Empire Offshore Wind LLC

Empire Wind 2 Project

Exhibit 4

Environmental Impact

June 2022

Environmental Impact

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FIGURES

ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
μg/m³	micrograms per cubic meter
ac	acre
Alpine	Alpine Ocean Seismic Survey, Inc.
AMSL	Above Mean Sea Level
APE	area of potential effects
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas
ASLF	ancient submerged landform feature
ASMFC	Atlantic States Marine Fisheries Commission
AVEHAP	analysis of visual effects on historic and architectural properties
BLM	Bureau of Land Management
BOEM	Bureau of Ocean Energy Management
CAA	Clean Air Act
CBRA	Cable Burial Risk Assessment
CFR	*Code of Federal Regulations*
CIRES	Cooperative Institute for Research in Environmental Sciences
CMECS	Coastal and Marine Ecological Classification Standard
CMP	Comprehensive Management Plan
CO	carbon monoxide
CO_2	carbon dioxide
COP	Construction and Operations Plan
CPT	cone penetration test
CRIS	Cultural Resource Information System
CRIS	Cultural Resource Information System
CWA	Clean Water Act
CZM	Coastal Zone Management
dB	decibel
dBA	decibel, A scale
DMA	Dynamic Management Area
DOE	Department of Energy
DPS	Distinct Population Segment
EECBG	Energy Efficiency and Conservation Block Grant

EFH	Essential Fish Habitat
EM&CP	Environmental Management & Construction Plan
EMF	electric and magnetic fields
Empire or the Applicant	Empire Offshore Wind LLC
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESPreSSO	Experimental System for Predicting Shelf and Slope Optics
EW 2	Empire Wind 2
EW 2 Project	Empire Wind 2 Project
FEMA	Federal Emergency Management Agency
FHA	Flood Hazard Area
FIRMs	Flood Insurance Rate Maps
FLO	Fisheries Liaison Officer
FMC	Fishery Management Council
FMP	Fishery Management Plan
ft	foot
GHG	greenhouse gas
GWP	global warming potential
ha	hectare
HAPC	Habitat Area of Particular Concern
HARS	Historic Area Remediation Site
HDD	horizontal directional drilling
HRG	high resolution geophysical
HUC	*Hydrologic Unit Code*
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
kg	kilograms
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 Area	BOEM-designated Renewable Energy Lease Area OCS-A 0512
L_{eq}	equivalent sound level
LiMWA	Limit of Moderate Wave Action
LIPA	Long Island Power Authority
LIRR	Long Island Railroad
LOA	Letter of Authorization
LZ	Littoral Zone
m	meter
m^3	cubic meter
MA NHESP	Mass Wildlife Natural Heritage and Endangered Species Program
MAFMC	Mid-Atlantic Fisheries Management Council
MBES	multi-beam echo sounder
MFE	mass flow excavation
mG	milliGauss
mg/L	milligrams per liter
mi	mile
MLLW	Mean Lower Low Water
mm	milimeters
MMC	Marine Mammal Commission
MMPA	Marine Mammal Protection Act
mph	miles per hour
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
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act

NJDEP	New Jersey Department of Environmental Protection
NLCD	National Land Cover Dataset
nm	nautical mile
NO	nitric oxide
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
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	Noise Sensitive Area
NSPS	New Source Performance Standards
NSR	New Source Review
NWI	National Wetlands Inventory
NY Project	EW 2 Project transmission facilities in New York
NY Project Area	The submarine export cable corridor, onshore export and interconnection cable corridors and onshore substation facilities within New York State jurisdiction
NY SHPO	New York State Historic Preservation Office
NYCRR	New York Codes, Rules and Regulations
NYISO	New York Independent System Operator, Inc.
NYNHP	New York Natural Heritage Program
NYPL	New York Public Library
NYRCR	New York Rising Community Reconstruction Plan
NYSDEC	New York State Department of Environmental Conservation
NYSDOS	New York State Department of State
NYSDPS	New York State Department of Public Services
NYSERDA	New York State Energy Research and Development Authority
NYSOPRHP	New York State Parks Recreation and Historic Preservation
NYSPSC or Commission	New York State Public Service Commission
O&M	operations and maintenance
O_3	ozone
OCS	Outer Continental Shelf

OPRHP	New York State Office of Parks, Recreation and Historic Preservation
OSRP	Oil Spill Response Plan
PAH	polycyclic aromatic hydrocarbons
PAPE	preliminary area of potential effects
Pb	lead
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 an expansion of the Barrett 128-kV Substation
ppm	parts per million
PSEG-LI	PSEG Long Island
PSL	New York Public Service Law
PV	Plan View
rms	root-mean-square
RPS	RPS Group plc
SASS	Scenic Areas of Statewide Significance
SCFWH	Significant Coastal Fish and Wildlife Habitat
SF_6	sulfur hexafluoride
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
SSER	Long Island South Shore Estuary Reserve
SSS	side scan sonar
SWPPP	Stormwater Pollution Prevention Plan
TOGS	Technical and Operational Guidance Series
tpy	tons per year
U.S.C.	*United States Code*
UKHO	United Kingdom Hydrographic Office
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
VRM	Visual Resource Management
WHO	World Health Organization
WHOI	Woods Hole Oceanographic Institution
WI/PWL	Waterbody Inventory/Priority Waterbodies List
WMA	Wildlife Management Area
WNC	winter normal conductor
WNS	white-noise syndrome

EXHIBIT 4: ENVIRONMENTAL IMPACT

4.1 Introduction

Empire Offshore Wind LLC (Empire or the Applicant) proposes to construct and operate the Empire Wind 2 (EW 2) 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 EW 2 Project will require an electric transmission system to connect the offshore wind farm to the point of interconnection (POI) to the New York State Transmission System. An electric transmission line with a design capacity of 125-kilovolt (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 pursuant to Article VII of the New York Public Service Law (PSL). The EW 2 Project transmission system will extend a total of approximately 12.1 miles (mi) (19.5 kilometers [km]) within the State of New York and includes 230-kV export cable circuits and 345-kV interconnection cable circuits. As such, this application is being submitted to the Commission pursuant to Article VII of the PSL for the portions of the EW 2 Project transmission system that are located within the State of New York (collectively, the NY Project).

The NY Project will interconnect to the New York State Transmission System operated by the New York Independent System Operator, Inc. (NYISO) at the Oceanside POI, located at an expansion of the Barrett 138-kV Substation. The Barrett 138-kV Substation is owned by the Long Island Power Authority (LIPA) and operated by PSEG Long Island (PSEG-LI) and is located in Oceanside in the Town of Hempstead, New York. The NY Project will enter LIPA's substation at 345 kV, where the voltage will be converted to 138-kV within the POI. The onshore portion of the NY Project will be located entirely within Nassau County, New York.

The NY Project includes:

- Three three-core 230-kV high-voltage alternating-current (HVAC) submarine export cables located within an approximately 7.7-nautical mile (nm) (14.2-km)-long submarine export cable corridor from the boundary of New York State waters 3 nm (5.6 km) offshore to the cable landfall;
- A cable landfall in the City of Long Beach, New York;
- Three 230-kV onshore export cable circuits, each with three single-core HVAC onshore export cables within an approximately 1.5-mi (2.4-km)-long onshore export cable corridor from the cable landfall to the onshore substation;
- An onshore substation in the Village of Island Park, within the Town of Hempstead, New York, which will step up the voltage to 345-kV for the onshore interconnection cables; and
- Up to three 345-kV interconnection cable circuits, each with three single-core HVAC interconnection cables within an approximately 1.7-mi (2.8-km)-long interconnection cable corridor 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 NY 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 NY 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 this Exhibit, 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)
(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)

16 NYCRR § 86.5 requirement	Exhibit Section(s)
(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)
(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 NY Project facilities on the environment. For the purposes of this document, the potential impacts associated with construction and operation of the NY 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 NY Project, such that the cause and effect occur simultaneously (or near simultaneously) during construction or operation of the NY Project. Indirect impacts are caused by the NY Project and are later in time or farther removed from the NY 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 NY 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 NY Project routing and/or when there is no impact-producing activity associated with the NY Project that has the potential to affect the resource.

4.1.1.1 Impact Assessment Area

The NY Project Area includes the areas that may be used for the build-out of the NY Project, including the submarine export cable corridor within New York State boundaries, the onshore export and interconnection cable corridors, the onshore substation, and areas to be temporarily used for construction. The submarine export cables in New York State waters will be installed in a 7.7-nm (14.2-km)-long corridor that extends from the federal/New York State water boundary to the cable landfall. The submarine export cable siting corridor (submarine export cable corridor) in New York State waters is approximately 900 feet (ft) (274 meters [m]) in width; however, this width is variable 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**). This submarine export cable corridor is expanded or reduced to allow for additional assessment of seabed features, in response to stakeholder input, and/or due to maintenance constraints in certain areas.

Throughout the submarine export cable corridor, the three 230-kV submarine export cables are anticipated to be spaced variably, with separation distances ranging from 33 ft (10 m) to 300 ft (91 m) in New York State waters. 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 33 ft (10 m) wide per cable, including approximately 5 ft (1.5 m) for the width of the burial tool penetrating the seafloor (bottom of trench), plus the additional width of seafloor contact and sediment sidecast.

In addition, a width of up to 1,250 ft (381 m) on both sides of the submarine export cable corridor may be used during installation activities for anchoring of the submarine export cable installation vessel. The anchoring corridor width may also 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, will conservatively occupy a width of up to 36 ft (11 m) over the submarine export cables, except at existing submarine asset crossings (e.g., cables, pipelines), where the width may be up to 53 ft (16 m). Pre-sweeping and/or dredging may be required in limited areas of the submarine export cable corridor as described further below.

The NY Project's submarine export cable route will make landfall in the City of Long Beach, New York. The cable landfall area consists of an existing public right-of-way and adjacent vacant parcel. Cable landfall construction activities will temporarily occupy approximately 2.4 ac (1.0 ha). Access to the area is from Riverside Boulevard and E Broadway. The Applicant is proposing a trenchless installation (horizontal directional drill [HDD]) method for the export cable landfall. The cable landfall may also require a separate temporary staging area for welding sections of the pipe or conduit string together. Work areas temporarily used for construction will be restored to pre-construction conditions to the extent practicable following the installation.

The onshore export cables will extend approximately 1.5 mi (2.4 km) from transition bays at the export cable landfall to the onshore substation. The onshore export cables will be housed in either one common duct bank or two to three separate concrete duct banks, within a single onshore export cable corridor that is up to 150 ft (46 m) wide.

The NY Project Area also includes the approximately 5.2-acre (ac) (2.1-hectare [ha]) onshore substation, as well as an additional 0.2-ac (0.1 ha) temporary work area adjacent to the onshore substation, which will be used during installation of the onshore export cables underneath Reynolds Channel via HDD and will be restored to pre-construction conditions to the extent practicable following the installation. 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.

The interconnection cables will be installed within a 1.7-mi (2.8-km)-long interconnection cable corridor, located primarily within and adjacent to the Long Island Railroad (LIRR) right-of-way from the onshore substation to the POI. The interconnection cable corridor is up to 100 ft (30 m) wide. Following construction, the Applicant will maintain a 25-ft (8-m)-wide operational corridor for the onshore export and interconnection cables.

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

Table 4.1-2 Summary of the NY Project Area

NY Project Component	Total NY Project Area (acres) a/ b/	Temporary Construction Disturbance Area (acres)	Permanent Operational Area (acres)
Submarine Export Cable Corridor	933.4 c/	105.6 d/	11.5 e/
Cable Landfall	2.4	2.4	0 f/
Onshore Export Cable Corridor	9.6 g/	9.6 g/	4.6 h/
Onshore Substation	5.4	0.2	5.2
Interconnection Cable Corridor	12.6 g/	12.6 g/	5.3 h/

NY Project Component	Total NY Project Area (acres) a/ b/	Temporary Construction Disturbance Area (acres)	Permanent Operational Area (acres)

Notes:

a/Totals include associated temporary workspace areas for each component.

b/ If required, other nearby parcels may also be used for vehicle parking, work trailers, cable and equipment storage, storage and management of excavated soil, construction equipment, and temporary material storage. The Applicant will also require a staging and fabrication area for the HDD conduit string for the cable landfall. These areas are not included in this summary table, and details on any additional staging and laydown areas necessary for construction of the NY Project, if applicable, will be provided within the Applicant's EM&CP.

c/ 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.

d/ Based on an estimated 33-ft (10-m)-wide disturbance corridor for submarine export cable lay activities per cable along the approximately 8.8-mi (14.2-km)-long cable route.

e/ Based on a remedial cable protection width of up to 36 ft (11 m) along each cable for up to 10% of the 8.8-mi (14.2-km)-long cable route.

f/ approximate operational footprint of the cable landfall is included within the onshore export cable corridor and therefore is not included here.

g/ Based on the area of the cable corridor during construction and additional temporary workspace.

h/ Based on a 25-ft (7.6-m) operational corridor along the onshore export and interconnection cable routes.

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 export and interconnection 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 NY Project-related components can also produce impacts associated with increased vessel traffic.

The typical key stages of submarine cable installation are:

1. Notification to the maritime community;
2. Unexploded ordnance (UXO) clearance and pre-installation activities[1];
3. Pre-sweeping (if needed)
4. Pre-trenching activities (if needed);
5. Cable lay and burial;
6. Cable and pipeline crossings;
7. Post-installation survey; and
8. 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.

The installation of the submarine export cables, including pre-installation activities, is expected to take approximately two months 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 NY 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 (MFE) or dredging may also be required to prepare for cable installation. 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 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, cable lay support vessels, 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 and personnel from ports and staging areas to the offshore construction areas.

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 NY 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 NY 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.

Pre-Sweeping

In certain limited areas of the submarine export cable corridor, where underwater megaripples and sandwaves may be 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 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 may occur in a width of up to approximately 164-ft (50-m) along the length of the megaripples and sandwaves. Megaripple and sandwave heights vary depending on localized seabed and current characteristics. 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 MFE, 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 to 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. 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 similar to those described below for cable lay and burial and pre-sweeping as described above.

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 cables cross other assets, local dredging may be needed in order to reduce the shoaling of the crossing design (see "Cable and Pipeline Crossings" below). Additional information on areas where dredging may be is provided in **Exhibit E-3**. The Applicant anticipates that dredged material generated from the NY 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 change to seafloor bathymetry will result from the removal of seabed sediment.

Cable Lay and Burial

Following the pre-burial activities, the submarine export cables will be brought to the appropriate section of the cable corridor and laid on the seabed. The main method of cable lay will use a dedicated cable lay vessel to place the submarine export cables and ensure the correct position on the seabed. Cable burial may be performed as separate campaigns, or cable lay and burial may be performed in one campaign. Cable burial will be conducted 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 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. Post-lay burial with a jetting tool means that 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. Alternately, the cable may be fed from the cable vessel down through the device and simultaneously laid into the trench.

  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.

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 C: 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. The cable may be simultaneously 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. 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[2], 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 vessel traffic and will minimize impacts to benthic resources during operations, to the extent practicable. In the event that the minimum burial depth is not achieved, the Applicant will propose cable protection measures.

[2] At the time of this submittal, the Applicant has not identified any federally maintained channels or anchorages that will be crossed by the NY Project.

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 remedial cable protection.

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

Several existing cables and pipelines, including in-service, planned and out-of-service assets, may be crossed by the NY Project (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; 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 up to 8 ft (2.4 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 735 cubic yards (562 cubic meters [m^3]) of material is anticipated to be removed by suction hopper dredge and/or MFE 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 Cable Landfall Installation

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.

Horizontal directional drill installation of the export cable landfall will minimize impacts to the marine and shoreline environments. This method allows for installing conduits or ducts beneath sensitive coastal and nearshore habitats, such as dunes, beaches, waterways, and submerged aquatic vegetation. Trenchless installations can also be used to cross under major infrastructure, including railroads and highways. Typically, trenchless installation operations for an export cable landfall originate from an onshore landfall location and exit a certain distance offshore, determined by the water depth contour and total cable landfall length considerations. To support this installation, both onshore and offshore work areas are required.

The onshore work area for the HDD installations is located within the upland cable landfall parcel at the entry point, where operations will originate. Since the proposed cable landfall parcel is an existing roadway and vacant parcel, no impacts to vegetation, natural habitats, wetlands or waterways will result from use of this area. The Applicant will also require a staging and fabrication area for the HDD conduit string for the cable landfall. Once fabricated, each conduit string would be rolled across the shoreline on pipe rollers in an approximately one-day operation (per HDD/conduit). From there, it would be towed to the offshore HDD exit point for installation.

The offshore exit locations of the HDD installations require some seafloor preparation in order to collect any drilling fluids that localize during HDD completion. Preparation may include installation of a cofferdam or excavation (wet or dry). A steel casing may be installed on the exit side from a jack-up barge to below the mudline. A pit is excavated or material within the cofferdam is dredged prior to installation of the conductor casing. Up to three cofferdams may be required (one for each HDD).

Preparation of the seafloor for the HDD installations, including dredging, may result in temporary impacts associated with the suspension of sediment, which are anticipated to be minor with the implementation of appropriate best management and mitigation measures. Potential impacts will be short-term and limited to the installation footprint and immediately adjacent areas. 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 vibratory pile driving for the cofferdams. 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. Impacts associated with the HDD installations will additionally include a short-term increase in in-air noise and vibration.

Impacts associated with HDD installations could also 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. The Applicant will develop an Inadvertent Returns Plan that addresses prevention, control, and clean-up of potential inadvertent releases during HDD installations. The Inadvertent Returns Plan will be included in the Applicant's EM&CP.

Depending on subsurface conditions and the size and length of the boreholes, HDD equipment operation will result in short-term, localized noise impacts, and night-time lighting impacts.

4.1.2.3 Installation of Onshore Components

The construction of onshore NY Project components includes construction of the onshore substation and onshore export and interconnection cables. Impact-producing factors for onshore construction also include the transportation of project-related components to the NY 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 export and interconnection cables, except at certain waterway crossings. The Applicant anticipates that ground-disturbing activities for onshore export and interconnection cable installation will take place within a period of approximately two years; however, installation activities will not be continuous during this period and will move along the length of cable corridor, such that the duration of disturbance in any given location will be less.

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 export and interconnection 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 export and interconnection 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 export and interconnection cable corridors, which are located primarily in existing road or railroad rights-of-way and existing paved areas in a developed environment. Activities will move progressively along the construction corridor so that construction sequence activities may be in different stages in different areas of the corridor.

To install the ducting using the open-cut method, a trench will be excavated along the onshore export and interconnection cable routes. Typically, the trench will be 10 ft (1.5 to 3 m) deep and up to 30 ft (9 m) wide, within up to a 150-ft-wide (46-m-wide) construction corridor. The trench will be large enough to accommodate duct banks for all three 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 a cable corridor; additional details will be provided as part of the EM&CP.

Pre-cast culverts or conduits will be lowered into the trench, spacers installed, and duct banks formed with poured concrete/cable sand or similar. 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 then will be 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 infrastructure, such as the LIRR. 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 LIRR crossing. 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 60 ft by 60 ft (18 m by 18 m) alongside the cable corridor. Within the cable corridor, the crossing requires a 60-ft by 60-ft (18-m by 18-m) bore pit to be excavated on one side and a 40-ft by 40-ft (12-m by 12-m) receiving pit on the other side. 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 bore and/or receiving 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 bore and receiving pits will be returned to pre-construction conditions.

Inland Waterway Crossings

The Applicant is proposing to install the onshore export cables across Reynolds Channel via the HDD method. This crossing would involve installation of the three land-to-land HDDs, one for each of the onshore export cables, for approximately 1,014 ft (309 m) across the waterbody. Similar to the cable landfall HDDs, for each HDD 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 an onshore export cable is pulled through the installed duct. Onshore HDD crossings require two onshore work areas (approximately 246 ft by 246 ft [75 m by 75 m] on each side) to support the activities. For the Reynolds Channel crossing, both workspaces are located on previously developed commercial/industrial lands adjacent to the waterbody. Conceptual drawings for the Reynolds Channel crossing are provided in **Exhibit 5**. An additional 0.2-ac (0.1 ha) temporary work area adjacent to the onshore substation will be used for conduit staging an pullback during installation of the onshore export cables underneath Reynolds Channel via HDD.

