ambient concentration of VOCs across the state. The program currently collects samples at 12 monitoring stations within the state's network of monitoring stations (NYSDEC 2020c). While some compounds exhibit more variable trends, data from 2006 to 2019 indicates that annual average concentrations of VOCs have generally decreased since 2006 (NYSDEC 2020c).

In July 2019, NYSERDA finalized the New York State Greenhouse Gas Inventory: 1990-2016, which inventories GHG emissions by sector. The report indicates that while GHG emissions increased between 1990 and 2005, GHG emissions in the state have been decreasing since 2005 (NYSERDA 2019). The state has reduced emissions from 236 million metric tons of GHG in 1990 to 206 million metric tons of GHG in 2016, achieving an 8 percent decrease in GHG emissions over this period. While the state reduced GHG emissions, the national emissions increased approximately 2 percent over the same period from 1990 to 2016 (NYSERDA 2019).

4.12.6 Potential Air Quality Impacts and Proposed Mitigation

Project-related air emissions are predominantly expected to result in short-term, minor impacts to air quality during construction activities and long-term minor impacts to air quality during operations, as described in this section.

4.12.6.1 Construction

During construction, the potential impact-producing factors to air quality are expected to include construction of the submarine export cables, onshore export and interconnection cables, and onshore substation, as well as transportation of Project-related components to Project construction sites. Project-related air emissions during construction could have short-term impacts to air quality.

Primary Project emissions sources include marine vessels used for construction of the submarine export cable and cable landfall, which will operate in New York State waters in Kings and Queens Counties. Most of these vessels and the onboard construction equipment will utilize diesel engines burning low sulfur fuel while some larger construction vessels may use bunker fuel. Project-related vessels will comply with applicable EPA, or equivalent, emission standards.

Construction staging and laydown for offshore and onshore construction will occur at SBMT. Onshore construction activities for the onshore substation and onshore cable will primarily utilize diesel-powered equipment. In addition, a localized increase in fugitive dust may result during onshore construction activities. To minimize impacts, Project-related vehicles, diesel engines, and/or nonroad diesel engines at the staging site will comply with applicable state regulations regarding idling. In New York State, 6 NYCRR § 217-3 prohibits all on-road diesel-fueled and non-diesel-fueled heavy-duty vehicles from idling for more than five minutes. Any fugitive dust generated during construction of the onshore components of the Project will be managed in accordance with the Project's onshore Fugitive Dust Control Plan.

Evaluation of emissions scenarios show that most of the construction emissions will be produced by the marine vessels used for installation of the submarine export cable and the cable landfall.

Proposed mitigation measures for construction emissions are summarized below:

- Marine vessels constructed on or after January 1, 2016 will meet the Tier III NO_X standard established by the IMO, where applicable, when operating within New York state waters;
- Onshore diesel-powered construction equipment and vehicles will use ULSD fuel, per the requirements of 40 CFR § 80.510(b), where applicable;
- Marine vessels will use low sulfur diesel fuel where possible and be at or below the maximum fuel sulfur content requirement of 1,000 ppm established per the requirements of 40 CFR § 80.510(k), where applicable; and
- Fugitive dust generated during onshore construction will be managed in accordance with the Fugitive Dust Control Plan.

4.12.6.2 Operations

During operations and maintenance, potential Project-related emissions will result from the operation of an emergency generator at the onshore substation and from GHG emissions of sulfur hexafluoride from gas-insulated switchgear installed at the onshore substation. These potential emissions are presented in **Table 4.12-2**.

Estimated air emissions from operations and maintenance activities will be very small and are not expected to have a significant impact on regional air quality over the operational life of the Project. The use of wind to generate electricity reduces the need for electricity generation from traditional fossil fuel powered plants that produce GHG emissions and will result in the displacement of marginal generation from fossil fuel-fired power plants.

Table 4.12-2 Operations and Maintenance Potential Emissions (tons)

Activity	VOC	NO_X	CO	PM/ PM10	PM2.5	SO2	HAP	GHG (CO2e)
Operation of onshore substation	0.26	1.85	1.16	0.07	0.06	0.002	0.002	783
TOTAL	**0.26**	**1.85**	**1.16**	**0.07**	**0.06**	**0.002**	**0.002**	**783**

Proposed mitigation measures for operations emissions are summarized below:

- The emergency generator engine at the onshore substation will be certified to meet the applicable emission standards of 40 CFR 60 Subpart IIII; and
- Onshore diesel-powered equipment will use ULSD fuel, per the requirements of 40 CFR § 80.510(b).

4.13 Electromagnetic Fields

This section describes onshore and offshore EMF that may occur within and surrounding the Project. Potential impacts resulting from EMF during construction, operations, and maintenance of the Project are discussed, as well as Project-specific measures adopted by the Applicant that are intended to avoid, minimize, and/or mitigate potential impacts. This section addresses requirements of 16 NYCRR § 86.5 relative to assessment of EMF impacts to biological processes.

The Commission established guidelines in 1978 for electric fields generated by new transmission lines in Opinion No. 78-13 (see Section 4.13.1.1). In 1990, the Commission established guidelines for magnetic field levels for new transmission lines in their Interim Policy Statement on Magnetic Fields. The Project was assessed in accordance with these guidelines.

4.13.1 Electric and Magnetic Field Studies and Analysis

The Applicant contracted Exponent Engineering, P.C., to conduct an EMF assessment associated with the operation of the submarine export, EW 1 onshore export, and onshore interconnection cables. The EMF Assessment is provided in **Appendix F**. This assessment includes calculation of the 60-Hz magnetic fields levels anticipated to be produced during operation of the underground transmission lines onshore and the submarine export cables offshore. Magnetic field values are reported as root-mean-square flux density in milligauss (mG), where 1 Gauss = 1,000 mG[16] and were calculated as the magnitude of the field along the major axis of the ellipse as specified by the Commission (NYSPSC 1990).

The Project will not be a direct source of electric fields above ground or at the seabed, due to shielding of the electric field by the cable components (CSA Ocean Sciences Inc. and Exponent 2019). Additionally, the electric field from the cables will be blocked by the earth (soil, sediment or other material) due to the burial depth, or cable protection measures to be applied in areas where target burial depth may not be achieved. As such, an electric field was not calculated for the submarine export cables or the onshore cables.

The oscillating magnetic field produced by the submarine export cables induces a weak electric field in the marine environment and potentially in marine species near the cables as discussed further in Sections 4.6 and 4.7. These induced electric field levels would be approximately 1 million times below the Commission's electric field limit and so are not included in this discussion.

4.13.1.1 Electric and Magnetic Field Guidelines and Policies

The NYSPSC's Interim Policy guideline states that magnetic fields created by Article VII transmission lines cannot exceed 200 mG at the edge of the ROW. For the purposes of this assessment, it is assumed each submarine export cable will be installed at the center of a 30-ft (9.1-m) wide easement (i.e., ROW). For the onshore interconnection cables, it is assumed the cables will be installed in duct banks or pipes and will be at the center of a 25-ft (7.6-m) cable corridor (i.e., ROW) during operations. However, the maximum magnetic field has also been calculated for comparison with the Interim Policy guideline, in the event that final ROW widths differ from these values. Although the final ROW widths have not been determined, these ROWs are significantly less than the typical ROW widths outlined in the NYSPSC's Interim Policy for transmission lines within or across public thoroughfares, which indicates typical widths are 150 ft (45.7 m) for 345-kV circuits and 120 ft (36.6 m) for 230-kV circuits. Therefore, the calculated magnetic fields are conservative (higher) than

[16] Magnetic fields also are commonly reported in units of microtesla, where 0.1 microtesla is equal to 1 mG

what would be expected at the edge of these typical ROWs. The magnetic field level is measured or calculated at 3.3 ft (1 m) above ground or seabed, with the transmission line operating at winter normal conductor rating.

The Commission guidelines for electric fields as set out in Opinion No. 78-13 are based on a maximum induced current of 4.5 milliamperes, with the maximum electric field strength to induce that current estimated based on the largest object expected to be under a line at any given point. These field strengths, measured at one meter above ground, are 7 kilovolts per meter (kV/m), 11 kV/m and 11.8 kV/m for public roads, private roads, and other terrain, respectively. The Commission also requires a not-to-exceed electric-field limit at the ROW edge of new transmission lines of 1.6 kV/m. Since the electric field from the submarine and onshore interconnection cables is blocked by the cable components and the ground, the Project will not be a direct source of any electric field, and any electric field induced by the magnetic field will be *de minimis*.