Impacts associated with HDD installations 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. The Applicant will develop an Inadvertent Returns Plan that addresses prevention, control, and clean-up of potential inadvertent releases. The Inadvertent Returns Plan will be included in the Applicant's EM&CP. Depending on subsurface conditions and the size and length of the borehole, HDD equipment operation may result in short-term, localized noise impacts, and night-time lighting impacts.

The interconnection cable route includes an inland waterway crossing between the Village of Island Park and Oceanside, New York, which will be crossed by an above-water cable bridge. This crossing will use up to four support columns (pile caps) located within the waterway to support the truss system which will hold the cables above the water. These supports may be installed by hammer or other installation methods, up to 100 ft (30 m) below the seabed, with final design subject to geotechnical investigation. These supports will include up to three 1.5-ft (0.5-m)-diameter steel pipe piles per pile cap, for a total of 12 steel pipe piles within the waterway. The cable bridge will be constructed from a prefabricated steel truss system assembled offsite and set in place. The structure will measure up to 25 ft (7.6 m) wide and 8 ft (2.4 m) tall and span a length of approximately 300 ft (91 m). The crossing will be located adjacent to the existing LIRR railway bridge. The structure is anticipated to have a total height of up to 15 ft (4.6 m) above mean sea level (MSL), with a maximum total height of 30 ft (9.1 m). Construction of the cable bridge may require temporary in-water work to install the bridge supports, but disturbance is anticipated to be minor. Hammering may result in a temporary increase in underwater noise, which can affect certain aquatic species (Section 4.6 and 4.7); however, this activity will be short-term.

In the case that the Applicant determines that a trenchless or bridge crossing solution for waterway crossings (Reynolds Channel and Barnums Channel, respectively) along the onshore export and/or interconnection cable route is not feasible, an open cut crossing may be used. For a waterway crossing, an open cut is typically constructed using excavators working from both banks and/or within the channel, as necessary. Excavated material is collected in an appropriate manner for either re-use or disposal (depending on the nature of the material) and in accordance with applicable regulations. Installation via an open cut requires an approximately 120 ft (37 m) construction corridor across the channel.

If further feasibility evaluation reveals that an open cut crossing method is required, the Applicant would evaluate installation of the onshore export or interconnection cables via an open cut with a dry crossing method. A dry crossing method involves isolating the work area from the flow of water (with sandbags, bladderdam, cofferdam, or other measures) prior to trenching, and using a dam-and-pump, flume, or similar design to transport water from one side of the work area to the other. Dry crossings minimize the transport of sediment during an open cut by preventing water from flowing across the disturbance area until the bed and backs have been restored. In the case that a dry crossing is also not feasible, a wet crossing would be used. A wet crossing typically involves trenching directly across the channel, without isolation of the workspace from the flow of water, either working from both banks or from within the channel. The Applicant would consider the potential efficacy of alternative best management practices to minimize sediment transport (e.g., silt curtains).

Onshore Substation Construction

For the onshore substation, the construction and installation methodology will comply with local and state regulations and guidelines. In instances where the Applicant cannot fully comply with the applicable local regulations, the Applicant will seek a waiver request for compliance with such regulations from the Commission (see **Exhibit 7: Local Ordinances)**. General construction and installation methodology is as follows:

1. Site preparation, including clearing, cutting, filling, 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 onshore substation site is predominantly unvegetated, but some vegetation clearing is expected to be required for site preparation. Prior to installation of the onshore substation facilities, the Applicant plans to elevate the site to the proposed grade. Site preparation activities within the onshore substation site will also likely include the excavation and removal or relocation of existing utilities and demolition of existing 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, grading, soil stockpile, and backfilling, which have the potential to result in short-term increases in erosion and stormwater run-off. Activities at the onshore substation will include upgrades to the existing bulkhead along the southern edge of the site adjacent to Reynolds Channel (see **Exhibit 5: Design Drawings**). The Applicant also anticipates that three existing boat slips will be filled to provide stabilization for the access driveway and structures, and the existing marina structures located on site may be removed as part of the onshore substation development. 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, schedule 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 NY 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 export and interconnection cables.

The NY 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 NY 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, control, and maintenance activities will be based out of the Applicant's operation and maintenance (O&M) base for the offshore wind farm.

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 NY Project. The new buried submarine export cables have the potential for producing 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 NY 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 NY Project. During routine operations, seafloor disturbance is not anticipated. Minor increases in NY 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 NY 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 Applicant will account for the topographical and geological conditions identified in the NY Project Area during operation of the NY Project. The submarine export cables and onshore cables will be monitored through Distributed Temperature Sensing equipment. The Distributed Temperature Sensing system will be able to provide real time monitoring of temperature, alerting the Applicant should the temperature change, which often is the result of a change in cable burial depth, for example caused by scouring of cable covering material. The Applicant will also conduct surveys of the submarine export cables to confirm the cables have not become exposed or that the cable protection measures have not worn away. A Distributed Vibration Sensing system will be integrated within the submarine export cables to provide real time vibration monitoring close to the cables, which may indicate potential dredging activities or anchor drag occurring close to the cables. Upon receiving any such alert, the Applicant will warn vessels in the area (for the submarine export cable route), assess the cable condition and identify any needed corrective actions.

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, the submarine export cables require reburial, or 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.

4.1.3.2 Operation of Onshore Components

New onshore components include the onshore substation and onshore export and interconnection cables. The presence of this new onshore infrastructure is an impact-producing factor for the life of the NY Project.

Onshore operations will also include access and maintenance activities associated with the onshore components, with associated minor increases in vehicle traffic in the area.

The presence of onshore electrical infrastructure, including the onshore substation and onshore export and interconnection cables, has the potential for producing 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 NY Project components, 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 (Section 4.9) 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 a previously developed site, the presence of the onshore substation is not expected to result in significant conversion of natural habitats or otherwise impact vegetation or wildlife.

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 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 will also result in air emissions (Section 4.12) from the emergency generator, when operating. The onshore substation 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 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.

As part of the onshore substation site plan, the existing sea wall and bulkhead along the shoreline forming the southern portion of the onshore substation site may need to be retrofitted and/or replaced for site stabilization. Approximately 650 ft (198 m) of bulkheaded shoreline may be upgraded or replaced along the southern border of the onshore substation. The onshore substation site plan also requires removal/fill of three existing boat slips along the bulkheaded shoreline. A total of approximately 3,040 sq ft (282 m^2) will be filled with clean fill or flowable fill material to support the access road and structures as part of the site design. The Applicant also anticipates that existing marina structures located on site will be removed as part of the onshore substation development. This construction associated with the onshore substation represents a small long-term in-water impact.

The onshore substation, including the potential removal of the existing marina that is present on site, could represent some long-term change in land use from commercial and recreational land uses to industrial land use (Section 4.10) and may result in some restriction of public access to the waterfront compared to its existing condition. However, based on the relatively small area of land use change at the onshore substation site, this is not expected to have a significant effect on land uses in the vicinity of the NY Project or region in general.

Onshore Export and Interconnection Cable Operations

As the new onshore export and interconnection cables will be installed predominantly below ground (with the exception of an aboveground cable bridge across Barnums Channel, Section 4.1.2.3), 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 presence of the aboveground infrastructure associated with the proposed cable bridge across Barnums Channel would also represent a long-term visual impact (Section 4.9); however, that impact is expected to be minor due to its proximity to other existing and industrial infrastructure.

The onshore export and interconnection 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 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 NY Project components and detail the methods proposed to decommission the NY Project components. As NY Project components are decommissioned, the Applicant will record and remove them from the inventory list to facilitate confirmation that NY Project components have been properly removed from the seafloor and that the NY 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 export and interconnection 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 NY 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 NY Project. The EM&CP will capture these efforts and requirements and will be implemented by construction and operations personnel.

4.1.4.1 Construction

NY Project Siting

The NY 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 rights-of-way 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 NY Project right-of-way does not traverse any heavily timbered areas, high points, ridgelines, or steep slopes. To the extent practicable, right-of-way vegetation clearing for the NY Project has been minimized by the Applicant.

Cultural Resource Buffers

Where sensitive resources have been identified along the NY Project submarine and onshore export and interconnection cable routes (Section 4.8), 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 Applicant'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 needs to be managed during construction activities that require digging of pits or trenches for the NY Project's onshore facilities. As designs for the onshore export and interconnection cable corridors 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 the Applicant's 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 Applicant'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. NY Project personnel will be trained in accordance with relevant laws, regulations, and NY Project policies.

Emissions Controls

Construction emissions impacts (Section 4.12) 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 (Section 4.11), 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, schedule 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 the local municipality and where feasible, plan the location and timing of construction activities to minimize overlap with areas or times of high activity.

Due to the known presence of the northern long-eared bat on Long Island, the Applicant will comply with the New York State tree clearing restriction between November through March on Long Island, unless further agency coordination or studies indicate an exception to this restriction would not adversely impact these species.

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. The Applicant is also consulting with applicable agencies and will consider seasonal timing windows to minimize 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).

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 use of the HDD method for construction, the Applicant will develop and implement an agency-approved Inadvertent Return Plan. The Inadvertent Return Plan will be provided as part of the Applicant's EM&CP.

Noise Controls

To minimize noise during onshore construction activities (Section 4.11), 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 ports and the NY 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 NY Project right-of-way has been sited in an urban environment, minimizing any vegetation clearing and wildlife habitat impacts (Section 4.5) , as well as any impacts to adjacent vegetation or soils. Along the onshore export and interconnection 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 bird deterrent devices on offshore, above-water project-related vessels 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. 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).

Appropriate project-related personnel onboard NY 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, if present, or NY 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.

Unanticipated Discoveries Plan

The Applicant will develop and implement an Unanticipated Discoveries Plan in coordination with federal and state agencies and state and federally recognized 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

NY Project Siting

The NY 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 (Section 4.2) where possible, 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 rights-of-way 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 NY 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 NY 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. Deeper burial of the submarine export cables may be required in areas within certain navigation channels or anchorages, subject to ongoing discussions with applicable stakeholders, to reduce the potential for cable exposure and conflicts with existing and future navigation. The submarine export cables may 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 sufficient 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 potential impacts to fishing activity.

Cultural Resource Buffers

The Applicant has assessed establishing resource buffers (Section 4.8) to avoid potential operational impacts to sensitive resources along the NY 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. NY Project personnel will be trained in accordance with relevant laws, regulations, and NY 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 NY 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 NY Project right-of-way has been sited on land in a highly developed area, limiting any vegetation maintenance and wildlife habitat impacts (Section 4.5) 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 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. NY 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 NY 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, if present, or NY 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). Buildings will be a combination of cladded steel frame and concrete buildings, designed to match the style and visual character of the surrounding urban landscape, and are proposed to be painted a light gray or white color. The Applicant will continue to work with local stakeholders throughout the permitting process and will submit final building architectural design details in the EM&CP as part of the Article VII approval process for the NY Project.

Noise Controls

The noise from the submarine and onshore export and interconnection cables is negligible, and the onshore substation design considers measures to reduce the sound levels at off-site locations (Section 4.11). The vessels used for nearshore work and vessels transiting between ports and the NY Project work areas will comply with applicable IMO noise standards.

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 and railroad rights-of-way, and by ensuring that the onshore substation design satisfies New York State Department of Environmental Conservation (NYSDEC) requirements governing construction within mapped floodplains . The Applicant has avoided siting aboveground facilities within Federal Emergency Management Agency (FEMA)-designated Zone VE that is subject to high velocity wave action (Section 4.4).

4.2 Marine Physical and Chemical Conditions

This section describes the marine physical and chemical environment in the NY Project Area, including a discussion of bathymetry; tides, currents, and waves; sea level; coastal erosion, sediment transport, suspension and deposition; water temperature; and chemical conditions. Potential impacts to marine physical and chemical conditions resulting from construction, operation, and maintenance of the NY 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 NY 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 NY 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);
- Delft3D hydrodynamic model;
- TUDflow3D hydrodynamic model (**Appendix C: Sediment Transport Analyses**); and
- Experimental System for Predicting Shelf and Slope Optics (ESPreSSO) hydrodynamic model.

The Applicant completed several geophysical and geotechnical assessment campaigns along the submarine export cable route in 2019, 2020, and 2021, consisting of high-resolution geophysical (HRG) and shallow geotechnical surveys of the submarine export cable corridor. Additional geophysical and geotechnical surveys, including nearshore and onshore geotechnical assessment within the NY Project Area, are ongoing in 2022.

The Applicant contracted Gardline Limited (Gardline, which was split to Gardline and Alpine Ocean Seismic Survey Inc [Alpine] since the time of the initial survey) to conduct HRG surveys between 2019 and 2021. HRG surveys were conducted from four vessels: the *Henry Hudson*, a 45 ft (14 m) survey vessel that operated in water shallower than 16 ft (5.0 m); *William M*, a 22 ft (6.7 m) survey vessel that operated in shallow water; the *Shearwater*, a 110 ft (34 m) research vessel that operated in water depths between 16–49 ft (5.0–15 m); and the *Ocean Researcher*, a 228 ft (69 m) research vessel that operated in water depths greater than 49 ft (15 m).

Geophysical 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".[3] 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.

Geotechnical surveys were completed on behalf of the Applicant by Fugro, from July to August 2019 and included the following:

- Vibracores 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).

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

4.2.2 Existing Marine Physical Characteristics

Marine physical conditions include characteristics of the seafloor, bathymetry, currents, tides, wave heights, sea level elevation, coastal erosion, water temperature, and sediment transportation. In many cases, these physical characteristics interact in complex ways throughout the NY 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 NY Project route from approximately 28 ft (8.4 m) at the HDD punchout to approximately 56 ft (17 m) as referenced to North American Vertical Datum of 1988 (NAVD88). In general the gradient along the submarine export cable route is less than one degree with no areas of steep or unstable seafloor identified along the submarine export cable route. The Applicant identified certain natural and anthropogenic seafloor features, such as debris and existing seabed assets, 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**.

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

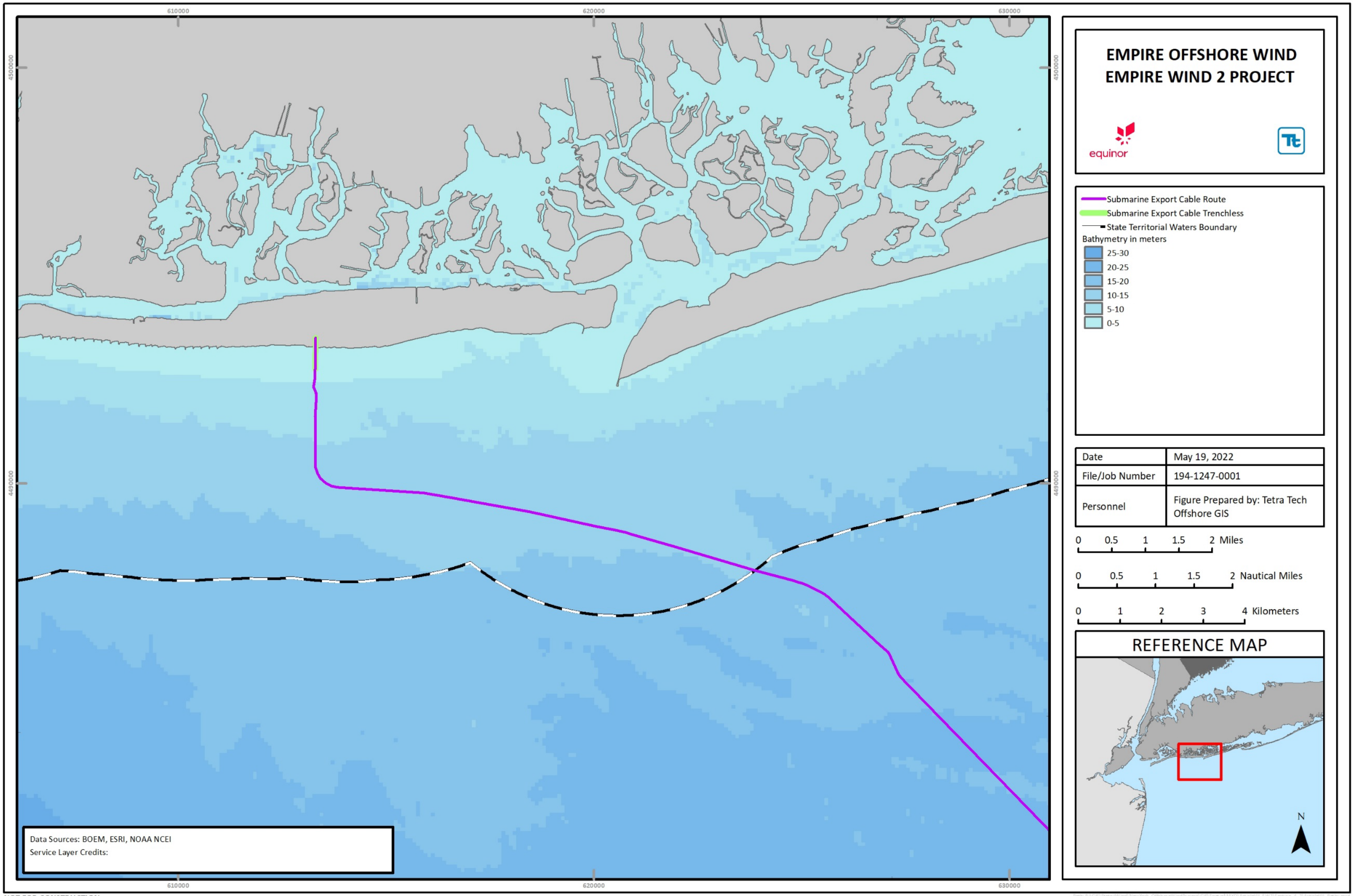


Figure 4.2-1 Bathymetry along the Submarine Export Cable Route

Several bathymetric features have been identified along the submarine export cable route. Occasional cobbles and boulders occur along the submarine export cable route and are identified as having increased density in areas of coarser sediment. As discussed above, steep and unstable seafloor slopes have not been identified along the submarine export cable route. Though areas of sand dredge scars do occur within the survey area with locally steeper slopes, these areas are avoided by the route. Anthropogenic hazards including debris, buoys, and existing seabed assets (cables and pipelines) have been identified along the submarine export cable route. Minor scour has been observed at some of these locations with bathymetric expressions.

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 NY Project, the primary bedforms observed are relict bedforms, seen in intermittent locations along the submarine export cable route. These relict bedforms are part of wider areas of sandwave bedforms superimposed on top of larger sand ridge bedforms. These bedforms are typically associated with slightly gravelly areas. These areas cause changes to the bathymetry, which modify and concentrate currents, resulting in the potential for some minor seabed mobility due to seabed scour and deposition of mobile bedforms. Bedforms along the submarine export cable route are considered relic features due to the rounded, crestless morphology. Data collected along the submarine export cable route did not identify modern, active sandwave scale features indicating mobile seabed; however, general knowledge of mobile seabed in coastal regions indicates the possibility of mobile seabeds along the route. The cables will be micro-sited around areas of potential mobile seabed to the extent practicable.

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. Boulder removal, if necessary, will be completed during pre-installation cable operations (see Section 4.1).

4.2.2.2 Tides, Currents, and Waves

The currents within the NY 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).