There are no federal standards that limit human exposure to either magnetic or electric fields produced by transmission infrastructure, but two international organizations provide guidance on limiting human exposure to magnetic fields, which is based on extensive review and evaluations of relevant research of health and safety issues—the International Committee on Electromagnetic Safety (ICES), which is a committee under the oversight of the Institute of Electrical and Electronics Engineers, and the International Commission on Non-Ionizing Radiation (ICNIRP), an independent organization providing scientific advice and guidance on electromagnetic fields. Both organizations have recommended limits designed to protect health and safety of persons in occupational settings and for the general public. The ICES maximum permissible exposure limit for the general public to 60-Hz magnetic fields is 9,040 mG, and ICNIRP determined a reference level limit for whole-body exposure to 60-Hz magnetic fields at 2,000 mG (ICNIRP 2010; ICES 2005, 2002). The World Health Organization (WHO) views these standards as protective of public health (WHO 2007). As the WHO (2019) also states on its website, "[b]ased on a recent in-depth review of the scientific literature, the WHO concluded that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields."

4.13.2 Existing Electric and Magnetic Field Conditions

The Applicant will be installing new submarine export cables subsea. Onshore cables (including the EW 1 onshore export and onshore interconnection cables) will be installed in developed lands and along an existing roadway corridor, which have been previously disturbed for construction of structures, roads, and sidewalks. Existing EMF along the submarine export or onshore cable routes could be associated with natural conditions, or with existing electrical infrastructure along the cable corridors. Existing submarine and overhead electric and telecommunications cables occur within and near the Project Area (see **Exhibit 2**, **Exhibit E-5** and **Exhibit E-6**).

4.13.3 Potential Electric and Magnetic Fields Impacts and Proposed Mitigation

The flow of electric currents in the submarine export cables, EW 1 onshore export cables, and onshore interconnection cables will be new sources of EMF. Like all wiring and equipment connected to the electrical system in North America, the EMF surrounding cables will oscillate with a frequency of 60 Hz. The magnetic field will be strongest at the surface of the cable and will decrease rapidly with distance from the cables.

Electric fields are generated due to the voltage applied to the conductors located within the cables; however, they are not expected to enter the marine environment offshore or above ground onshore. The oscillating magnetic field produced by the cables, however, will induce a weak electric field in the marine environment and in marine species near the cables. Since the electric field is induced by the cables' magnetic field, it will vary depending on the flow of electric currents in the cables, rather than voltage. Similar to magnetic fields, the induced electric fields decrease rapidly with distance from the cables.

Magnetic fields for the submarine export cables were calculated using a conservative assumption of a burial depth of 4 ft (1.2 m) beneath the seabed. As discussed in Section 4.1, the Applicant has a minimum target burial depth for the submarine export cables of 6 ft (1.8 m) beneath the seabed in New York State waters. It is also anticipated that portions of the submarine export cable route will be buried deeper, including within federally maintained channels. Calculations therefore reflect higher magnetic field levels than locations where the cables will be buried deeper. Where it is impossible to bury the cable, the submarine export cables will be laid on the surface for short distances and covered with cable protection. Cable protection may include rock berms, rock bags, or concrete mattresses. The minimum coverage depth for any of the proposed cable protection measures along the route is 3.3 ft (1.0 m), which was the basis for magnetic field calculations for surface-laid portions of the submarine export cable route. Calculations of the magnetic field for the onshore cables assumed that duct banks will be installed with a minimum target burial depth of 3 ft (0.9 m) to the top of the duct bank.

Post-construction magnetic field levels at the edges of the assumed ROWs for either the submarine export cables or the onshore interconnection cables do not exceed the Commission's standard of 200 mG in any modeled cable configurations of the Project. As listed in **Appendix F**, at ±15 ft (±4.6 m) from the submarine export cable, and ±12.5 ft (±3.8 m) from the onshore interconnection cable route centerline (i.e., the ROW edge) the magnetic-field level is 40 mG or less. Moreover, the maximum calculated magnetic field level is 170 mG for the onshore interconnection cable in the flat configuration; other configurations for the onshore interconnection cables and the submarine export cables have magnetic field values less than 80 mG. Therefore, even in the case that a smaller ROW is requested for either the submarine export or onshore cable routes, the magnetic field is not expected to exceed the Commission's standard.

Calculated magnetic field levels were below reported thresholds for effects on the behavior of magneto-sensitive marine organisms (see Sections 4.6 and 4.7). In addition, calculated magnetic field levels were below limits published by ICES and the ICNIRP, designed to protect the health and safety of the general public, for both onshore and offshore. Levels of electric fields induced in seawater and large fishes are also expected to be below reported detection thresholds of local electrosensitive marine organisms.