Coastal settings in the New York Bight area are primarily impacted by semi-diurnal tide. The NY Project cable landfall experiences two episodes of equal high water and two episodes of equal low water each day. There are no NOAA tide and current stations near the NY Project, and the closest tide station is Station 8531680 in Sandy Hook, New Jersey. There is a mean range at this station of 4.7 ft (1.4 m) and a monthly mean tide varying from of 2.75 to 3.36 ft (0.8 to 1.02 m) during 2020, measured 7.7 ft (2.3 m) above mean lower low water (MLLW) (NOAA Tides & Currents 2021).

A study using the publicly available ESPreSSO hydrodynamic model was undertaken for the NY Project to develop information regarding current velocity and flow direction in the NY Project Area, as described further in Section 4.2.2.6. The ESPreSSO data set includes hourly simulations covering the period from October 2009 through February 2014.[4] The ESPreSSO model provides velocity, salinity, and temperature outputs at regularly spaced output stations throughout the NY Project Area. Hourly bottom velocity outputs at ESPreSSO model stations located within the NY Project Area were downloaded for the year 2012. A rolling 4-hour average velocity was calculated at each hourly time step for all stations. The 90th percentile of the rolling 4-hour average ebb and flood velocities was selected to represent the potential high velocities during these tidal periods. To

[4] Model information can be accessed at http://www.myroms.org/espresso/.

represent the variability in the flow throughout the NY Project Area, data from stations closest to the submarine export cable routes and Lease Area were selected and paired with the sediment data in the analytical model. The locations of velocity stations in the vicinity of the NY Project that were used in the model are depicted in **Figure 4.2-2**. The results of this model at stations in New York are shown in **Table 4.2-1**, which lists the representative flood and ebb velocities.

The Applicant also contracted Deltares for a sediment transport study using the Delft3D far-field hydrodynamic model, which incorporated near-bed ambient current velocity from the DHI hindcast database (DHI 2021), including seasonal variation, based on 2019 data. Daily-averaged near-bed velocities were generally below 0.7 ft/s (0.2 m/s) in this dataset (see **Appendix C)**.

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)
6	-73.69	40.58	24	0.53	0.39
9	-73.64	40.55	37	0.57	0.44
11	-73.53	40.55	36	0.54	0.48

Wave data was taken from the Global Reanalysis of Ocean Wave GROW2012 hindcast archive by Oceanweather Inc. (2018) consisting of data from January 1979 to December 2012 (34 years). The annual mean of significant wave heights recorded within federal waters of the EW 2 Project is less than 4.9 ft (1.5 m), with maximum significant wave heights of 32.8 ft (10 m) or less. These values are expected to be conservative for the NY Project Area, as wave heights are expected to decrease with closer proximity to the shoreline.

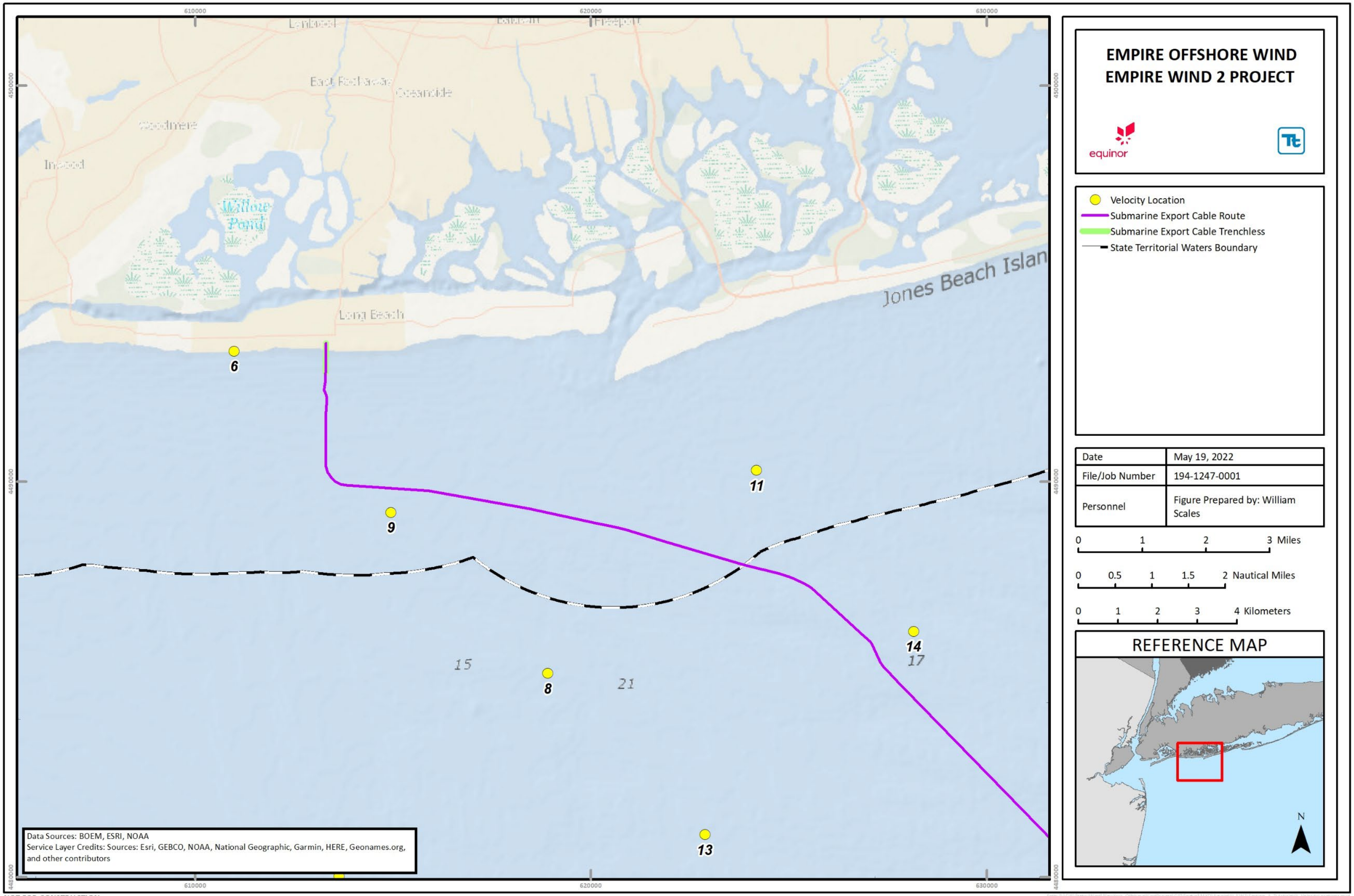


Figure 4.2-2 Velocity Station IDs

4.2.2.3 Sea Level

Historical data of sea level rise along the shoreline and coastal regions of the NY Project Area do not indicate significant rates of sea level rise in the past. Sea level rise data measured at NOAA Tides & Currents stations in the New York Bight and New York Harbor region indicate a slow linear increase in sea level since recording began (in 1856 at the Battery station). Recent data indicates an accelerated increase in sea level rise (Long Island Sound Study 2021).

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 NY Project components and flood mapping is provided in Section 4.4.

4.2.2.4 Coastal Erosion

The shoreline of the NY Project Area is known to experience coastal erosion. Coastal erosion occurs in both normal conditions, at a slower rate, and in storm conditions. Severe storms in the recent past have caused a reduction in the overall height and width of the beaches along the barrier island of Long Beach (USACE 2006). Regular erosion is exacerbated by the low elevation of protective beach berms on the barrier island. A USACE study identified the historical shoreline change of the island ranging from as erosive as -23 ft/yr (-7 m/yr) at the eastern end of the island and as accretive as +51 ft/yr (+51 m/yr) at the west end of the island.

4.2.2.5 Water Temperature

Water temperatures in the NY 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 Bight 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).

4.2.2.6 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 NY Project Area, as well as publicly available data. Sediment in the NY Project Area along the submarine export cable route typically consists 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 cross-sectional area, 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).

Two analytical sediment transport models were developed and implemented for the NY Project to assess the suspended sediment water column concentrations and sediment deposition characteristics that would result from the submarine cable installation activities. A study using the publicly available ESPreSSO hydrodynamic model was conducted by Tetra Tech, Inc. (Tetra Tech) for the EW 2 Project to assess plume distances, suspended sediment concentration, and sediment deposition. Additional refined hydrodynamic modeling for the NY Project, incorporating project-specific sediment sampling data, was then conducted by Deltares to assess suspended sediment concentrations, using the Delft3D hydrodynamic model. The reports from these two sediment transport analysis efforts are provided in **Appendix C**.

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). Additionally, MFE may be used for pre-sweeping activities. The sediment transport analyses completed for the NY Project characterizes the potential maximum sediment transport and deposition scenario for jetting (using Capjet equipment or similar), the installation method proposed for most of the submarine export cable installation and for MFE in certain locations. The use of jetting would result in greater disturbance of marine sediments than mechanical plow or mechanical trenching (cutting) installations; therefore, sediment transport analyses are conservative for the installation methods that may be used.

Pre-trenching activity was not modeled in the sediment transport analyses, because sediment transport from pre-trenching is expected to be the same as jetting. If needed, pre-trenching 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.

Jetting 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 jetting 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).

The height of the sediment plume above the seabed during installation is dependent on local hydrodynamics, sediment size distribution, and the operating parameters. Previous studies have shown that the plume of sediment released during jetting 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 NY 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 models (**Appendix C**) 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. 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.

Sediment composition varies significantly throughout the NY Project submarine export cable corridor. Grain size ranges from silt/clay and very fine sand to gravelly sand. Based on the geotechnical study by Fugro, the offshore zone consists mainly of fine to coarse sands, although in the vicinity of the New York State boundary offshore, there were some sample points with fine sediment. Approaching shore, the consistency generally becomes finer sediment. The fines are typically separated into approximately 70% silt and 30% clay (see **Appendix C**).

4.2.3 Existing Marine Chemical Characteristics

Marine chemical conditions include the sediment and water quality characteristics of the NY Project Area. The Applicant has assessed chemical conditions based on a project-specific sediment sampling program conducted in 2021, and publicly available data for the New York Bight area.

4.2.3.1 Sediment Quality

Sediment contamination is present in some portions of the New York Bight, which hosts the largest deposit of sewage sludge in the nation dumped in the apex of the New York Bight (125 million m^3 [163 million cubic yards] over 64 years). The contaminated sediments were dumped at the offshore disposal locations, now known as the Historic Area Remediation Site (HARS); the submarine export cable route does not intersect the HARS within New York Bight (Butman et al. 2002; Mecray et al. 2000).

In 2006, the NYSDEC summarized over twenty years of previously collected sediment data for thirteen constituents of concern (Mueller and Estabrook 2006). These data were collected statewide, including in the New York Harbor and offshore in the New York Bight. In the harbor and adjacent and immediately south of Rockaway Beach, NYSDEC reported mercury and silver levels in surficial sediment collected to be ten times the sediment quality guidelines (Mueller and Estabrook 2006). Maximum exceedances of sediment quality guidelines for constituents of concern in sediment offshore of Rockaway Beach were generally greater than for sediments offshore of Long Beach (Mueller and Estabrook 2006). The NY Project submarine export cable route is located within the New York Bight to the east of Rockaway Beach. Offshore of Long Beach, constituents of concern were typically detected in low concentrations and are predicted to not have adverse impacts to biota (Mueller and Estabrook 2006).

A sediment sampling program was initiated in 2022[5] as part of the Applicant's geophysical and geotechnical surveys along the nearshore portion of the submarine export cable route, developed in consultation with the USACE and the NYSDEC. The sediment sampling program is ongoing to properly assess geotechnical conditions around the cable landfall and inshore channel crossings. Sediment sampling surveys consist of boring samples collected with a 3-inch diameter casing, with a target penetration depth of between 50 and 175 feet, varying by boring location below the sediment-water surface at all sampling locations. Thirty-four locations within New York State waters were proposed for sampling in 2022.

Each sample will be 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). Additionally, chemical analysis will be conducted for constituents of concern outlined in TOGS 5.1.9 (2004). Only sampling locations with combined sand and gravel concentrations below 90 percent (by weight) will be 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 constituents of

[5] The results of the 2022 sampling will be made available once received from the lab.

concern, especially compounds such as dioxins, furans, polycyclic aromatic hydrocarbons (PAHs), or polychlorinated biphenyls (PCBs). Data from the 2022 sampling campaign are pending.

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 anthropogenic conditions.

Water quality classifications for waters crossed by the NY Project are depicted in **Figure 4.2-3**. Additional information on water quality classifications is provided in Section 4.4. The NYSDEC maintains the Waterbody Inventory/Priority Waterbodies List (WI/PWL), a database that contains information on water quality, the ability of waters to support their use classifications, and known or suspected sources of contamination or impairment. The status of waterbodies crossed by the NY Project, based on the WI/PWL is provided in **Table 4.2-2**.

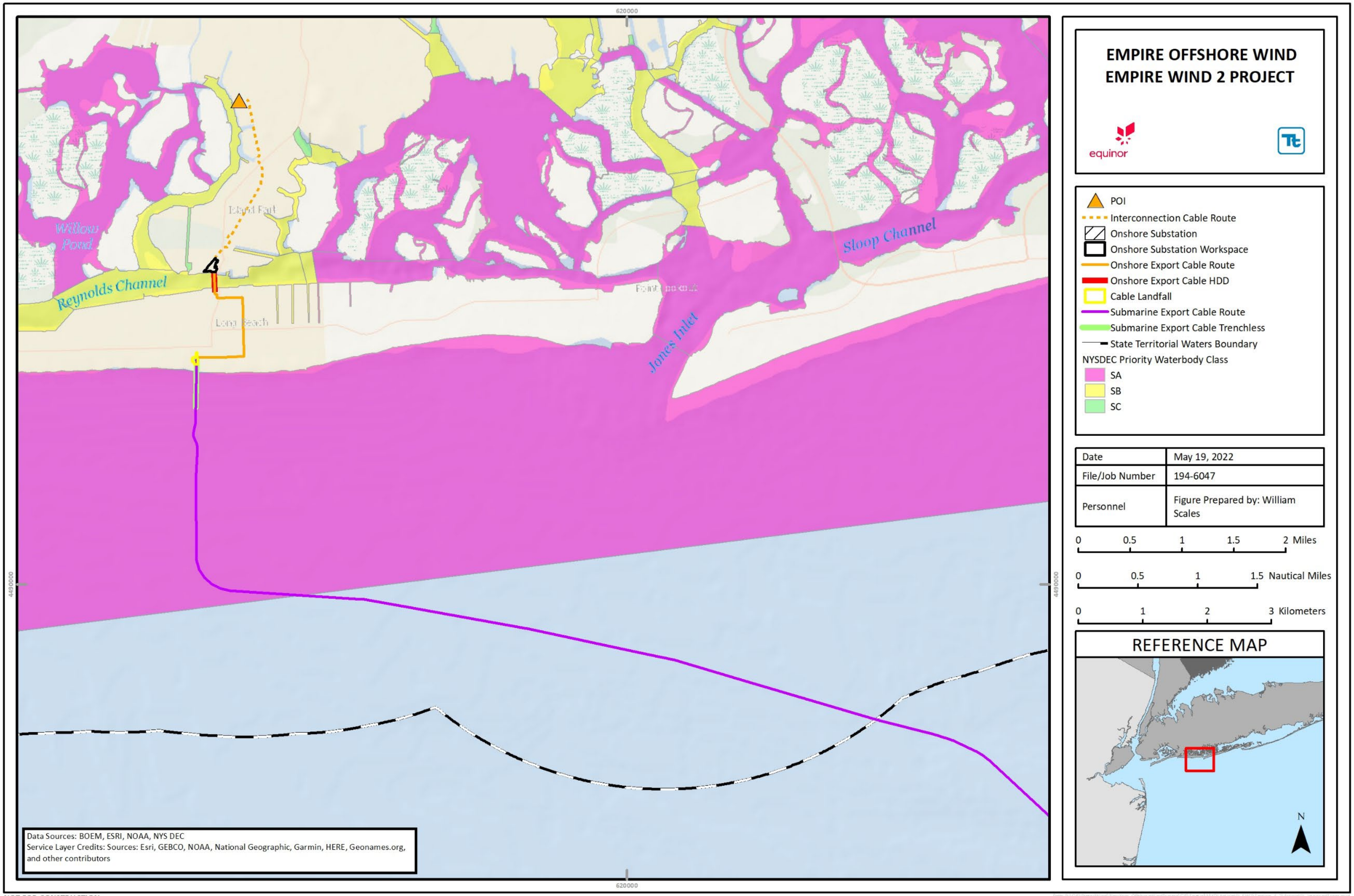


Figure 4.2-3 Water Quality Classifications of Waters Crossed by the NY Project

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
Atlantic Ocean (885-78) a/	SA	Shellfishing for market purposes, primary and secondary contact recreation and fishing	Not Listed
Reynolds Channel (885-168) b/, c/	SB	Primary and secondary contact recreation and fishing	Nitrogen
Barnums Channel (885-171)/Hog Island Channel d/, e/	SC	Fishing	Nitrogen

Notes
a/ Refers to 6 NYCRR 885.6 Water Quality Standards Table I item number 78.
b/ Reynolds Channel, West (NYSDEC 2021a).
c/ Refers to 6 NYCRR 885.6 Water Quality Standards Table I item number 168.
d/ The WI/PWL includes this portion of Barnums Channel as part of the larger Hog Island Channel segment (NYSDEC 2021b), although it is listed separately in 6 NYCRR § 885.6.
e/ Refers to 6 NYCRR 885.6 Water Quality Standards Table I item number 171.

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. 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 export and interconnection cable systems and the onshore substation.

The following are potential impacts to marine sediment and chemical characteristics that may occur as a result of the above-referenced NY 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;
- Short-term, minor potential for inadvertent return of drilling fluids during HDD; and
- Short-term, minor potential for accidental spills and/or releases offshore or onshore.

Short-term 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 dispersion; however, impacts on water quality are expected to be short-term and localized (Latham et al. 2017). To evaluate the impacts of NY Project submarine export cable installation, the Applicant developed analytical sediment transport models to quantify potential maximum plume dispersion, sediment concentrations and potential maximum sediment deposition thicknesses (see **Appendix C)**. The sediment transport analysis characterizes the potential maximum sediment transport and deposition scenario for jetting 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.

When cables are buried using jetting techniques, only fine sand and smaller particle sizes are suspended into the water column sufficiently to be transported away from the immediate trench. Larger particle sizes re-settle immediately into the trench. Therefore, the fine sand and smaller sediment particle classes were most appropriate to assess NY Project impacts in the analytical sediment transport models and the percent gravel was not used.

Deltares conducted high-resolution 3D hydrodynamic and wave modeling conducted by using Delft3D (**Appendix C**), incorporating project-specific sediment grain size data. As sediment is released near the seabed has a higher density compared to the ambient water and settles back to the seabed, the largest concentrations of sediment are found near the seabed (within approximately 3.3 ft [1 m]). Therefore, discussion of suspended sediment concentration focuses primarily on the maximum, near-bed suspended sediment concentrations above background concentration. The NYSDEC TOGs 5.1.9 defines the edge of the mixing zone as 1,500 ft (457 m) in open water areas. The suspended sediment concentrations are not expected to exceed the NYSDEC standard of 100 milligrams per liter (mg/L) excess above background concentration at 1,500 ft (457 m) from the NY Project submarine export cable installation under normal conditions, which include wave heights up to 3.3 ft (1 m) and represents about 66% of the time. Under these conditions, for representative location A12, which contained an approximately 92% fine sediment fraction, the largest suspended sediment concentration above background at the edge of the mixing zone was approximately 30 mg/L. At representative location A3, which contained only an approximately 45% fine sediment fraction, concentrations were approximately 20 mg/L at 1,500 ft (457 m). Modeled values exceed 100 mg/L at the edge of the defined mixing zone in a few locations along the submarine export cable route with large concentrations of fine sediments when significant wave heights are 4.9 ft (1.5 m) and above.