4.13.3.1 Construction

Since electric and magnetic fields are produced by the flow of electricity, no impacts from Project-related EMF are anticipated during construction, which occurs before the cables are operational and electrified.

4.13.3.2 Operations

Impact producing factors during operations include the presence of the submarine export cables, and the presence of the onshore cables.

Submarine Export Cables

The following impacts from Project-related EMF have the potential to occur:

- Negligible long-term impacts to fish and invertebrates;
- Negligible long-term impacts to marine mammals; and
- Negligible long-term impacts to sea turtles.

Impacts to fish and invertebrates. Some fish and invertebrates are known to detect and respond to EMF from buried cables, but no clear trend of avoidance, attraction, or adverse effects has been established. Additional information on the effects of EMF on fish and invertebrates is provided in Sections 4.6 and 4.7.

A recent review of potential effects of the weak EMF generated by alternating current undersea power cables associated with offshore wind energy projects found they would not negatively affect any fishery species in Southern New England because the frequencies are not within the range of detection for these species (Snyder et al. 2019). No adverse effect of existing subsea cables offshore or in New York State waters has been demonstrated for any marine resource (NYSERDA 2017a, 2017b; Copping et al. 2016). Nevertheless, the Applicant has committed to sufficiently burying electrical cables wherever feasible, which will minimize EMF.

Numerous studies of EMF emitted by subsea alternating current cables reported no interference with movement or migration of fish or invertebrates (Hutchison et al. 2018; Love et al. 2017; Rein et al. 2013) and no adverse or beneficial effect on any species was attributable to EMF (Snyder et al. 2019; Copping et al. 2016). A review of effects of EMF on marine species in established European offshore wind farms suggested that heat generated by electrified cables should be further investigated (Rein et al. 2013). Follow-up analysis of thermal effects of subsea cables on benthic species concluded that effects were negligible because cable footprints are narrow, and the small amount of thermal output is easily absorbed by the sediment overlying buried cables (Taormina et al. 2018; Emeana et al. 2016). Thermal gradients do not form above the buried cables because the overlying water is in constant motion. At the Block Island Wind Farm off the coast of Rhode Island, buried subsea cables were determined to have no effect on Atlantic sturgeon or on any prey eaten by whales or sea turtles (NOAA Fisheries 2015), which includes most fish and macroinvertebrates.

Given the data from operational wind projects, field experiments in Europe and the United States (Snyder et al. 2019; Kilfoyle et al. 2018; Taormina et al. 2018; Wyman et al. 2018; Love et al. 2017; Dunlop et al. 2016; Gill et al. 2014), modeling results of potential effects of EMF on fish and invertebrates in the Project Area, and the Applicant's commitment to cable burial, impacts of energized cables on fish and invertebrates would be negligible. Electric and magnetic fields generated by the buried export cables would be detectable by some benthic fish and invertebrates but would not adversely impact individuals or populations (Snyder et al. 2019).

Impacts to marine mammals. Literature suggests cetaceans can sense the geomagnetic field and use it during migrations, although it is not clear which components they are sensing or how potential disturbances to the geomagnetic field caused by EMF near the buried submarine export cables may affect marine mammals (Normandeau et al. 2011). Additional information on the effects of EMF on marine mammals is provided in Section 4.7.

There is no evidence indicating magnetic sensitivity in seals, but other marine mammals appear to have a detection threshold for magnetic sensitivity gradients of 0.1 percent of the Earth's magnetic fields and are likely to be sensitive to minor changes (Normandeau et al. 2011, Walker et al. 2003, Kirschvink 1990). Variations of the geomagnetic field caused by cable EMF in high-voltage direct-current cables would have the potential to elicit a reaction from marine mammals, including changes in swimming direction or detours during migration. However, as the Project proposes to use HVAC cables, this effect is not anticipated to occur (Gill et al. 2005).

Indirect effects on marine mammals from alterations in prey due to EMF are also unlikely, as the average magnetic field strengths in the vicinity of the submarine export cables are below levels documented to have adverse impacts to fish behavior. Impacts to mid-water fish species including small schooling fish (e.g., mackerel, herring, capelin) consumed by marine mammals would not be affected by the EMF associated with Project cables.

In similar windfarm operations, modeling determined that the intensity of the magnetic fields generated by the submarine export cables is expected to be low and localized (Gill et al. 2005, Normandeau et al. 2011). Generally, electric and magnetic fields are not considered to directly affect marine mammals.