For MFE, the suspended sediment concentration is below 100 mg/L at 1,500 ft (457 m) at offshore locations for all evaluated conditions. Closer to shore at certain locations the suspended sediment concentration exceeds 100 mg/L at 1,500 ft (457 m) for significant wave heights of 3.2 ft (1 m). In these cases, the maximum suspended sediment concentration is between 100 mg/L and 200 mg/L. Elevated suspended sediment concentrations at 1,500 ft (457 m) persist for only a short time, up to about 20 minutes, given the short duration of MFE operations.

These results are generally consistent with a previously conducted sediment transport assessment using the ESPreSSO hydrodynamic model, based on publicly available sediment data (**Appendix C**). The percentage of fine sediment assumed from this publicly available sediment data for open water areas of the submarine export cable route was approximately 53%. This model predicted that the maximum sediment plume travels 1,640 to 3,280 ft (500 to 1,000 m) from the trench centerline during flood and ebb conditions.

The ESPreSSO model used conservative assumptions for the NY Project. Results for stations 6, 9 and 11, indicated suspended sediment concentrations within New York State waters were below 110 mg/L at a distance of 1,640 ft (500 m) from trench centerline during flood and ebb tides. For flood tides, the suspended sediment concentration averaged around 100 mg/L at a distance of 1,640 ft (500 m), and for ebb tides, the concentrations averaged around 100 mg/L at a travel distance of 1,148 ft (350 m). Results indicated that the plume would travel to a maximum distance of approximately 3,280 ft (1,000 m) during the flood tide, although the maximum suspended sediment concentrations at that distance would be typically less than 15 mg/L. During ebb tides, the maximum plume distance travelled is typically around 1,640 ft (500 m). Maximum plume distance at any station depends on the current velocity and its components perpendicular and parallel to the direction of trench movement. The analysis conducted with the ESPreSSO model also evaluated sediment deposition. The deposition thickness was highest in the vicinity of the trench, as fine sand tends to deposit close to the trench centerline due to its higher settling rate. Most of the coarser fine sediments settled to the marine floor within 16 ft (5 m) of the trench, and deposition depths decreased rapidly. For example, Station 6 has a fine sand content of 53% and the maximum observed deposition depth during flood tides was 10.49 inches (in, 26.6 centimeters [cm]) at the trench, but deposition decreased to 2.78 in (7.06 cm) within 82 ft (25 m) of the trench. The maximum observed deposition depth during ebb tides at Station 6 was 17.39 inches (in, 44.17 centimeters [cm]) at the trench, but deposition decreased to 0.09 in (0.23 cm) within 82 ft (25 m) of the trench. Deposition was 0 at all stations by 820 ft (250 m) during flood tides and 2,264 ft (800 m) during ebb tides.

Results from the sediment analyses conducted for the NY Project are 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 the 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 NY 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.

Short-term Increase in Erosion and/or Stormwater Runoff. Excavation, soil stockpile, and grading associated with installation of the onshore export and interconnection cables, the 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 NY Project Area is provided in Section 4.4.

Where the potential for an increase in erosion and/or stormwater runoff as a result of NY Project construction 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.

Short-term inadvertent return of drilling fluids during HDD. HDD technologies are proposed at the crossing of Reynolds Channel and the trenchless installation of the cable landfall. HDD installation 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 to water quality in the shallow marine environment associated with the landfall and/or the portion of the onshore export and interconnection cables that traverses near wetlands or waterbodies. The Applicant will implement an Inadvertent Return Plan, to be provided in the EM&CP and approved by the applicable agencies, as necessary, to avoid, minimize, and mitigate impacts associated with an inadvertent return of drilling fluids.

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 NY 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 NY 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;
- Presence of new onshore infrastructure; and
- 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;

- Long-term, minor effects due to stormwater run-off; and
- Long-term, minor effects due to potential for accidental spills and releases.

Long-term 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 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 will minimize 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). Potential impacts associated with scour protection are anticipated to be long-term during the life of the NY Project, but minor due to the relatively small footprint and localized nature of the cable protection measures compared to existing softbottom seabed present.

Long-Term Bathymetry Changes Due to Pre-Sweeping. Pre-sweeping may be conducted prior to cable lay 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 may result, as the final seabed contours will remove slopes and waves. However, impacts of pre-sweeping are expected to be predominantly short-term. Underwater currents will facilitate the natural return of pre-construction conditions in areas subject to pre-sweeping or pre-trenching. Given the very localized nature of this activity, any bathymetry changes due to pre-sweeping will have a negligible impact and will not affect scour, current, temperature or other ocean processes.

Short-term 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 Sensing 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 a change in cable burial depth, for example caused by scouring of material. 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 warn vessels in the area, investigate the cable condition, and identify and take corrective actions, if necessary.

The Applicant will also conduct surveys of the submarine export cables to confirm the cables have not become exposed or that the cable protection measures have not worn away Should one of the submarine export cables fault, that 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, , the submarine export cables require reburial, or 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 associated with cable repair will include localized, direct, short-term seafloor disturbance that may result in short-term impacts to water quality from sediment disturbance.

Long-term 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. Development will be required at the onshore substation, and elevation of the site may affect existing drainage patterns. While the construction disturbance area is likely several acres, expected long-term increases in impervious area minimal. The Applicant will evaluate stormwater management as part of the detailed design of the facility. Stormwater pollution prevention controls will be installed on site in accordance with federal and state requirements to capture and treat stormwater runoff on site before it enters nearby surface waters. Additional discussion of stormwater runoff associated with the onshore NY Project Area is provided in Section 4.4.

Long-term Effects Due to Potential for 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 NY 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 NY 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 NY Project Area, including the submarine export cable corridor, onshore substation, and onshore export and interconnection cable corridors, were initially assessed by reviewing the following resources:

- USGS Mapping (1995a); USGS topographic 7.5-minute quadrangles for New York (Lawrence, Jones Inlet);
- NOAA's Continually Updated Digital Elevation Model (Cooperative Institute for Research in Environmental Sciences [CIRES] 2014);
- NOAA nautical charts;
- Geologic mapping (NYSMuseum 1999); and
- Soil survey mapping (SoilWeb 2019; USDA 2020).

The Applicant completed several geophysical and geotechnical assessment campaigns along the submarine export cable route in 2018 and 2020/2021, consisting of high-resolution geophysical and shallow geotechnical surveys of the submarine export cable corridor. Additional geophysical and geotechnical surveys are currently ongoing, including nearshore and onshore geotechnical assessment within the NY Project Area.

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 NY Project Area, with a focus on the factors that pertain to the NY 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 NY 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 topography, geology, soils, and groundwater of the offshore and onshore areas of the NY Project that have the potential to be directly or indirectly affected by the construction or operation of the NY 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 NY Project Area, which includes the onshore substation site and the onshore export and interconnection cable corridors, ranges in elevation from -4.92 ft (1.5 m) to 38.25 ft (11.7 m) elevation NAVD88 (USGS, 2014). Topographic relief is generally characterized as flat to gently sloping. There is minimal elevation change throughout the NY Project Area.

The submarine export cables come onshore at Riverside Boulevard in the City of Long Beach, and from there the onshore export cables traverse the low barrier island that forms Long Beach. After crossing Reynolds Channel, the onshore export cables enter the onshore substation in the southern portion of the Village of Island Park. The onshore substation site is characterized by elevations ranging from -4.92 (ft) to 38.25 (ft) NAVD88 (USGS, 2014). Areas of higher elevation within the onshore substation site generally represent anthropogenic fill from deposited dredged spoils. From the onshore substation north to the POI, the interconnection cable route traverses Barnum Island, which includes the incorporated Village of Island Park and unincorporated Barnum Island. This portion of the NY Project Area is also characterized by natural topography that is generally low elevation and gently sloping. Throughout the onshore portion of the NY Project Area, artificial fills and rip-rap seawalls have been utilized to modify the original topography to accommodate significant amounts of anthropogenic activities.

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

4.3.2.2 Geology

The NY Project Area is within the Barrier Beach System and Long Island Coastal Lowlands of the Atlantic Coastal Plain Geomorphic Province. The province encompasses an area from the southern tip of Florida north to Cape Cod and includes the coastline of the New York Bight watershed (USFWS 1997). The area is characterized by low topographic relief, with most of the region being less than 100 ft (30 m) in elevation.

The geology of the NY 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 from a series of sea level changes of the Pleistocene Epoch, and more recent Flandrian transgression of sea level. The NY Project Area is located in a boundary region between glaciated and proglacial areas. The most recent glacial period in the U.S., called the Wisconsinan glaciation, lasted 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 (Messina and Stoffer 1996).

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. To the south of the moraines, Pleistocene outwash deposits generally consisting of sands and gravels interbedded with silts overly older Upper Cretaceous coastal plain strata. Modern marine sand deposits overlie the area in variable thicknesses from nearly absent to large shore-attached and shore-detached sand ridges greater than 16 ft (5 m) thick (Cadwell et al. 1989).

Long Island comprises two roughly parallel moraines that make up the core of the island: the Ronkonkoma Moraine and the Harbor Hills Moraine. These converge approximately 20 mi (32 km) east of New York City (USFWS 1997). Along the southern shore of Long Island, there is an extensive system of barrier beaches and barrier islands broken by tidal inlets and mostly separated from the mainland of Long Island by a backbarrier lagoon and tidal marshes (e.g. Hempstead Bay) (USFWS 1997).

Onshore Geology

The onshore NY Project Area is underlaid by metamorphic rock formed 230 to 350 million years ago, followed by geologic layers formed between the Upper Cretaceous Period (72 to 100 million years ago) and Pleistocene Epoch (12 to 2.5 million years ago), which mostly consist of gravels, sand, and clay (Jean-Michel 2014).

Deposits underlying the onshore export and interconnection cable routes and onshore substation are made up of fluvial sand and gravel, which form a barrier island deposited by ocean currents and are associated with dunes. The sand and gravel make up the landfall area and overlie glacial outwash deposits. Further to the north at Island Park, the beach deposits are replaced by surface outwash deposits consisting of coarse to fine well-rounded stratified gravel and sand fining away from the moraine, and are up to 60 ft (18 m) thick. The onshore export and interconnection cable routes and onshore substation site are located in an area heavily influenced by human development.

The areas surrounding the NY Project Area have undergone significant anthropogenic 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. This has resulted in the Natural Resource Conservation Service identifying many of these areas as Urban Land (SoilWEB 2019). Section 4.3.2.3 provides additional discussion of soils underlying the NY Project Area.

Offshore Geology

The geological units underlying the marine portions of the NY 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.

Geologic conditions underlying the submarine export cable route are characterized by the surficial geology (determined from the Applicant's grab sampling and geophysical survey work) and the stratigraphic geology (determined through the Applicant's geotechnical sampling). Conditions along the submarine export cable route exhibit a general trend of shoaling towards the shore. Water depth variations range, in the current surveyed and interpreted portion of the route, from approximately 28 ft (8.4 m) to 56 ft (17 m) (NAVD88).

Sediments along the submarine export cable route have been observed as sand with accumulations of slightly gravelly sands. The slightly gravelly sands typically correlate with localized bathymetric lows between bedforms and in areas of small depressions. Megaripples are generally observed in the areas containing slightly gravelly topographic lows. The general stratigraphy has been observed to consist of Coastal Plain deposits, overlain by Pleistocene deposits, overlain by Holocene deposits.

4.3.2.3 Soils

A review of early twentieth century maps of the Nassau County indicates that portions of the onshore NY Project Area occur on fill constructed into and adjacent to Reynolds Channel and surrounding waterways in the late nineteenth and early twentieth century (NYPL 2019). Portions of the area have undergone significant human and construction-related modification. The Natural Resources Conservation Service (NRCS) identifies many of the area soils as Urban (SoilWeb 2019). **Table 4.3-1** lists the soils present in the NY Project Area. **Table 4.3-2** provides the descriptions for the major soil types crossed by the NY Project. Soils mapping for the NY Project Area is provided in Figure 4.3-1**.**

Mapped Soils in the NY Project Area (SoilWeb 2019)

Table 4.3-1 Soil Types within the NY Project Area

Soil Type	Map Unit	Slope	Percent within the NY Project Area
Urban Land – Udipsamments complex	Uu	0-3%	6.5%
Udipsamments, wet substratum	Ue	0-3%	10.1%
Urban land-Udipsamments wet substratum complex	Uw	0-3%	23.4%
Urban Land	Ug	undefined	58.8%
Water	W	undefined	1.5%

Table 4.3-2 Soil Type Descriptions

Soil Type	Description
Udipsamments	Udipsamments are deep soils that are usually excessively to moderately well drained. They occur on open landscapes. A typical profile has a surface layer of thin, dark grayish brown loamy sand underlain by a substratum of light brownish gray sand. Udipsamments with west substratum are moderately well to well drained and occur on nearly level areas that have been filled with sandy dredged materials from adjacent waterways. Mostly they occur as fill over organic tidal marsh sediments. Native vegetation may consist of beach grasses, bayberry, and other salt-tolerant plants, or reeds where elevation is lower (Wulforst 1987).
Beaches	This map type characterizes sandy area that slope seaward and are subject to constant wave action by the Atlantic Ocean; they are inundated at high tide. Most of the area has no plant cover (Wulforst 1987).
Urban land	Urban land typically occurs where a high percentage (at least 85 percent) of the surface is anthropogenic, impervious cover, such as asphalt or concrete. This may occur in commercial plazas, industrial parks, and other developed areas. Slopes are often nearly level and range from 0 to 8 percent but are usually from 0 to 5 percent (Wulforst 1987).

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

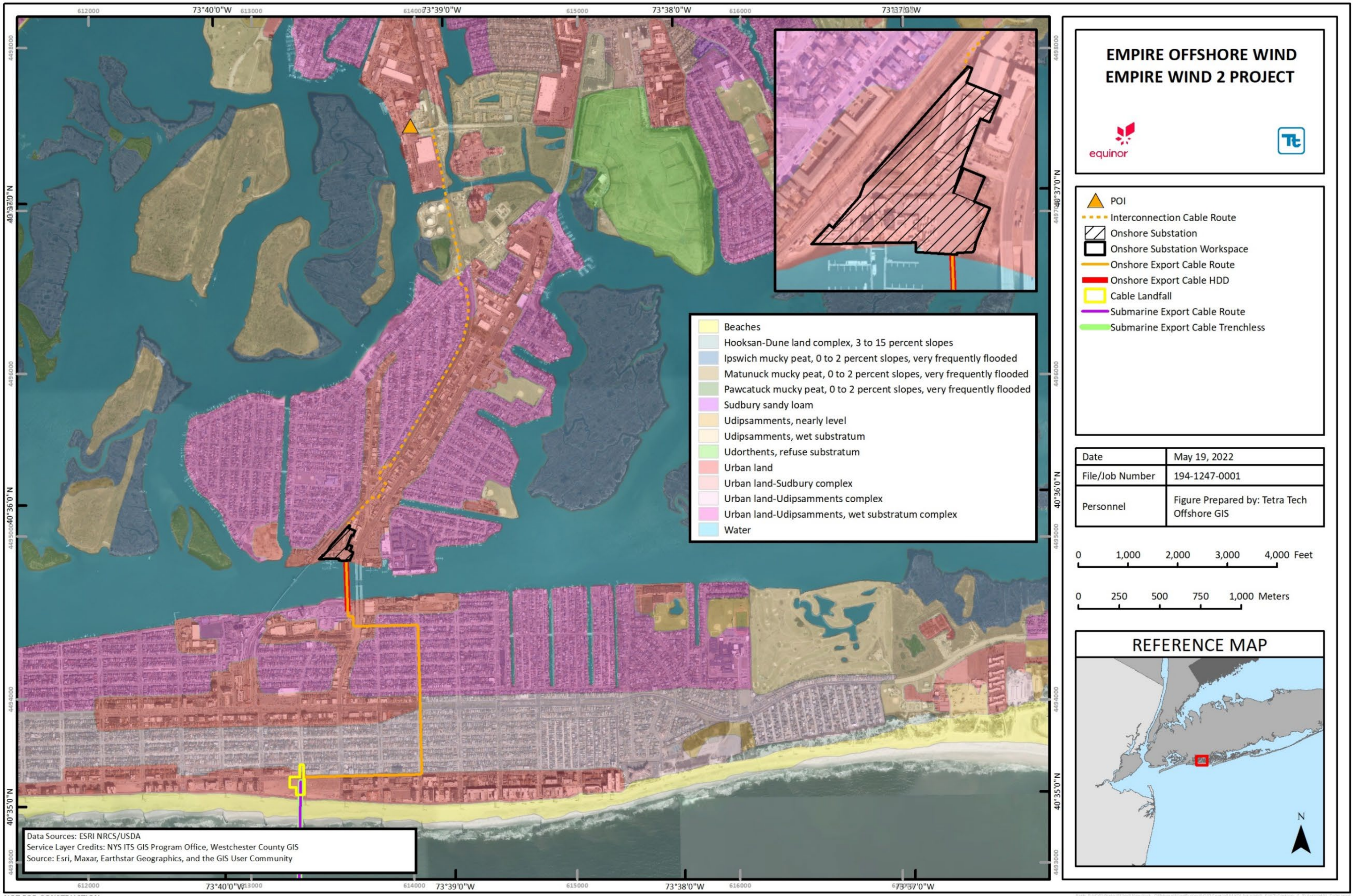


Figure 4.3-1 Soils Mapping in the vicinity of the NY Project

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 export and interconnection 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 reduced recharge, and water demand caused freshwater water tables to drop (USGS 1995b). The only source of potable freshwater for Nassau and Suffolk Counties on eastern and central Long Island is precipitation that recharges the groundwater system. Long Island's groundwater aquifer system consists of a very large wedge of unconsolidated Cretaceous sands, gravels, silts, and clay overlain by similar glacial sediments.

The principal aquifers of Long Island, vertically from top to bottom, are the Upper Glacial Aquifer, the Magothy Aquifer, and the Lloyd Aquifer, (USGS 1995b, NYSDEC 2019a). The Upper Glacial Aquifer is composed of unconsolidated sediments deposited during the Pleistocene Ice Ages. The Magothy Formation is generally composed of unconsolidated sands with some layers of silts and clays; the lower portion of the Magothy Formation consists of coarse sand and gravel. The Magothy Formation thickens seaward and is about 1,000 ft (305 m) thick in southwestern Suffolk County. This formation occurs approximately 600 ft (183 m) below sea level beneath the south shore of Long Island. The Raritan Formation consists of an upper clay member and a lower sand member (Lloyd Aquifer).

The USGS does not monitor groundwater elevations near the cable landfall in the City of Long Beach, Long Island, New York, although they have a robust monitoring network to the north and east. The groundwater depths along the eastern and southern shorelines range from 1.71 ft (0.52 m) below mean sea level to 5.83 ft (1.78 m) below MSL, with well closest to the cable landfall measuring 2.69 ft (0.82 m) below MSL. 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).

The area near the NY Project is completely dependent on groundwater as the source for all potable water needs (NYSDEC 2019a). On the barrier island of Long Beach, drinking water is sourced from local groundwater of the Llyod Aquifer (Long Beach New York 2019). In the Town of Hempstead, drinking water is sourced from local groundwater, primarily of the Magothy Aquifer; however, some also comes from the Llyod Aquifer (Town of Hempstead 2021). 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 export and interconnection cables, 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.

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

Topography and Geology

Throughout the construction phase of the NY 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 NY Project will be localized and are not anticipated to result in broad-scale impacts to the geological conditions of the NY Project Area.

During submarine export cable installation, anchoring of working vessels and the NY Project infrastructure being installed may be disrupted or damaged as a result of the natural and anthropogenic topographic, bathymetric and geological conditions, including such features as boulders, debris, existing seabed assets. The siting and design of NY Project components has therefore been informed by the presence or absence of these features and adjusted accordingly to mitigate potential risks.