Impacts to sea turtles. There is little data on the effects of EMF on sea turtles, so species sensitivity to field strength of either electric or magnetic fields is often addressed as a proxy. Additional information on the effects of EMF on sea turtles is provided in Section 4.7.

What research has been done suggests that sea turtles in all life stages orient to the Earth's magnetic field to position themselves in oceanic currents, which helps them locate seasonal feeding and breeding grounds and to return to their nesting sites. Sea turtles do not appear to be sensitive to EMF (Tethys 2010). Cable-related EMF is generally considered to be less intense than the Earth's geomagnetic field, and it is generally assumed that sea turtles will not be affected by this EMF (NJDEP 2010).

Changes in these geomagnetic fields, however, could potentially impact a sea turtle's ability to navigate at sea as well as their movement patterns (Taormina et al. 2018; Normandeau et al. 2011). Experiments show that sea turtles can detect changes in magnetic fields, which may cause them to deviate from their original direction (Lohmann et al. 1999; Lohmann and Lohmann 1996). Sea turtles also use nonmagnetic cues for navigation and migration, and these additional cues may compensate for variations in magnetic fields. There are indications that an overall geomagnetic sense is used and is critical for primary orientation to travel to areas that are important at various life stages (e.g., nesting beaches or feeding grounds), but detail and fine-scale navigation is accomplished via olfactory and visual cues (Normandeau et al. 2011). If located in the immediate area (within about 650 ft [200 m]) where electromagnetic devices are being used, sea turtles could deviate from their original movements, especially during feeding bouts; however, the extent of this disturbance is likely to be inconsequential. Potential impacts of exposure to electric and magnetic stressors are not expected to result in substantial changes to an individual's behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment, and are not expected to result in population-level impacts. As the magnetic and induced electric fields of the submarine export cables are expected to be of relatively low intensity in the Project Area, impacts to sea turtle species are not anticipated to result in short-term behavioral disturbance. Burial will act as a buffer between EMF and the sea turtles, further reducing exposure levels. In areas where sufficient burial is not feasible, surface cable protection will provide an additional barrier to EMF.

Onshore Cables

No impacts to humans or terrestrial wildlife from EMF are anticipated from onshore Project components. The calculated magnetic field levels generated by the Project's onshore cables (including EW 1 onshore export cables and onshore interconnection cables) are well below limits published by the ICES and ICNIRP designed to protect the health and safety of the general public and calculated magnetic field and induced electric field levels are not expected to adversely affect nearby marine organisms. The highest calculated magnetic field level is 170 mG, which occurs for the onshore interconnection cables in the flat configuration; therefore, the magnetic field is not expected to exceed the Commission's Interim Policy Statement on Magnetic Fields.

4.14 Summary of Impacts

The Applicant has incorporated measures to avoid, minimize, and mitigate impacts of the Project. In accordance with 16 NYCRR § 86.5, the Applicant has described the studies which have been made to assess the impact of the proposed Project to the environment and described potential impacts on physical and biological processes. The risk of disturbance to the seabed resulting from secondary interaction of fishing gear and vessel anchors with the submarine export cables during operation of the Project was determined to be a moderate (see Section 4.6). Additionally, the proposed onshore substation has the potential to introduce strong visual contrast in views from the east along 2nd Avenue (see Section 4.9). All other impacts from construction and operation the Project were assessed as either minor or negligible.

The Applicant will determine through a CBRA the appropriate target burial depth for submarine cables, informed by continued engagement with regulators and stakeholders (including commercial fisheries stakeholders), extensive experience with submarine assets, and based on an assessment of seabed conditions (e.g., geologic, sediment, mobility) and activity (including fishing) in the area, in order to reduce the risk of interaction with fishing gear and vessel anchors. Additionally, to decrease the risk of gear snagging where target burial depth cannot be achieved, the Applicant has committed to limit the use of concrete mattresses where alternatives are feasible, except where required for certain asset crossing locations. Cable protection, when applied, will be designed to minimize the potential for gear snags, as feasible. To minimize potential visual impacts during operations, a pre-engineered building system with prescribed architectural elements incorporated into the design will be used to ensure the Project meets the Waterfront Revitalization Program policies, and lighting at the onshore substation will be designed to reduce light pollution, where feasible.

4.15 Cumulative Impacts

Cumulative impacts occur when multiple actions affect the same resource(s). These impacts can occur when the incremental or increased impacts of an action, or actions, are added to other past, present, and reasonably foreseeable future actions regardless of which agency, entity, or person undertakes such other actions.