The use of jetting to install the submarine export cables may also cause temporary disturbance to the seabed, resulting in suspended sediments (see Section 4.2). However, the seabed is expected to be restored, stabilized, and returned to pre-construction conditions through the action of natural currents shortly after the suspended sediments have settled.

In certain limited areas of the submarine export cable corridor, pre-sweeping may be necessary prior to cable lay activities. Pre-sweeping may involve removing material to facilitate the installation of the submarine export cables at crossings of existing pipeline or cable assets, where present. The primary pre-sweeping method will involve using a suction hopper dredge vessel and/or MFE 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. The Applicant will also need to dredge a pit for the end of the HDD installation of each submarine export cable at the cable landfall. 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 export and interconnection cable routes, and for preparation of the onshore substation site. Following installation of the onshore export and interconnection cables, all trenches will be backfilled, and surface grades will be returned to pre-construction conditions to the extent practicable. The onshore substation site is relatively flat, except where anthropogenic deposited materials are present. The Applicant is proposing to raise the elevation in portions of the site as part of onshore substation construction, to mitigate the potential for flooding impacts to the facilities. Site preparation activities for the onshore substation may also include excavation and removal of existing belowground and demolition of aboveground infrastructure, grading, and installation of foundations and supports.

Design and installation of the cable landfall, onshore export and interconnection 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 export and interconnection 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. Where the submarine and onshore export cables cross beach areas and/or sandy soils that may be susceptible to coastal erosion, the design depth of the cables will be targeted to minimize the potential for exposure and restoration of temporary construction work areas and will minimize potential erosion impacts. No significant impacts to soils are expected from construction of the NY 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 and complying with a SPDES general permit for stormwater discharges from construction activity and developing a SWPPP per the Clean Water Act (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 export and interconnection cables and the onshore substation may result in minor, short-term disturbance to localized shallow groundwater. Final engineering design will determine if groundwater needs to be managed during excavation activities for the NY Project's onshore facilities. As discussed above in Section 4.2.3.4, groundwater may be less than 5 ft (1.5 m) below the surface in portions of the onshore NY Project Area and therefore may be encountered by trenching for the onshore export and interconnection cable installation or onshore substation foundation excavation activities. As designs for the onshore facilities 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 NY 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 approved, discharged onsite. Impacts of dewatering on water quality will be minor and short-term due to implementation of dewatering best management practices.

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. 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 will 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, pre-sweeping may be necessary prior to cable lay activities to remove material where the submarine export cables cross existing pipeline or cable assets, where present. These activities may result in a minor alteration of bathymetry in local areas along the submarine export cable route. It is anticipated that any impacts will be short-term in areas subject to pre-sweeping, as underwater currents will facilitate the natural return of pre-construction conditions.

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 export and interconnection cables, all trenches will be backfilled, and surface grades will be returned to pre-construction conditions to the extent practicable. The onshore substation site is relatively flat, except where dredged spoils are present. The Applicant is proposing to raise the permanent elevation of the onshore substation site to mitigate the potential for flooding impacts to the facilities (see Section 4.4). Effects on topography and site drainage will be minimized through appropriate design of the onshore substation during the detailed design phase.

The Applicant will account for the topographical and geological conditions identified in the NY Project Area during operation of the NY Project. The submarine export cables and onshore cables will be monitored through Distributed Temperature Sensing equipment. The Distributed Temperature Sensing system will be able to provide real time monitoring of temperature, alerting the Applicant should the temperature change, which often is the result of a change in cable burial depth, for example caused by scouring of cable covering material. The Applicant will also conduct surveys of the submarine export cables to confirm the cables have not become exposed or that the cable protection measures have not worn away. A Distributed Vibration Sensing system will be integrated within the submarine export cables to provide real time vibration monitoring close to the cables, which may indicate potential dredging activities or anchor drag occurring close to the cables. Upon receiving any such alert, the Applicant will warn vessels in the area (for the submarine export cable route), 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. Soil disturbance is not anticipated during operations of the NY Project's onshore infrastructure except during maintenance activities, when necessary. 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 export and interconnection 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 a SPCC plan detailing spill prevention, control, and mitigation measures to be implemented during onshore operations, which will be provided as part of the NY 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 NY Project Area. Potential impacts to wetlands and waterbodies associated with construction and operation within the onshore NY Project Area, including the upland portion of cable landfall construction activities, are discussed as well. 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. Impacts to the tidal and marine environments from installation and operation of the submarine export cables 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.

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.

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 displayed on an inventory map, as defined in 6 NYCRR § 661.4(o), and the associated tidal wetlands adjacent areas. There are multiple types of tidal wetlands based on 6 NYCRR § 661.4(hh), including:

- *Coastal Fresh Marsh*: The tidal wetland zone, designated FM on an inventory map, found primarily in the upper tidal limits of riverine systems where significant freshwater inflow dominates the tidal zone. Species normally associated with this zone include narrow leaved cattail (*Typha angustifolia*), the tall brackish water cordgrasses (*Spartina pectinata* and/or *S. cynosuroides*), and the more typically emergent freshwater species such as arrow arum, (*Peltandra virginica*), pickerel weed (*Pontederia cordata*), and rice cutgrass (*Leersia oryzoides*).
- *Intertidal Marsh*: The vegetated tidal wetland zone, designated IM on an inventory map, lying generally between average high and low tidal elevation. The predominant vegetation in this zone is smooth cordgrass (*Spartina alterniflora*).

- *Coastal Shoals, Bars and Flats*: The tidal wetland zone, designated SM on an inventory map, that satisfies each of the following, except as otherwise determined in specific cases where such lands do not function biologically as tidal wetlands due to such factors as pollution, sedimentation, or other physical disturbances:

  (1) at high tide is covered by water,
  (2) at low tide is exposed or is covered by water to a maximum depth of approximately one foot, and
  (3) is not vegetated by smooth cordgrass.

- *Littoral Zone*: The tidal wetlands zone, designated LZ on an inventory map, that includes all lands under tidal waters which are not included in any other category, except as otherwise determined in specific cases where such lands do not function biologically as tidal wetlands due to such factors as pollution, sedimentation or other physical disturbances. The Littoral Zone does not extend under waters deeper than six feet at mean low water.
- *High Marsh or Salt Meadow*: The normal uppermost tidal wetland zone, designated HM on an inventory map, usually dominated by saltmeadow cordgrass (*Spartina patens*) and spike-grass (*Distichlis spicata*). This zone is periodically flooded by spring and storm tides and is often vegetated by low vigor (dwarf form) smooth cordgrass and Seaside lavender (*Limonium carolinianum*). Upper limits of this zone often include black grass (*Juncus Gerardi*), chairmaker's rush (*Scirpus pungens*), marsh elder (*Iva frutescens*), and groundsel bush (*Baccharis halimifolia*).
- *Formerly Connected Tidal Wetlands*: The tidal wetlands zone, designated FC on an inventory map, in which normal tidal flow is restricted by man-made causes. Typical tidal wetland plant species may exist in such areas although they may be infiltrated with common reed (*Phragmites australis*).

The tidal wetlands adjacent area is defined as the land adjacent to the wetland boundary to a maximum landward distance of 150 ft (46 meter [m]) for tidal wetlands within the New York City limits and 300 ft (91 m) for tidal wetlands elsewhere in the State. The maximum landward distance (150 ft [46 m] or 300 ft [91 m] from the tidal wetland boundary) is reduced per 6 NYCRR § 661.4 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). Saline surface waters fall into five categories based on the best uses assigned by NYSDEC, which are further described in Section 4.2.

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 NY 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 NY 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 2021),
- NYSDEC:
    - Regulatory Freshwater Wetlands (NYSDEC 2002),
    - Tidal Wetlands (NYSDEC 2005), and
    - Water Quality Classifications (NYSDEC 2019b),
- USGS National Hydrography Dataset (NHD) (USGS 2017), and
- FEMA National Flood Hazard Layer (FEMA 2021).

The Applicant conducted a preliminary reconnaissance of the onshore NY Project Area was conducted along the onshore export and interconnection cable route on November 4, 2021 from publicly accessible areas to: (1) verify the presence of any mapped wetland and waterbody resources identified during the desktop analysis, and (2) assess the potential presence of unmapped wetland and waterbody resources. The Applicant evaluated the potential presence of unmapped wetlands within the NY Project Area based on the occurrence of hydrophytic vegetation within topography conducive to wetland hydrology.

During this effort, a wetland delineation was also conducted at the onshore substation site. Survey methodologies incorporated the requirements detailed within the Northcentral and Northeast regional supplement to the Corps of Engineers Wetlands Delineation Manual (USACE 1987). Tidal wetlands were assigned an additional cover class corresponding with the NYSDEC tidal wetland categories (NYSDEC, n.d.) based on their position in the tidal landscape and their dominant vegetation community. The results of the November 4, 2021 effort are summarized in this section, with additional details provided in **Appendix D Wetland and Terrestrial Vegetation Report**. Formal wetland delineations for the remainder of the onshore NY Project Area is planned for 2022.

4.4.2 Existing Wetlands and Waterbodies

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

4.4.2.1 Wetlands and Waterbodies

Mapped wetlands and waterbodies within one mile of the onshore NY Project Area, as classified by the NWI, NHD and NYSDEC, are displayed on **Figure 4.4-1**. **Table 4.4-1** summarizes the wetlands and adjacent areas present in the NY Project Area. **Table 4.4-2** lists the surface waterbodies crossed by the onshore export and interconnection cable route.

Table 4.4-1 NWI and NYSDEC Mapped Wetlands Within the onshore NY Project Area[6]

Route Feature	NWI Classification	NWI-mapped Wetland Area within NY Project Area (ac)	NYSDEC Classification	NYSDEC-mapped Wetland Area within NY Project Area (ac) a/
Cable Landfall	No NWI-mapped wetlands	n/a	No NYSDEC-mapped wetlands	n/a
Onshore Export Cable Corridor	No NWI-mapped wetlands	n/a	No NYSDEC-mapped wetlands	n/a
Onshore Substation	Estuarine and Marine Deepwater (E1UBL)	0.02	Littoral Zone	0.3
Interconnection Cable Corridor	Estuarine and Marine Deepwater (E1UBL)	0.4	Littoral Zone (LZ), Intertidal Marsh (IM)	0.5

a/does not include mapped adjacent area.

Table 4.4-2 Waterbodies Crossed by the onshore export and interconnection cable corridors

Route Feature	NWI Classification	NYSDEC Stream/Lake Classification	Route Crossing Length (ft [m]) a/
Reynolds Channel	Estuarine and Marine Wetland (E2US2N), Estuarine and Marine Deepwater (E1UBL)	SB (Marine Waters) b/	764 (233 m)
Barnums Channel	Estuarine and Marine Deepwater (E1UBL)	SC (Marine Waters) c/	192 (59 m)

a/based on NYSDEC mapping

b/SB indicates a best usage for primary and secondary contact recreation and fishing. See Section 4.2 for additional information on classification of marine waterbodies.

c/ SC indicates a best usage for fishing. See Section 4.2 for additional information on classification of marine waterbodies.

[6] These numbers reflect the existing NY Project Area, and do not reflect shoreline modifications at the onshore substation site, discussed below.

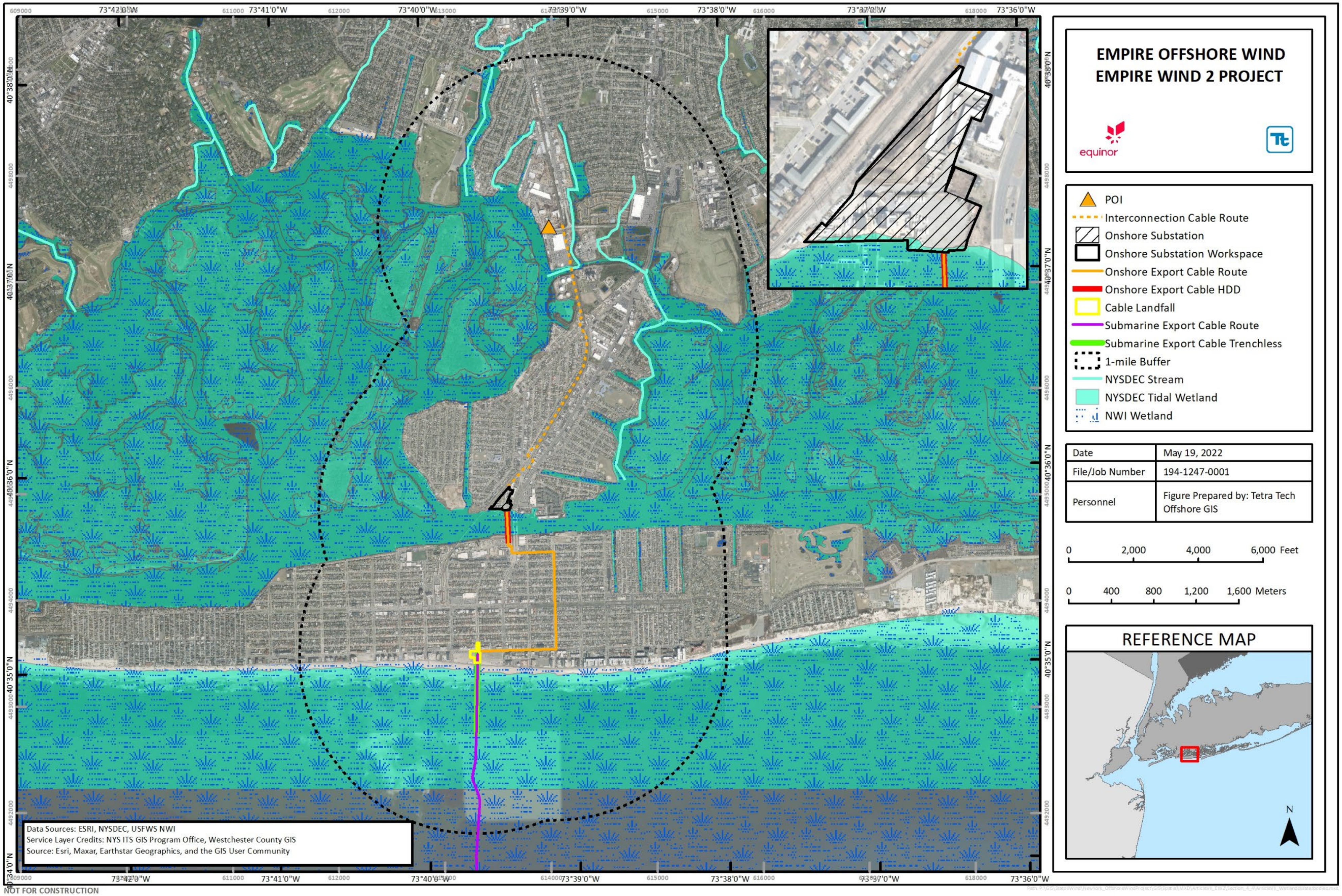


Figure 4.4-1 NWI, NHD and NYSDEC Mapped Wetlands and Waterbodies within one mile of the onshore NY Project Area

The submarine export cables make landfall from the marine environment of the Atlantic Ocean in the Long-Island-Atlantic Ocean watershed (10-digit *Hydrologic Unit Code* [HUC 10]: 0203020209) in the City of Long Beach within the public right-of-way at Riverside Boulevard and an adjacent vacant parcel. The submarine export cables cross mapped NWI Estuarine and Marine Deepwater (M1UBL) and Estuarine and Marine Wetland (M2US2N, M2US2P) wetland types and NYSDEC-mapped Littoral Zone offshore and approaching the cable landfall. The onshore cable landfall area does not contain any mapped NWI or NYSDEC wetlands.

The onshore export cable route north of the cable landfall enters the South Oyster Bay-Jones Inlet watershed (HUC 10: 0203020202) and traverses developed areas of the City of Long Beach. The onshore export cable route is located primarily within existing road rights-of-way. Based on NWI and NYSDEC mapping, the onshore export cable corridor between the cable landfall and Reynolds Channel does not cross any tidal or freshwater wetlands. No unmapped wetlands or waterbodies were identified in this portion of the NY Project during the November 4, 2021 field reconnaissance; however, portions of the cable landfall area could not be assessed due to access limitations. Portions of the onshore export cable route cross within 300 ft (91 m) of NYSDEC-mapped tidal wetlands; however, based on field reconnaissance and aerial photography, it appears that lawfully and presently existing functional structures greater than 100 ft long are present, which are anticipated to truncate the tidal wetland adjacent area short of the cable route.

The onshore export cable route crosses Reynolds Channel to the onshore substation in Island Park, which is located immediately to the east of the LIRR right-of-way. Reynolds Channel is classified by NWI as a subtidal estuarine feature with an unconsolidated bottom (E1UBL), and by the NYSDEC tidal wetland database as a Littoral Zone. NYSDEC also maps a portion of the southern bank of Reynolds Channel as Coastal Shoals, Bars and Flats. Based on observations during the November 4, 2021 field reconnaissance, the southern bank of Reynolds Channel is highly modified, comprising a mix of riprap and natural shoreline high in concrete and asphalt debris that quickly transitions to industrial properties.

The onshore substation site is located on the northern bank of Reynolds Channel (also identified as Wreck Lead Channel on some mapping) on developed lands comprising commercial properties. NWI and NYSDEC mapping indicates that Reynolds Channel extends into the onshore substation site by a maximum of approximately 40 ft (12 m). Based on the November 4, 2021 field delineation, the north bank encroaches into the onshore substation site by a maximum of approximately 27 ft (8 m). The central portion of the northern shoreline consists of approximately 760.60 ft (231.8 m) of wooden bulkheading and floating docks associated with an active marina. Approximately 35.48 ft (10.8 m) of natural shoreline is present adjacent to the western end of the wooden bulkhead and 11.54 ft (3.5 m) of natural shoreline is present adjacent to the eastern end, with natural shoreline extending from there west and east beyond the property limits of the site. The substrate along the north bank comprises coarse sand with gravel and concrete debris, and no intertidal vegetation, sholes, or mudflat habitat was observed, consistent with the NYSDEC mapping of Littoral Zone. As such, tidal wetland adjacent areas abut the natural shoreline areas in the easternmost and westernmost portions of the onshore substation site.

From the onshore substation, interconnection cable route traverses the Village of Island Park north to the POI and is located primarily within existing rights-of-way. The interconnection cable route crosses tidal wetlands mapped by NWI and NYSDEC at Barnums Channel. NWI classifies these wetlands as subtidal estuarine with an unconsolidated bottom (E1UBL). The NWI mapped wetland boundaries at these locations approximately correspond to the NYSDEC tidal wetlands mapping, which depicts Littoral Zone with Coastal Shoals, Bars and Flats as well as Intertidal Marsh in this area. Due to access limitations, this area was not assessed during the November 4, 2021 field reconnaissance.

NYSDEC mapping identifies two surface waterbodies crossed by the NY Project: Reynolds Channel and Barnums Channel. Reynolds Channel is classified as a Class SA waterbody, for shell fishing and general recreation use. NYSDEC classifies Barnums Channel as a Class SC waterbody, used for fishing. Additional discussion of waterbody classification and water quality impairments for tidal waterbodies is provided in Section 4.2, and mapping of these waterbodies in the vicinity of the NY Project Area is provided in **Figure 4.2-4**. The Applicant is proposing to cross Reynolds Channel using the HDD installation method. The Applicant's proposed crossing method for Barnum's Channel is an aboveground cable bridge alongside the existing railroad trestle (see Section 4.1); this method is undergoing additional feasibility evaluation.

4.4.2.2 Floodplains

FEMA data indicates that portions of the NY Project are situated within Special FHAs associated with the Atlantic Ocean, Hempstead Bay, and Reynolds Channel. Special FHAs within one mile of the onshore NY Project Area per the effective 2009 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.
- Zone X (unshaded)/Area of Minimal Flood Hazard is outside or above the elevation of the 0.2 percent annual chance flood.