For impacts to compound, the actions must be in close enough proximity that they affect the same resource, and in close enough succession that impacts from one action have not returned to background levels prior to the occurrence of the next action. Cumulative impacts can be minimized through siting and scheduling projects to maintain an appropriate distance and/or time separation between actions.

As detailed in Sections 4.2 through 4.13 and summarized in Section 4.14, the Applicant has proactively sited Project components to minimize disturbance to sensitive resources to the extent practicable, including through evaluation of the submarine export cable routing, and siting the onshore cable route and onshore substation within previously disturbed areas (see **Exhibit 3**). The Applicant will adhere to avoidance, minimization, and mitigation measures provided in this Exhibit and in the Project's Certificate and permit conditions. The Applicant is also engaged in outreach with the owners and developers of nearby projects to obtain information on future development and to minimize cumulative impacts to the extent practicable.

4.15.1 Cumulative Impacts Data Sources

To identify and evaluate existing and planned projects that have the potential to result in cumulative impacts, the Applicant consulted publicly available data, including state applications, news articles, and project websites, as well as engagement with asset owners. The Applicant considered large-scale projects including existing infrastructure and past projects that have affected the Project Area. The Applicant also considered the publicly available plans of other projects to be constructed in the future that may overlap with the Project's construction period, and that may impact resources located within the Project Area. These other projects are described below, although not all of the projects that meet these criteria are expected to result in cumulative impacts.

4.15.2 Existing Facilities Proximal to the Project

This section provides an inventory of existing facilities considered in the assessment of cumulative impacts. These facilities represent past actions that have influenced the Project Area and its immediate surroundings. The potential cumulative impacts of existing facilities with the proposed Project are described.

4.15.2.1 Sims Municipal Recycling Facility

The Sims Municipal Recycling (Sims) Facility opened in the fall of 2013 on 11 acres of the SBMT parcel owned New York City and under lease to the NYCEDC. The facility was built in public-private partnership with NYCEDC in response to the Solid Waste Management Plan adopted by the New York City Council and the State of New York in 2006, as well as NYCEDC's plan to revitalize the marine terminal, which had previously been inactive since the 1980s (NYCEDC 2009).

The Sims Facility sits on the northernmost pier of the SBMT parcel, the 29th Street Pier. Sims brings barges containing materials to be recycled into an enclosed unloading facility and unloads those materials by crane into the tipping area. The facility also includes processing and bale storage buildings, green space, parking, and an administrative and education center (Selldorf Architects 2019). Construction of the Sims facility included raising the site by four feet (Paben 2017). Any short-term environmental impacts associated with the construction of the Sims Facility are expected to have returned to baseline conditions.

The Applicant is coordinating with the Sims Facility regarding Project activities. Since proposed Project facilities will also be located within the SBMT parcel, including the onshore substation and portions of the onshore cable route, increases in marine transportation and land traffic to Project facilities may represent minor cumulative impacts with the existing Sims Facility. However, due to the relatively small number of crew expected for construction and operations of the Project, the potential cumulative impact of vessel and vehicle traffic on marine and land transportation and local traffic is anticipated to be small. Based on the location of the facility in an existing industrial area and consistency with existing land uses, the Applicant does not anticipate any other cumulative impacts.

4.15.2.2 Onshore Transportation Infrastructure

SBMT contains several rail infrastructure features constructed in 2011, including a rail spur for break-bulk along the 39th Street pier shed, two new rail sidings for auto rack loading and unloading, and a rail connection to the Sims recycling facility. This rail was constructed by the NYCEDC to extend rail infrastructure from Bush Terminal to SBMT (NYCEDC 2011). Any short-term impacts associated with the construction of these rail infrastructure features are expected to have returned to baseline conditions. Within the substation parcel, the onshore interconnection cable will cross the rail connection to the Sims Facility. The Applicant is proposing to use trenchless construction along the onshore interconnection cable route in order to cross the railroad, which would avoid interference with the railroad tracks or active rail service. The Applicant will coordinate with NYCEDC and New York New Jersey Rail as applicable regarding requirements for the crossing. The submarine export cable corridor would also cross the carfloat route used to transport freight rail from the 65th Street Railyard across New York Harbor; however, construction activities will be coordinated to minimize disruption to marine transportation. Effects on transportation are further described in **Exhibit E-6**.