The onshore NY Project Area contains Zone VE, AE and Zone X (shaded) and Area of Minimal Flood Hazard as detailed in **Table 4.4-3** and depicted in **Figure 4.4-2**, per the effective 2009 FEMA FIRMs. The majority of the onshore substation is located in Zone AE (the 1-percent-annual-chance floodplain), with a small area in the southeastern portion of the site in Zone X (shaded). Additionally, the southern portion of the 5.2-ac (2.1-ha) onshore substation is within the Coastal A Zone, as delineated by the Limit of Moderate Wave Action. 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 present along nearshore portions of the submarine export cable route and at the cable landfall.

Table 4.4-3 FEMA-Mapped Zone VE, AE and Zone X (Shaded) within the NY Project Area

Route Feature	FEMA Flood Zone	Area (ac)
Cable Landfall	AE (1% Annual Chance Flood Hazard)	0.39
	VE (1% Annual Chance Flood Hazard)	1.99
	Total	**2.38**
Onshore Export Cable Corridor	AE (1% Annual Chance Flood Hazard)	8.79
	VE (1% Annual Chance Flood Hazard)	0.52
	X (shaded) (0.2% Annual Chance Flood Hazard)	0.13
	Total	**9.45**
Onshore Substation	AE (1% Annual Chance Flood Hazard)	5.07
	X (shaded) (0.2% Annual Chance Flood Hazard)	0.34
	Total	**5.41**
Onshore Interconnection Cable Corridor	AE (1% Annual Chance Flood Hazard)	10.79
	X (shaded) (0.2% Annual Chance Flood Hazard)	0.71
	Total	**11.50**

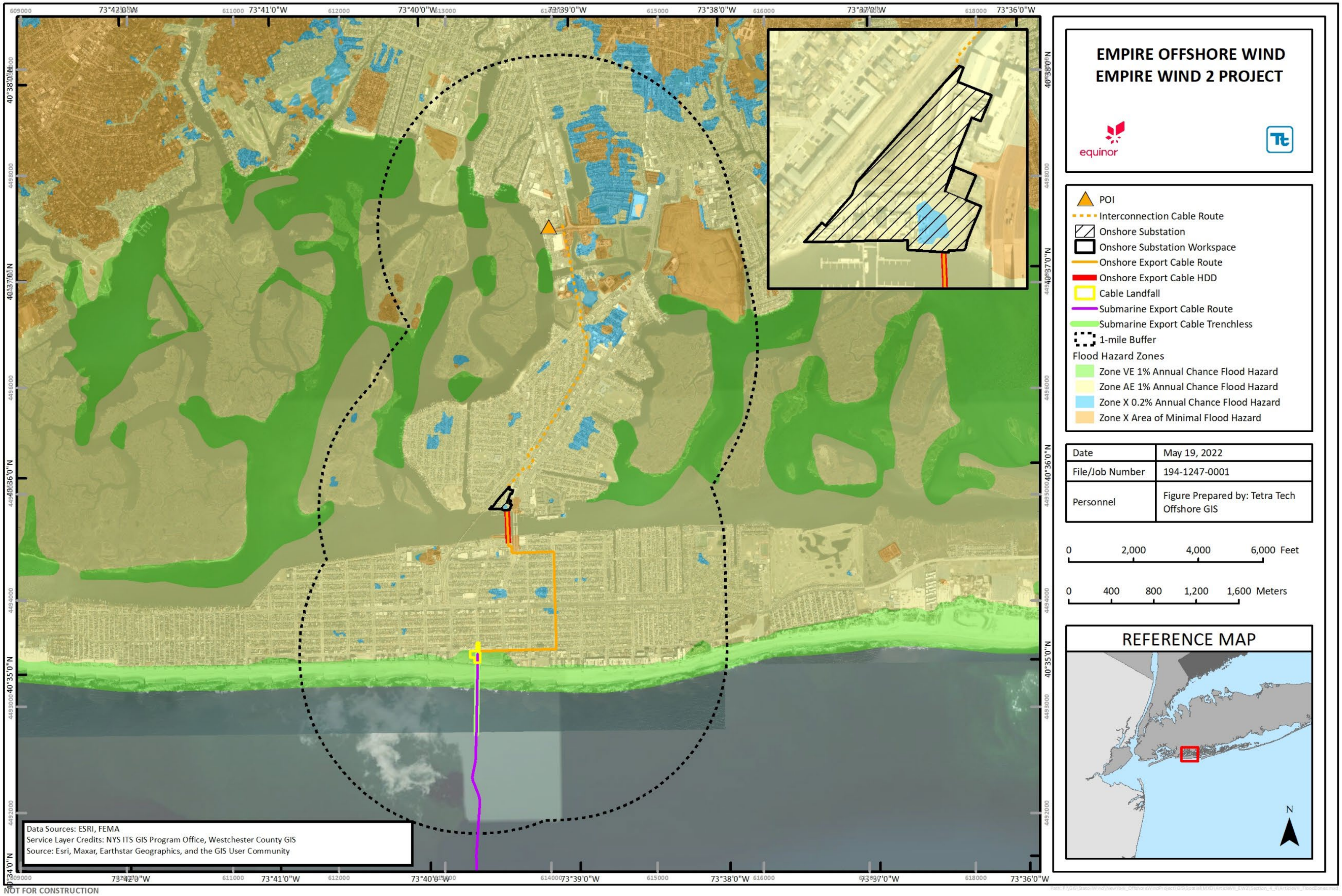


Figure 4.4-2 Mapped Floodplains within one mile of the onshore NY Project Area

4.4.3 Potential Wetland and Waterbody Impacts and Proposed Mitigation

This section discusses potential impacts to the affected existing environment, as defined in Section 4.4.2, resulting from the construction and operation of the NY Project as well as avoidance, minimization, and mitigation measures proposed to offset such impacts to the maximum extent practicable. Construction and operations impacts, avoidance, minimization and mitigation measures for marine in-water work 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 export and interconnection cable systems (including cable landfall, open cut trenching and trenchless installation techniques); and
- Construction of the new onshore substation.

Construction of the onshore NY Project infrastructure will be partially located within wetlands, waterbodies, and adjacent areas. 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 wetlands, waterbodies, associated adjacent areas and special FHAs, and removal of vegetation within wetlands, due to construction activities;
- Short-term, negligible impacts associated with water use during NY 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;
- Short-term, minor impacts associated with erosion into adjacent wetlands and waterbodies; and
- Short-term, minor impacts associated with dewatering discharges.

Disturbance to wetlands, waterbodies, associated adjacent areas and special FHAs, and removal of vegetation within wetlands due to construction activities. Every practicable effort has been made to avoid wetland and waterbody resources and minimize the permanent conversion of regulated areas by siting NY Project infrastructure outside of and away from jurisdictional wetlands, waterbodies, and their corresponding protected adjacent areas. During construction and installation activities, including during trench excavation, in HDD work areas, and in temporary construction work areas for staging of equipment and supplies, vegetation may be temporarily removed. Removal of woody vegetation could represent a potential long-term impact if slower-growing vegetation does not recover quickly within the construction corridor following cable installation; however, based on field observations, limited trees or woody vegetation are present in the NY Project Area. The Applicant will comply with applicable permitting standards to limit potential environmental impacts from NY Project related activities.

To avoid impacts to surface waters, tidal wetlands and tidal channels, the Applicant is proposing to install the onshore export cables across Reynolds Channel using the HDD installation method, if technically feasible.

The Applicant is also proposing to install the interconnection cables across Barnums Channel using an aboveground cable bridge to minimize in-water impacts within the tidal channel. The cable bridge crossing will use up to four support piles located within the waterway to support the truss system which will hold the cables above the water. The cable bridge will be constructed from a prefabricated steel truss system assembled offsite and set in place, and the structure will measure up to 25 ft (7.6 m) wide and 8 ft (2.4 m) tall, and span a length of approximately 300 ft (91 m). The structure is anticipated to have a total height of up to 15 ft (4.6 m) above MSL, with a maximum total height of 30 ft (9.1 m).

The onshore substation will include concrete foundations, pilings, gravel lots, fencing, and associated structures located in special FHAs: Zone AE and Zone X (shaded). 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 potential impacts by implementing the following measures:

- The siting of onshore components in previously disturbed areas, existing roadways and road rights-of-way to the extent practicable;
- 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);
- The installation of temporary matting if access through wetlands is required during construction activities to protect vegetation root systems, reduce compaction, and minimize ruts;
- Restricting access through wetlands to identified construction sites, access roads, and work zones, to the extent practicable;
- During construction, access will be restricted to existing paved roads and approved access roads at wetland and stream crossings where possible, to avoid excessive soil compaction in sensitive areas;
- The implementation of an invasive species control plan, which will be provided for agency review and approval, as applicable, to avoid the spread of invasive species and replant with native vegetation only; and
- Landscaping and restoration work will be completed with appropriate native species in compliance with the invasive species control plan to prevent the introduction of invasive plant species.

Water use during NY Project construction. Temporary water use will be required for certain activities during construction of the NY Project. 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. For the Reynolds Channel crossing HDD and any other HDDs, if proposed, water will be used to produce the bentonite-based drilling fluid 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 discharge 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 indirectly via stormwater runoff. The Applicant proposes to implement the following measures to avoid, minimize, and mitigate potential impacts during construction:

- Prevention and management of accidental spills or releases of oils or other petroleum products 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. Inadvertent returns of drilling fluids have the potential to escape to the surface during HDD activities (e.g., at the Reynolds Channel crossing). In the event of an inadvertent return within a regulated area during HDD activities, drilling fluids have the potential to impact wetland and/or stream habitats and the biota inhabiting such areas. 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 wetlands and waterbodies. Excavation, soil stockpiling, grading, and dewatering associated with the installation of the onshore export and interconnection cables, the onshore substation, and supporting infrastructure may increase the potential for erosion and sedimentation to down gradient areas. The down gradient surface water resources for onshore NY Project facilities consist of tidal wetlands, channels, and the Atlantic Ocean. 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 export and interconnection 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.

Potential impacts associated with dewatering discharges. Excavation associated with installation of the onshore export and interconnection 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. Water removed during dewatering of the construction area for the NY Project may be discharged to an existing sewer or to a surface waterbody and will be conducted in accordance with the appropriate SPDES permit requirements.

Investigations associated with the preparation of the final engineering design will determine if groundwater will need to be managed during excavation activities for the NY Project's onshore facilities. 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 NY 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 NY 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 NY Project's onshore infrastructure, except in the event 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;
- Long-term, minor conversion of existing wetland cover types;
- Long-term, minor fill within Reynolds Channel associated with the onshore substation and bulkhead replacement;
- Short-term, minor impacts from erosion, sedimentation and runoff to off-site surface waters during NY Project operations; and
- Short-term, minor impacts associated with accidental releases during operations.

Long-term presence of the aboveground facilities, including the onshore substation, within special FHAs. The onshore substation and its associated components will include concrete foundations, gravel lots, fencing, and structures in special FHAs: Zone AE and Zone X (shaded). 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 rights-of-way to the extent practicable; and
- 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.

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

Long-term conversion of existing wetland cover types. Vegetation cover type conversion may represent a long-term impact in the case that vegetation maintenance during operations includes the removal of woody vegetation within the permanent easement for the onshore export and interconnection cables. However, the Applicant anticipates minimal to no conversion of vegetation cover type within wetlands and adjacent areas, due to the very limited presence of woody vegetation within the NY Project Area (see Section 4.5) and the types of wetlands that have been identified along the proposed export and interconnection cable routes to date. The Applicant does not anticipate the need to conduct operational vegetation maintenance along the onshore export and interconnection cable routes. However, in the event that impact to wetland cover types is anticipated, the Applicant will comply with applicable permitting standards to limit environmental impacts from project-related activities.

Long-term fill within Reynolds Channel associated with the onshore substation and bulkhead replacement. As part of the onshore substation site plan (see Exhibit 5: Design Drawings), the existing sea wall and bulkhead along the shoreline forming the southern portion of the onshore substation site may need to be retrofitted and/or replaced for site stabilization. The Applicant is currently evaluating the extent of shoreline stabilization that may be required. Approximately 650 ft (198 m) of bulkheaded shoreline may be upgraded or replaced along the southern border of the onshore substation The onshore substation site plan also requires removal/fill of two existing boat slips along the bulkheaded shoreline. A total of approximately 3,040 sq ft (282 m^2) will be filled with clean fill or flowable fill material to support the access road and structures as part of the site design. Upgrades to bulkhead and footprint beyond the current bulkhead edge, as well as loss of the existing boat slips are estimated to require up to approximately 395 cubic yards (301 m^3) of fill material below spring high water along the Reynolds Channel shoreline. The onshore substation facility design is not expected to impact the delineated areas of natural (non-bulkheaded) shoreline that were identified at the site during the wetland field survey.

The Applicant also anticipates that existing marina structures located on site will be removed as part of the onshore substation development; however, marina removal activities will not result in permanent loss of any wetland area.

Short-term potential erosion, sedimentation and runoff to off-site surface waters during NY Project operations. Changes in elevations and grades, impervious surfaces, and placement of structures for the onshore substation could affect post-construction stormwater runoff from the NY Project Area. Changes in grades are expected to be limited to the operational footprint of onshore substation, since areas temporarily used for construction, surface grades will be returned to pre-construction conditions to the extent practicable. The southern portion of onshore substation site, adjacent to Reynolds Channel, is relatively flat and on previously filled land. The northern portion of the onshore substation site includes a soil stockpile that occupies approximately 0.5 ac (2 h) of land. It is anticipated that this stockpile will be removed, and the area will be graded prior to construction of the onshore substation. 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 NY Project's EM&CP.

Short-term potential for accidental releases during operations. 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 surface waters such as Reynolds Channel, or impact water quality. The Applicant will prepare a SPCC plan, which will be provided as part of the NY 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 NY Project Area. Potential impacts to terrestrial vegetation and wildlife resources associated with construction and operation within the onshore portion of the NY Project Area landward of cable landfall are also 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

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

- Level III U.S. Environmental Protection Agency Ecoregions of the Continental United States (Bryce et al. 2010);
- 2019 National Land Cover Dataset (NLCD): Land Cover Conterminous United States (Dewitz 2019);
- Google Earth Historical Aerial Imagery, 1985–2021. Long Beach, Island Park, and Oceanside, New York; and
- USFWS Information for Planning and Consultation (IPaC) (USFWS 2018).

In January 2019, the Applicant submitted a formal inquiry 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. The Applicant submitted updated inquiry letters to the NYSDEC in August 2019, July 2020, April 2021 and May 2022. The Applicant also obtained Official Species Lists from the USFWS 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 NY 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.**

The Applicant conducted a field reconnaissance of terrestrial vegetation and wildlife habitat in the NY Project Area on November 4, 2021 in conjunction with wetland delineation surveys (see Section 4.4). As part of this field reconnaissance, habitats within the potential Project limits of disturbance were assessed and assigned appropriate community classifications according the 2014 *Ecological Communities of New York State, Second Edition* (Edinger et al. 2014). Additionally, the Applicant conducted a preliminary assessment of invasive plant species identified as prohibited or regulated on 6 NYCRR Part 575. A formal survey for invasive plant species will be conducted before NY Project construction, if needed, in accordance with the Applicant's Invasive Species Control Plan, to the document the location of invasive plant stands within the limits of disturbance. The field reconnaissance was conducted from publicly-accessible road rights-of-way, with the exception of the onshore substation location, which was assessed in its entirety. Other portions of the NY Project onshore export cable and interconnection cable corridors were not accessible at the time of field surveys.

4.5.2 Existing Terrestrial Vegetation and Wildlife

The affected environment described in this section is defined as the onshore NY Project Area that has the potential to be directly affected by the construction and operation of the onshore components, including the upland portion of cable landfall activities, the onshore export and interconnection cables, and the onshore substation. In addition to the NY Project onshore components, the NY Project Area includes proposed onshore temporary work areas to support the construction of the NY Project (see **Exhibit 2: Location of Facilities)**.

4.5.2.1 Terrestrial Vegetation

The onshore NY Project Area is located within the Barrier Islands/Coastal Marshes Level III U.S. Environmental Protection Agency ecoregion. This ecoregion consists of flat to gently sloping plains, coastal bays and inlets, islands, bluffs, dunes, beaches, tidal flats, and marshes. Natural vegetation comprises coastal forests of scarlet oak (*Quercus coccinea*), black oak (*Quercus velutina*), post oak (*Quercus stellata*), beech (*Fagus grandifolia*), black gum (*Nyssa sylvatica*), red maple (*Acer rubrum*), pitch pine (*Pinus rigida*), and American holly (*Ilex opaca*). Coastal forests may have a dense shrub layer and vines including sassafras (*Sassafras albidum*), greenbrier (*Smilax* spp.), poison ivy (*Toxicodendron radicans*), Virginia creeper (*Parthenocissus quinquefolia*), beach plum (*Prunus maritima*), lowbush blueberry (*Vaccinium angustifolium*), or grape (*Vitis* spp.). Beach communities comprise sea-rocket (*Cakile* spp.), dune grasses (*Ammophila breviligulata*), beach pea (*Lathyrus japonicus*), and seabeach orache (*Atriplex glabriuscula*). Salt marshes are dominated by saltmeadow cordgrass (*Spartina patens*), smooth cordgrass (*Spartina alterniflora*), spikegrass (*Distichlis spicata*), and saltmarsh rush (*Juncus gerardii*) (Bryce et al. 2010).

The onshore NY Project Area is broadly located within developed landscapes of the Town of Hempstead, City of Long Beach, and Village of Island Park, primarily along or within existing roadway and railroad corridors. Natural vegetation, as described above, is limited; the vegetation within the NY Project Area almost entirely consists of landscape plants, including trees, shrubs, other ornamental plants, and maintained grass (with exceptions noted below). This includes landscaped areas along roadways, within roadway medians, and in local parks. Based on the 2019 NLCD data, the onshore export and interconnection cable routes are situated within developed lands of variable development intensity (see **Table 4.5-1**). Vegetated areas are primarily limited to the area within and adjacent to the onshore substation, at the northern end of the interconnection cable route, and in strips along the railroad corridor, existing roadways, and maintained lawns (**Figure 4.5-1**).

Table 4.5-1 2019 NLCD Land Use for the Onshore NY Project Area

Route Feature	NLCD Cover Class (2019)	Area (Acres)	Percent of Total
Cable Landfall	Developed High Intensity	1.36	57.2%
	Developed, Medium Intensity	1.02	42.6%
	Total	**2.38**	**100%**
Onshore Export Cable Corridor	Developed High Intensity	6.19	64.5%
	Developed, Medium Intensity	3.26	33.9%
	Developed, Low Intensity	0.04	0.4%
	Open Water	0.12	1.2%
	Total	**9.60**	**100%**
Onshore Substation	Developed High Intensity	3.11	57.5%
	Developed, Medium Intensity	2.16	39.9%
	Emergent Herbaceous	0.14	2.6%

Route Feature	NLCD Cover Class (2019)	Area (Acres)	Percent of Total
	Barren Land (Rock/Sandy/Clay)	<0.01	<0.01%
	Total	**5.41**	**100%**
Onshore Interconnection Cable Corridor	Developed High Intensity	4.72	37.5%
	Developed, Medium Intensity	6.61	52.5%
	Developed, Low Intensity	0.82	6.5%
	Developed, Open Space	0.27	2.1%
	Open Water	0.17	1.4%
	Total	**12.59**	**100%**

The cable landfall is located on Riverside Boulevard and exhibits a paved road and a vacant lot with a gravel surface devoid of vegetation. Because the Applicant will use a trenchless installation method for cable landfall, the NY Project will not directly affect the beach habitat within adjacent Ocean Beach Park.

The onshore export cable route is located primarily within existing roadways, which have sparse vegetation that includes intermittent mowed roadside/pathway ecological communities with occasional planted trees and shrubs within the road median.

The proposed onshore substation will be located within developed lands of medium to high development intensity (USGS 2019). The land currently supports a marina, restaurant, and self-storage facility. The field reconnaissance identified multiple ecological communities within the onshore substation location, each within the Terrestrial Cultural subsystem, which includes communities either created or maintained by human activities or modified by human influence (Edinger et al. 2014). The dominant ecological communities include dredge spoils, urban structure exterior, and urban vacant lot. The vegetation is primarily sparse and consists of ornamental plantings around the marina with weedy invasive growth along the edges of the road and parking areas. The area of dredge spoils is a large soil stockpile mound that has regenerated with a dense community of invasive plants, including black locust (*Robinia pseudoacacia*) trees along with mugwort (*Artimisia vulgaris*) and multiflora rose (*Rosa multiflora*). Invasive vines including oriental bittersweet (*Celastrus orbiculatus*) and sweet autumn virgin's-bower (*Clematis terniflora*) coexist with herbaceous and shrub species.

From the onshore substation, the onshore interconnection cable route continues primarily along an existing railroad corridor to the POI. Aerial imagery reviews and limited observations from public vantage points during the field reconnaissance indicate that the interconnection cable corridor area is highly developed and is dominated by human-altered ecological communities. Undeveloped upland areas along the interconnection cable route contain herbaceous lands interspersed with shrubby habitats. Low areas bordering tidal creeks are dominated by tidal wetlands and estuarine common reed (*Phragmites australis*) marsh communities, with common reed forming dense monocultures.

Three significant natural communities were identified in NYSDEC consultation letters (see Section 4.7) as potentially occurring within the tidal channels in the vicinity of the northern portion of the interconnection cable route, specifically:

- Low Salt Marsh: a coastal marsh community that occurs in sheltered areas of the seacoast, in a zone extending from mean high tide down to mean sea level or to about 2 m (6 ft) below mean high tide. It is regularly flooded by semidiurnal tides. Low salt marsh grades into high salt marsh at slightly higher elevations, and into intertidal mudflats at slightly lower elevations. The vegetation of the low salt marsh is a nearly monospecific stand of smooth cordgrass (New York Natural Heritage Program [NYNHP] 2021a).

- High Salt Marsh: a coastal marsh community that occurs in sheltered areas of the seacoast, in a zone extending from mean high tide up to the limit of spring tides. It is periodically flooded by spring tides and incoming, rising tides. High salt marsh grades into salt shrub and brackish meadow habitats at the upland border, and into low salt marsh and salt panne habitats at the seaward border. High salt marsh typically consists of a mosaic of patches that are mostly dominated by saltmeadow cordgrass or a dwarf form of smooth cordgrass (NYNHP 2021b).
- Salt Panne: a shallow depression in a salt marsh where the marsh is poorly drained. Pannes occur in both low and high salt marshes. Pannes in low salt marshes usually lack vegetation, and the substrate is a soft, silty mud. Pannes in a high salt marsh are irregularly flooded by spring tides or flood tides, but the water does not drain into tidal creeks. After a panne has been flooded the standing water evaporates and salinity of the soil water is raised well above the salinity of seawater. Characteristic plants of a salt panne include the dwarf form of smooth cordgrass, glassworts (*Salicornia depressa* and *Sarcocornia pacifica*), marsh fleabane (*Pluchea odorata*), salt marsh plantain (*Plantago maritima* ssp. *juncoides*), arrow-grass (*Triglochin maritimum*), spikegrass, sea-blites (*Suaeda* spp.), and salt marsh sand spurry (*Spergularia marina*) (NYNHP 2021c).

Additional information on important habitats is provided in Section 4.7.

New York's invasive species regulations, 6 NYCRR Part 575, list 69 prohibited and six regulated plant species (75 species total). Prohibited species are those that cannot be sold, imported, purchased, transported, introduced, or propagated in New York. Regulated species can be possessed, sold, purchased, propagated, and transported, but cannot be introduced into a free-living state (i.e., unconfined and outside the control of a person).

The Applicant conducted a preliminary identification of invasive plant species during the field reconnaissance, from public rights-of-way. Invasive species commonly associated with disturbed and urban areas were identified within most vegetated areas. Common reed is a ubiquitous invasive plant that dominates many wetland habitats throughout the NY Project Area, commonly outcompeting both tidal and freshwater wetland vegetation communities. Common reed was also observed during the field reconnaissance within upland habitats, although with markedly less vigor and at a lower percent cover. Invasive vines such as porcelainberry (*Ampelopsis brevipedunculata*) and Japanese honeysuckle (*Lonicera japonia*) commonly intertwine with common reed or establish on and choke out woody shrubs and trees. Disturbed upland areas and road edges were observed supporting species such as Japanese knotweed (*Reynoutria japonica*), mugwort, and spotted knapweed (*Centauria stoebe*). A formal survey for invasive plant species will be conducted before NY Project construction, if needed, in accordance with the Applicant's Invasive Species Control Plan, to the document the location of invasive plant stands within the limits of disturbance

4.5.2.2 Terrestrial Wildlife

As the onshore components of the NY Project will be located predominantly within the developed lands identified within the onshore export and interconnection cable corridors, the NY Project Area is generally most suitable for species common to urban environments, comprising sparsely vegetated and highly fragmented habitats.

Coastal habitats consist of barrier beaches developed for tourism and recreational use. The cable landfall and onshore export cable crossing at Reynolds Channel are situated within the West Hempstead Bay/Jones Beach West Important Bird Area (IBA). This IBA does not include the islands of Long Beach and Island Park, although sand beach and dune systems, natural salt marshes, and spoil islands are included. Since the NY Project Area is highly developed, the birds mostly likely to be present are common coastal species as mentioned above, as well as urban (some introduced) and upland species.

From the cable landfall site, the onshore export and interconnection cable routes are co-located within heavily developed roadway and railroad corridors, therefore terrestrial wildlife is expected to be limited to those species adapted to living in urban environments, including mammals such as Virginia opossum (*Didelphis virginiana*), eastern cottontail (*Sylvilagus floridanus*), gray squirrel (*Scirus carolinensis*), meadow vole (*Microtus pennsylvanicus*), Norway rat (*Rattus norvegicus*), house mouse (*Mus musculus*), raccoon (*Procyon lotor*), and striped skunk (*Mephitis mephitis*). Bird species likely to utilize these urban habitats include house sparrow (*Passer domesticus*), European starling (*Sturnus vulgaris*), gulls, and rock pigeon (*Columba livia*).

Only a small portion of the onshore substation site contains vegetation, which may be cleared during construction of the site. Given the level of disturbance and development already present at the onshore substation site, temporary and permanent impacts to potential habitat for avian and bat species are expected to be minimal to low. The small undeveloped area that will be altered is located in an already urbanized area and dominated by invasive plant species. The limited trees that are present are dominated by black locust and do not constitute suitable summer bat roosting habitat. Although undeveloped areas onsite may have the potential to provide some habitat for certain species of terrestrial wildlife, this area is not likely to be an important habitat for any species.

Areas along the northern portion of the onshore export interconnection cable corridor in the vicinity of the POI are vegetated and may provide foraging and nesting habitat for wildlife species. Due to the limited amount of natural habitat, these species are not expected to occur at high densities or be dependent on habitats in the NY Project Area. While numerous tidal creeks and impoundments drain into the south shore bays and associated salt marshes around the barrier island of Long Beach and Barnum Island, these areas have been highly impacted from activities such as dredging, mosquito control ditching, erosion, and removal of fill for development.

Forested land in the NY Project Area is limited. Land in the vicinity of the POI contains some sparse tree cover and is characterized as scrub shrub habitat, which may support cave-hibernating bat species for foraging and roosting but is unlikely to provide important bat habitat. Additional discussion of protected bat species is provided in Section 4.7.

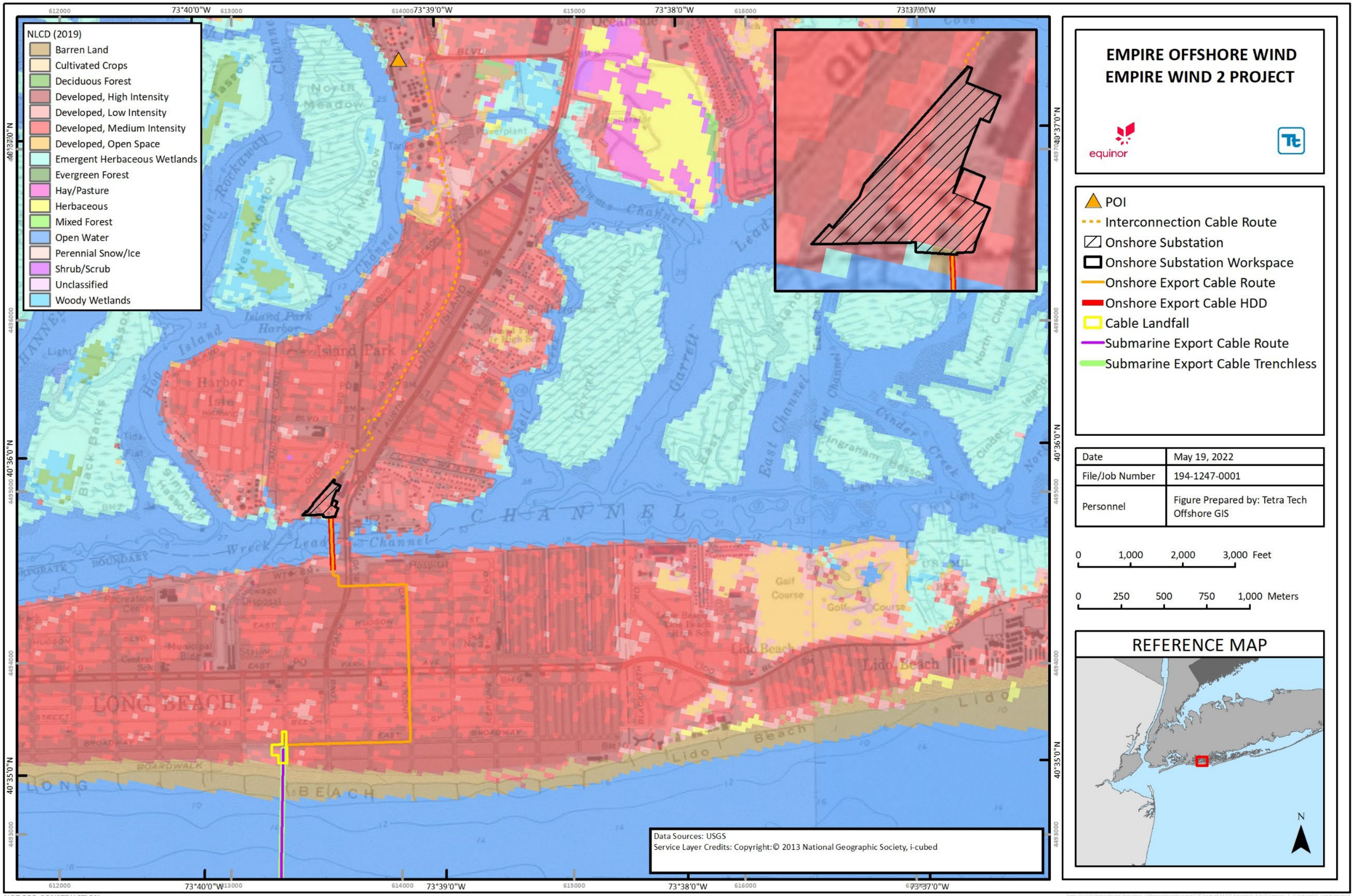


Figure 4.5-1 Land Cover in the Vicinity of the NY Project

4.5.3 Potential Terrestrial Vegetation and Wildlife Impacts and Proposed Mitigation

The NY Project is located within a highly developed area; therefore, potential impacts to terrestrial vegetation and wildlife as a result of the NY Project's onshore construction and operation are anticipated to be limited to those areas where NY Project components are located outside of existing roadway corridors and parking areas. These potential impacts, along with applicable avoidance and/or mitigation strategies, are discussed below.

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 export and interconnection cable systems, including open cut and trenchless installation techniques;
- Staging and construction activities within applicable construction areas; and
- Construction of the new onshore substation.

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

- Short-term, minor removal of vegetation;
- Short-term, minor potential for colonization of disturbed areas by invasive species;
- Short-term, minor potential for an inadvertent return of drilling fluids during HDD activities;
- Short-term, minor potential for accidental releases from construction vehicles or equipment;
- Short-term, minor disturbance associated with soil stockpile areas;
- Short-term, minor potential for erosion into adjacent vegetation and wildlife habitat;
- Short-term, minor impedance to local migration of terrestrial biota as a result of placement of silt fencing; and
- Short-term, minor disturbance to terrestrial biota as a result of NY Project-related construction activities.

Short-term removal of vegetation. Vegetation may be temporarily impacted and removed during construction and installation activities, including clearing for trench excavation, work areas for trenchless cable installation, and staging of equipment and supplies. Following construction, temporarily disturbed areas will be revegetated with appropriate native seed mix, as needed, and will be allowed to return to pre-construction conditions. To minimize temporary impacts to vegetation, the Applicant proposes to site onshore components of the NY Project in previously disturbed areas and/or existing roadway and railroad rights-of-way to the extent practicable. The NY Project has been sited to avoid heavily timbered areas, high points, ridgelines, and steep slopes.

Vegetation clearing will be the minimum width necessary for safe installation of the proposed facilities, and will be limited to the temporary construction right-of-way (a corridor of up to 150 ft [46 m] for the onshore export cables, and 100 ft [30 m] for the onshore interconnection cables), additional temporary workspaces, and approved access roads, as depicted on the construction drawings that will be provided in the EM&CP. Prior to vegetation clearing, the edges of the temporary construction area will be clearly marked to prevent disturbance of vegetation outside of the approved work limits and access roads.

Selected clearing equipment will be appropriate for the soil conditions and stability, and the Applicant will install temporary matting if access through wetlands is required during construction activities, to protect vegetation root systems, reduce compaction, and minimize ruts. Temporary topsoil segregation, and other soil protection measures, will be identified where appropriate in the Applicant's Soil Erosion and Sediment Control Plan. Use of pesticides or herbicides is not anticipated during construction. As appropriate, debris from clearing of woody vegetation will be chipped and removed from the right-of-way for disposal.

Since the vegetated portions of the NY Project Area predominantly consist of herbaceous and/or shrubby vegetation, the vegetated areas temporarily impacted by construction activities are expected to return to pre-construction conditions within approximately two to three growing seasons following the completion of construction. Areas temporarily impacted by construction activities will be seeded with appropriate seed mixes as outlined in the Soil Erosion and Sediment Control Plan. If seasonal weather conditions are not appropriate for permanent restoration at the time construction is completed, temporary seeding will be conducted for soil stabilization, followed by seeding with a permanent seed mix during the next suitable seasonal window. As appropriate and by agreement by the landowner, landscaping and restoration will be completed with suitable native species, in accordance with a landscape restoration plan or other appropriate plan, and in compliance with the Applicant's Invasive Species Control Plan, which will be provided as part of the Applicant's EM&CP.

Short-term potential for colonization of disturbed areas by invasive species. Land disturbance has the potential to encourage rapidly-growing invasive plant species, either due to regrowth from the seed bank in situ or due to the colonization of disturbed open space from existing populations of invasive plant species nearby. Invasive species may prevent or slow the regrowth of native plant species, and in some cases, may decrease the habitat quality for wildlife. Since the NY Project is sited within previously disturbed areas, existing roadways, and/or rights-of-way to the extent practicable, invasive species are not a concern throughout much of the NY Project Area. However, invasive species were observed to be prevalent within portions of the NY Project Area that are vegetated. As such, the Applicant plans to develop and implement an Invasive Species Control Plan, which will be provided as part of the Applicant's EM&CP.

Short-term potential for an inadvertent return of drilling fluids during HDD activities. HDD technologies may be implemented at the cable landfall and at the crossing of Reynolds Channel. In these areas, HDD will be used to avoid impacts to sensitive areas, such as wetlands, waterbodies, tidal creeks, coastal beaches, and dunes. The Applicant will implement appropriate measures during any HDD activities in order to minimize the potential release of HDD drilling fluid. However, in the event of an inadvertent return, drilling fluids could escape to the surface and impact adjacent vegetation, wildlife habitats, and biota. To avoid, minimize, and mitigate impacts, the Applicant proposes to develop and implement an agency-approved Inadvertent Return Plan that will be provided as part of the EM&CP, as applicable.

Short-term potential for accidental releases from construction vehicles or equipment. Onshore construction vehicles and equipment will be refueled and potentially serviced within the NY Project construction area. While within the NY Project Area, there is the potential for short-term, accidental releases onto the surrounding surfaces. Accidental releases from onshore construction or equipment will be minimized and managed through an SPCC plan, which will be included in the Applicant'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.

Short-term disturbance associated with soil stockpile areas. During construction and installation activities, soil stockpile areas will be created as a result of the ground-disturbing activities. As appropriate, topsoil may be segregated and stockpiled separately from subsoil, so that it can be returned to the upper layer of the soil profile upon backfilling and restoration. Soil stockpile areas will be placed on paved surfaces and previously disturbed areas to the extent practicable but may need to be located over existing vegetation along portions of the onshore export and interconnection cable route. Erosion and stormwater controls will be installed around stockpiled material as appropriate 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, temporary soil stockpile areas will be restored and allowed to return to pre-construction conditions.

Short-term potential for erosion into adjacent vegetation and wildlife habitat resulting from construction activities. During the construction of onshore infrastructure, there will be short-term disturbance of the upper layers of soil along the onshore export and interconnection cable route and for preparation of the onshore substation site. Excavation, soil stockpile, and grading associated with installation of the onshore export and interconnection cables and the construction of the onshore substation will increase the potential for erosion and sedimentation to adjacent vegetation and wildlife habitat resources downgradient. 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 Applicant will implement appropriate control measures in accordance with its Soil Erosion and Sediment Control Plan. The Soil Erosion and Sediment Control Plan will identify temporary erosion control devices and soil stabilization measures to be implemented during construction.

Short-term impedance to local migration of terrestrial biota as a result of placement of silt fencing. During construction and installation activities, silt fencing will be installed around ground disturbing activities. While installed, herpetofauna will be restricted from passing through these areas. Since the NY Project is sited within previously disturbed areas, existing roadways, and/or rights-of-way to the extent practicable, impedance to local migration is expected to be minimal throughout much of the NY Project Area. On a site-specific basis and in conjunction with the permitting process, the Applicant will consider staggering silt fencing or other erosion control devices in sensitive areas to facilitate the passage of biota, if the Applicant deems it effective to minimize impacts.

Short-term disturbance to terrestrial biota as a result of NY Project-related construction activities. During construction and installation activities, terrestrial biota may be temporarily disturbed. As these species are mobile, they may relocate to nearby areas to avoid construction-related noise during these activities. This disturbance will only be temporary, and the species are expected to return to all areas following the completion of construction.

During construction activities, avian and bat species, or their insect prey, may be attracted to lighting from construction equipment or NY Project components. Attraction to the NY Project Area could result in increased collision risk and light entrapment. Risk due to lighting during nighttime construction activities is considered to be temporary (Fox and Petersen 2019).

The Applicant will evaluate the use of seasonal restrictions for vegetation clearing where sensitive species are detected to minimize the potential impacts during construction. Due to the known presence of the northern long-eared bat on Long Island, the Applicant will comply with the New York State tree clearing restriction between March through November on Long Island, unless further agency coordination or studies indicate that an exception to this restriction would not adversely impact these species and such exception is approved by the USFWS, NYSDEC and other applicable agencies. Additional information on protected species is provided in Section 4.7.