The onshore interconnection cable route will be located within 2nd Avenue as it travels from the onshore substation at SBMT to the point of interconnection at the existing Gowanus 345-kV Substation. Impacts to roadways are expected to be minor and localized; **Exhibit E-6** provides additional information on impacts to transportation and roadways.

4.15.2.3 Existing Submarine Assets

The submarine export cable will cross existing cable and pipeline infrastructure as detailed in **Exhibit E-6. Exhibit 2** provides mapping of existing ROW crossings.

The most recently installed submarine asset project in the Project Area was in 2017, when Transcontinental Gas Pipe Line Company, LLC (Transco) completed construction on its New York Bay Expansion Project. The project modified sections of a previously existing pipeline and ancillary facilities, including the Narrows Metering and Regulation facility located onshore in eastern Staten Island (Transco 2017). The submarine export cable route crosses the pipeline approximately 1.6 nm (3 km) northwest of the New York State waters boundary. As construction of the Project is not anticipated until 2023 or later, short-term impacts associated with construction of the Transco pipeline expansion project and other existing submarine assets installed before 2017 are expected to have returned to background levels before construction of the Project begins. Therefore, short-term impacts related to the construction of the Transco pipeline, as well as other assets installed prior to 2017, are not expected to result in cumulative impacts.

Where asset crossings along the submarine export cable routes are identified as necessary, specific crossing methodology will be developed and engineered as the submarine export cable route is finalized and additional information will be provided in the EM&CP. Submarine cable crossings will usually require a physical separation, such as a concrete mattress or an exterior protection product installed on the cable. The Applicant is committed to appropriate cable protection to mitigate impacts to existing assets as well as serve to mitigate cumulative impacts to underwater EMF, and any cumulative impacts to underwater EMF are anticipated to be negligible. Minor long-term cumulative impacts may occur from the presence of external cable protection and introduction of artificial habitat.

4.15.3 Planned Projects Proximal to Empire Wind

4.15.3.1 South Brooklyn Marine Terminal Improvements

SBMT has been largely inactive for maritime transport since the 1980s; however, in recent years NYCEDC has launched a revitalization campaign, including the addition of the Sims Facility and the 2011 railway infrastructure, described above (NYCEDC 2009). Improvements to SBMT are included in the Port Master Plan 2050 developed by the Port Authority of New York and New Jersey (PANYNJ 2019).

In 2018, the City awarded a lease to Red Hook Container Terminal and Industry City to operate SBMT and to reactivate 64.5 acres of the terminal for maritime shipping. The project occupies the two southern piers and an upland area of the SBMT parcel and will move 900,000 metric tons of cargo annually (NYCEDC 2018).

In conjunction with these improvements to SBMT, the port will be upgraded to support offshore wind projects, including but not limited to the EW 1 Project. On February 6, 2020, New York City Mayor Bill de Blasio pledged to invest $57 million to help the terminal support offshore wind production (de Blasio 2020). Onshore and in-water work will be required to transform SBMT into an offshore wind staging and assembly facility, as well as an O&M base for Empire and other project developers.

Offshore, port upgrades will lead to increased vessel traffic, and possible seafloor disturbance near the piers. Dredging could cause seafloor disturbance in the vicinity of Project activities, such as along the submarine export cable corridor. Marine disturbances may cause short-term cumulative impacts to water quality and aquatic species; however, since the area is routinely dredged and is actively used for shipping and transit, cumulative impacts associated with the Project are expected to be minor relative to other ongoing activities.

Onshore, the construction and operation of the port facility may increase land traffic to SBMT, but due to the relatively small number of crew expected for construction and operation of the Project, the potential cumulative impact to local traffic is anticipated to be small. There also may be an increase in cumulative visual and noise impacts associated with future uses of the adjacent SBMT port facility, including the use of heavy-lift cranes and the O&M facilities. However, both projects are anticipated to be consistent with the industrial nature of the area. The Applicant will coordinate with SBMT to minimize potential cumulative impacts.

4.15.3.2 Industry City

A 16-building complex known as "Industry City" is located within two areas adjacent to SBMT, one just southeast of the proposed substation parcel and one along the shoreline south of the Red Hook lease. The 5.3 million square foot campus is part of the Southwest Brooklyn Industrial Business Zone and is zoned as M3-1 Heavy Manufacturing, although a wide variety of uses (retail, artist studios, office, manufacturing, etc.) are present within the complex. Developers Belvedere Capital Real Estate Partners, Jamestown, and Angelo, Gordon & Co proposed to map a Special District to rezone the selected areas to M2-4 and expand the allowed uses to include hotels, museums, academic uses, and large retail stores (Menchaca 2019). The rezoning was delayed in March 2019 and again in September 2019 due to opposition from the local community and City Council members. On September 22, 2020, Industry City withdrew its rezoning application and plans continue with as-of-right leasing options (Chadha 2020). Therefore, no cumulative impacts are anticipated.

4.15.3.3 USACE Dredging

The USACE New York District maintains the navigation channel system in New York Harbor. Under this authority, the USACE regularly conducts dredge projects in the Harbor, including Ambrose Channel, which is regularly dredged to maintain depth for shipping. The submarine export cable corridor closely parallels Ambrose Channel, and dredging effects from previous efforts adjacent to Ambrose Channel are seen on the route. The Bay Ridge and Red Hook Channels are also dredged regularly for maintenance, approximately every 10-15 years. On March 11, 2021, the USACE issued a Public Notice for maintenance dredging of shoal areas adjacent to SBMT and the approach to the Gowanus Creek Federal Navigation Channel (USACE 2021), in an area that is partially overlapping the Applicant's anticipated work areas. If dredging were to be conducted in close succession with the Project, short-term cumulative impacts would include seafloor disturbance, noise, increase in construction-related vessels, and changes in water quality. Maintenance dredging of Bay Ridge and Red Hook Channels is anticipated to occur in the summer or fall of 2021; most impacts from these activities would therefore have time to return to baseline conditions prior to construction of the Project. With the exception of the lower channel depth, long-term cumulative impacts from USACE dredging projects are not anticipated.

The USACE also has plans to deepen and widen the federal anchorage in Gravesend Bay immediately to the east of Ambrose Channel. This plan includes widening a portion of the anchorage to 3,000 ft (0.9 km) and deepening this area to a maintained depth of -50 ft (15 m) MLLW, with the goal of accommodating large, deep draft vessels which already call on the port but cannot currently anchor within the harbor. The anchorage project is estimated to be completed in approximately 2025, pending federal approval and funding (USACE 2020).

Subject to ongoing discussions with USACE and other stakeholders, the Applicant will bury the submarine export cable route at a deeper depth across federally maintained channels and planned dredging areas, in order to avoid any future issues with maintenance dredging. The Applicant will continue to consult with USACE on crossing federally maintained areas.

4.15.3.4 Poseidon Cable

Poseidon Transmission I, LLC (Poseidon) has proposed an approximately 200-kV high-voltage direct-current 500-megawatt electric transmission cable which would connect South Brunswick, Middlesex County, New Jersey, and the Town of Huntington, Suffolk County, New York and cross Lower New York Harbor (Poseidon 2013).

The status of the cable is currently unknown; the last filing on Poseidon's Article VII application (Case Number 13-T-0391) was in September 2015, which extended the deadline for identification of alternate routes. No filings since then appear on the Article VII case. A 2018 article indicates that Poseidon's parent company, Anbaric, is not advancing the project and hopes instead to use the planned onshore route for future offshore wind work (Kuser 2018).

If the Poseidon cable were to be constructed in close succession with the Project, short-term cumulative impacts could include seafloor disturbance, noise, increase in construction-related vessels, and changes in water quality. In this unlikely event, the Applicant would coordinate with Poseidon to minimize impacts. Long-term cumulative impacts would include EMF and the need for asset crossings, which would be minimized as discussed in Section 4.15.2.3.

4.15.3.5 Transco Raritan Bay Loop Pipeline

Transco has proposed a 26-inch diameter pipeline crossing New York and New Jersey waters, called the Raritan Bay Loop, which would cross the submarine export cable route in New York Harbor (Transco 2017). In 2019, the pipeline was denied several key permits (Fallon 2019). After re-submittal of the application, New York and New Jersey both denied necessary permits for construction of the pipeline on May 15, 2020 (NYSDEC 2020d; NJDEP 2020). On March 19, 2021, Transco asked the Federal Energy Regulatory Commission for an extension to its Certificate of Public Convenience and Necessity (FERC 2021). The Applicant's current understanding is that this Transco project is moving forward.

If the Transco pipeline is built close enough in time to the Project that impacts have not returned to background levels, short-term cumulative impacts may include seafloor disturbance, noise, increase in construction-related vessels, and changes in water quality. These potential impacts would be minimized by coordination with Transco and engagement with local authorities. An asset crossing would be required as discussed in Section 4.15.2.3.

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