Summary of Avoidance, Minimization and Mitigation Measures. Based on the potential impacts described, the Applicant proposes to implement the following measures to avoid, minimize, and mitigate impacts to terrestrial vegetation and wildlife:

- Siting of onshore components in previously disturbed areas, existing roadways, and/or rights-of-way to the extent practicable;
- The implementation of an Invasive Species Control Plan, which will be provided for agency review and approval, as applicable, to avoid the spread of invasive species and replant with native vegetation only;
- Revegetation of temporarily disturbed areas with appropriate native species, as needed and in compliance with applicable permits, mitigation plans, and/or Invasive Species Control Plan to prevent the introduction of invasive plant species;
- The prevention and management of accidental spills or releases of oils or other petroleum products through the development and implementation of an SPCC plan, which will be incorporated into the EM&CP;
- Limiting access of NY Project personnel and vehicles beyond existing disturbed areas and approved access roads to the extent practicable;
- 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), including development of a SWPPP;
- The consideration of staggering silt fencing or other erosion control devices in sensitive areas to allow the passage of biota; if the Applicant deems it effective, the strategy will be implemented on a site-specific basis and finalized during the permitting process;
- Limiting lighting associated with construction vehicles and work zones to the extent practicable to reduce the attraction of insect prey for wildlife species such as bats and insectivorous birds;
- Avoidance of tree-clearing of the onshore NY Project Area from March through November to minimize risks to bats, unless otherwise determined acceptable by the USFWS and NYSDEC; and
- The evaluation of seasonal restrictions for vegetation clearing where sensitive species are detected to mitigate potential impacts to breeding individuals.

4.5.3.2 Operations and Maintenance

No new impacts to terrestrial vegetation and wildlife habitats are anticipated during operations. NY Project-related activities are expected to use permitted access roads and entry points. Permanent aboveground structures associated with the onshore substation, including concrete foundations, gravel lots, fencing, and associated structures, will remain on-site throughout the lifetime of the NY Project.

Naturally vegetated lands, including forested areas, may be converted to permanent NY Project structures, such as the onshore substation, throughout the lifetime of the NY Project. Field reconnaissance indicates that forested habitat within the onshore substation is limited and dominated by invasive tree species, mainly black locust. Forested wetlands were not identified during the field reconnaissance. If forested wetlands are identified in the NY Project Area during future wetland delineation efforts, these habitats will be avoided to the maximum extent practicable. If it is determined that any long-term, unavoidable impacts within jurisdictional wetlands, waterbodies, or their regulated adjacent areas will occur, the Applicant will implement a mitigation plan, which will be provided for agency review and approval, as applicable.

Stormwater management and sediment control features will be installed during NY Project operations and maintenance activities 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 export and interconnection cable routes, as well as the onshore substation site, routine vegetation management to maintain the right-of-way during operations is not expected to be required. Therefore, naturally vegetated portions of the right-of-way are expected to return to pre-construction conditions or better following the completion of construction and restoration activities; permanent conversion of vegetation cover type is not expected. The Applicant does not anticipate regular mowing or regular use of herbicides or pesticides as part of operations and maintenance activities. If required, minimal handheld herbicide application, consistent with manufacturer's recommendations, may be conducted. An 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 NY Project Area, species that may transit through, or occur incidentally in the NY Project Area, and the commercial and recreational fishing resources within the NY Project Area. Potential impacts to fisheries and benthic resources resulting from construction, operation, and maintenance of the NY Project are discussed. This section also describes project-specific measures adopted by the Applicant to avoid, minimize, and/or mitigate potential impacts and 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. Benthic reports from the Applicant's survey activities are provided in **Appendix E Benthic Resource Characterization Reports**.

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 National Oceanic and Atmospheric Administration Marine Fisheries Service (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 NY 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 F Coastal Zone Management Consistency Statement**).

The New York Ocean Action Plan 2017-2027 (NYSDEC 2016a) 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 2017; 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 conducted site-specific geophysical, geotechnical, and benthic surveys of the submarine export cable siting corridor in 2019, 2020, and 2021. In July 2019, the Applicant contracted Inspire Environmental LLC (Inspire) to conduct a benthic assessment survey of the submarine export cable corridors proposed at that time. Sediment profile imagery (SPI), rather than grab sampling, was used to characterize benthic habitats. The interpretation of benthic substrate indicated by backscatter was well correlated with SPI results; no infauna or epifauna were sampled. Survey results are summarized in this section and the survey report is provided in **Appendix E**; digital imagery is available upon request.

The Applicant also contracted Gardline Limited (Gardline) to characterize surficial sediment and provide benthic habitat classifications within the submarine export cable corridor in winter 2020 and spring 2021. The Applicant contracted Alpine Ocean Seismic Survey, Inc. (Alpine) and RPS Group plc (RPS) to conduct additional benthic surveys near the export cable landfall in spring 2021. The benthic survey campaign provided 100 percent coverage of the Project Area using multi-beam echo sounder (MBES); side scan sonar (SSS); magnetometer; and shallow- and medium-penetration sub-bottom profilers. Additional benthic substrate and characterization data were collected using modified Van Veen and Day grab samplers, water quality profilers, and digital camera systems (drop down still cameras and towed video). Survey reports for these surveys are also provided in **Appendix E**.

The Applicant augmented the project-specific HRG and benthic surveys with the NorthEast Area Monitoring and Assessment Program Nearshore Trawl Survey (summarized in New York State Energy Research and Development Authority ([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 NY Project Area. Results of the Applicant's benthic surveys were evaluated in combination with data collected by others in the vicinity, including United States Geological Survey (USGS) sediment data, grab samples with infauna, FMPs (MAFMC 2017; NEFMC 2017; ASMFC 2015; 2018a, b; 2019a, b; 2020), 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 NY 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 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 and meetings as outlined in **Appendix A Agency Outreach and Correspondence**. The Applicant retained in-house Fisheries Liaison Officers (FLOs), 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 their keeping confidential the fishermen's operations. This information, together with other data collected, helped the Applicant assess the relative levels of interaction between fishermen and surveyed areas. The Applicant has also prepared a Fisheries Mitigation Plan for ongoing coordination, which is included in the Public Involvement Plan (**Appendix B Public Involvement Plan**), and a Fisheries Communication Plan.

4.6.2 Existing Fisheries and Benthic Resources

This section describes the existing benthic and pelagic habitats, benthic communities, finfish and shellfish species known or expected to occur within the NY Project Area, as well as the commercial and recreational fishing resources within the NY 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 NY Project.

4.6.2.1 Benthic and Pelagic Habitats

The NY 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 NY 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 NY Project Area.

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.

The characterization of benthic resources incorporated data from the Applicant's site-specific surveys; publicly available databases (e.g. NOAA Fisheries 2019a, Northeast Regional Ocean Council 2019, Mid-Atlantic Regional Ocean Council 2019); regional surveys; resource reports (e.g. NYSERDA 2017a, NEFMC 2017, NOAA Fisheries 2017, MAFMC 2016 and 2017); and relevant peer-reviewed literature. The Applicant's project-specific survey reports are in **Appendix E** and briefly described below.

In July 2019, the Applicant contracted Inspire Environmental LLC (Inspire) to conduct a benthic assessment survey of the NY Project's submarine export cable corridors proposed at that time using (PI and plan view (PV) imagery to characterize benthic habitats (**Figure 4.6-1**). The interpretation of benthic substrate indicated by backscatter was well-correlated with SPI results. Grain size distribution was analyzed in sediment grab samples to ground-truth the SPI results; no infauna or epifauna were sampled.

The Applicant contracted Alpine/RPS to perform a focused survey of benthic habitats near the shoreline in Spring 2021. The survey team collected triplicate grab samples at 12 locations within about 2.5 mi (4 km) of the shoreline along the submarine export cable corridor to ground-truth the results of geophysical data, characterize surficial sediment conditions, and provide benthic habitat classification as per BOEM guidelines and NOAA Fisheries recommendations. The surveys corroborated characterizations of softbottom habitat in previously surveyed portions of the submarine export cable siting corridor and detected novel hardbottom (e.g., cobbles, boulders) in previously unsurveyed portions of the corridor. One-third of the RPS grab samples contained the ≥ 5 percent gravel that categorizes complex habitat under the NOAA Fisheries Greater Atlantic Fisheries Office (NOAA Fisheries 2021) modified Coastal & Marine Ecological Classification Standard (CMECS) guidelines. Ten of the complex samples had ≥ 30 percent gravel. Polygordid polychaetes were the most common organisms in grab samples; more than 700 individuals were observed in 18 grab samples. Amphipods and mussels were also common. In 69 percent of the grab samples, the CMECS Biotic Group was classified as small-surface dwelling fauna, which included annelid worms, amphipods, and isopods. The CMECS Biotic Group in four grab samples was classified as mussel beds, which often also included with an assemblage of surface burrowing and small-tube building organisms.

The Applicant had planned to collect approximately 1,969 ft (600 m) of towed video at each station during the Spring 2021 survey; however, shallow water, strong currents, high seas, and influences from the nearby Jones Inlet interfered with video quality at the seven locations nearest shore. CMECS substrate classifications were derived from 370 still images. About 30 percent of the 2,260 ft^2 (210 m^2) of seafloor analyzed (approximately 678 ft^2 [63 m^2]) was classified as CMECS Substrate Group Sand/Mud. All transects were classified as CMECS Biotic subclass Soft Sediment Fauna, with mostly Mobile Mollusks as the CMECS Biotic Group (predominantly moon snails).

Video and still images were analyzed for percent cover of substrate types to characterize the transect areas using the NOAA Fisheries GARFO modified CMECS substrate classification. The CMECS biotic component based on towed video data was determined using a combination of the still image biological element percent cover data and video review enumeration data. The percent cover data were considered first to determine the appropriate CMECS biotic classifications with enumeration data used to determine which megafauna species were most dominant when megafauna covered the first or second largest area within the transect. Megafauna (organisms larger than 4 mm) were observed in all five videos; moon snails were the most common organisms recorded. Visible organisms were sparse, covering less than 0.1 percent of the seafloor in the survey area; algae were the most dominant groups. Winter skate was the most frequently observed fish in videos in the nearshore survey transects and a few *Cancer* crabs were also observed near shore.

Towed video, still images, and SPI/plan view imagery were reviewed to identify sensitive, rare, or unexpected species (including nonindigenous species). No soft coral, lobster, seagrass, or squid eggs were observed during any of the benthic surveys. The offshore submarine export cable corridor in New York was dominated by mobile sand, with slightly gravelly sand in topographic lows between bedforms. Sand ripples were visible across the survey area. Gravels were distributed unevenly.

The benthic survey campaign provided 100 percent coverage of the Project Area using MBES; SSS; magnetometer; and shallow- and medium-penetration sub-bottom profilers. Additional benthic substrate and characterization data were collected using modified Van Veen and Day grab samplers, water quality profilers, and digital camera systems (drop down still cameras and towed video). The specific equipment and methods used in each survey are described in the individual survey reports in **Appendix E.**

No hardbottom habitat was observed in the benthic surveys within State waters. These findings are consistent with other descriptions of the regional geology, which report that most of the natural rocky subtidal bank habitat of the United States Atlantic Coast occurs north of Massachusetts (Aquarone and Adams 2018; Davis 2009; Roman et al. 2000).

New York places and manages artificial reefs in State waters to enhance fish habitat, largely for recreational anglers and divers; several reefs comprised of sunken vessels and other hard materials have been established off Long Island in the vicinity of the NY Project Area. Artificial reefs in coastal New York waters are known for black sea bass (*Centropristis striata)*, blackfish (*Tautoga onitis*), scup (*Stenotomus chrysops*), American lobster (*Homarus americanus*), summer flounder (*Paralichthys dentatus*), cod (*Gadus* spp.), and several species of edible crab (NYSDEC 2020a).

Benthic habitats at the substrate 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 2017). Oceanic currents, temperature, conductivity, pH, dissolved oxygen, and other features of the water column influence the occurrence and abundance of marine species in the NY Project Area (Pineda et al. 2007). Oceanic conditions in the NY 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. 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).

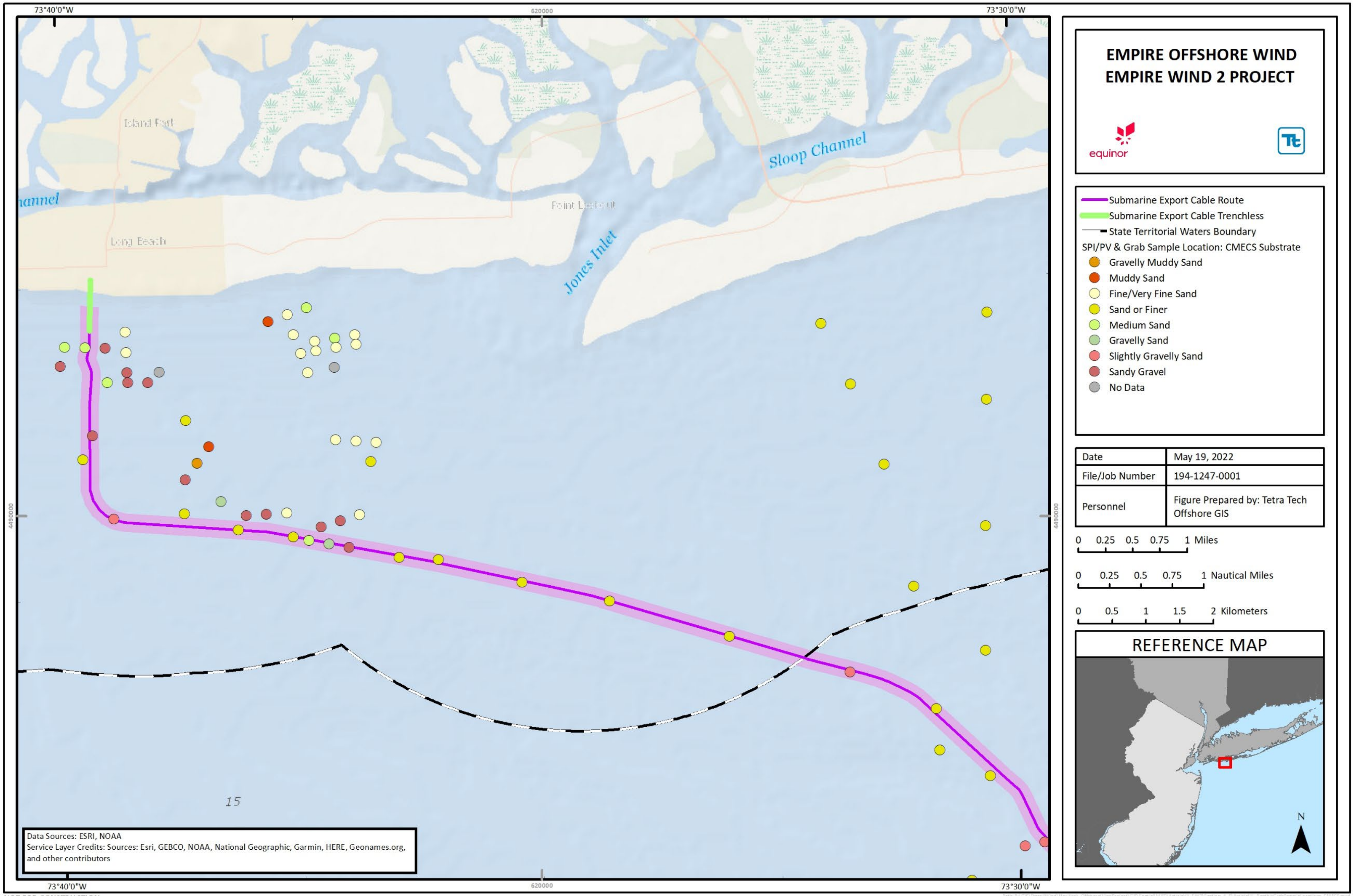


Figure 4.6-1 2019 and 2021 Benthic SPI/PV and Grab Samples (Empire)

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 EW 1 and EW 2 and a revised EFH Assessment was filed with BOEM in December 2021.

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 NY 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 [*Melanogrammus aeglefinus*], pollock [*Pollachius virens*], 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 NY 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 NY 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 NY Project Area.

The fishes in the NY 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 NY 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 of the NY Project Area 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).

Pelagic Species and Life Stages

The most numerically abundant component of the pelagic fish community in the open waters of the NY 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 the New York Project Area (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 NY 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*), bay anchovy (*Anchoa mitchilli*), 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 (*Coryphaena hippurus*), and sharks (Suca et al. 2018). For example, the bluefin tuna (*Thunnus thynnus*) 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 2017).

4.6.3 Managed and Exploited Species

4.6.3.1 Essential Fish Habitat and Habitat Area of Particular Concern

In the EW 2 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. NOAA Fisheries' Highly

Migratory Species Division is responsible for tunas and sharks in the NY Project Area (NOAA Fisheries 2017). 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 NY Project Area were identified using the EFH data inventory in each FMP and the online EFH Mapper (NOAA Fisheries 2021). EFH habitat categories were based on the EFH descriptions within each of the EFH source documents. The spatial overlap of EFH and EW 2 Project components was evaluated initially using plan-view maps in the EFH Mapper and habitat descriptions in EFH source documents. All species listed in **Table 4.6-1** have designated EFH in the NY Project Area and are assumed to occur there.

Table 4.6-1 Species with EFH in the NY Project Area

Common Name	Scientific Name
Atlantic butterfish	*Peprilus triacanthus*
Atlantic cod	*Gadus morhua*
Atlantic herring	*Clupea harengus*
Atlantic mackerel	*Scomber scombrus*
Black sea bass	*Centropristis striata*
Bluefin tuna	*Thunnus thynnus*
Bluefish	*Pomatomus saltatrix*
Common thresher shark	*Alopias vulpinus*
Dusky shark	*Carcharhinus obscurus*
Little skate	*Leucoraja erinacea*
Longfin inshore squid	*Doryteuthis [Amerigo] pealeii*
Monkfish	*Lophius americanus*
Ocean pout	*Macrozoarces americanus*
Pollock	*Pollachius virens*
Red hake	*Urophycis chuss*
Sand tiger shark	*Carcharhinus taurus*
Sandbar shark	*Carcharhinus plumbeus*
Scup	*Stenotomus chrysops*
Skipjack tuna	*Katsuwonus pelamis*
Smoothhound Shark Complex (Atlantic Stock)	*Mustelus canis*
Spiny Dogfish	*Squalus acanthias*
Summer flounder	*Paralichthys dentatus*
Tiger shark	*Galeocerdo cuvier*
White hake	*Urophycis tenuis*
White shark	*Carcharodon carcharias*
Windowpane flounder	*Scophthalmus aquosus*
Winter flounder	*Pleuronectes americanus*
Winter skate	*Leucoraja ocellata*
Yellowtail flounder	*Pleuronectes ferrugineus*

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 NY Project Area (NOAA Fisheries 2018a). All seagrass is HAPC for summer flounder; the nearest seagrass is located inshore of Jones Beach, Long Island, which is approximately 5 nm (9.3 km) from the submarine export cable corridor.

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 NY 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 NY Project Area.

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 NY Project include the horseshoe crab, Jonah crab (*Cancer borealis*), and blue crab (*Callinectes sapidus*). 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).

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), possibly in the NY Project Area. One horseshoe crab was observed during the Applicant's 2020/2021 benthic surveys. Most horseshoe crab spawning occurs south of the NY Project Area in Delaware Bay and other warm coastal waters.

The Jonah crab is commercially and recreationally harvested in the NY 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 2018c).

The blue crab, which is managed by NYSDEC, shares shallow coastal bay habitat with the horseshoe crab, but also ventures into less saline habitats (NYSDEC 2016a, 2020). Adults are associated with structures and submerged aquatic vegetation, but also occur over unvegetated sandy, clay, and mud substrates (NJ SeaGrant 2014).

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 NY Project Area include summer flounder (fluke), sea robins, black sea bass, striped bass (*Morone saxatilis*), scup, bluefish, and tautog (*Tautoga onitis*).

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 NY Project Area can generally be categorized as the following:

- Lobster and crab fisheries (lobster, blue crab, and horseshoe crab),
- Finfish (marine/estuarine finfish), and
- Shellfish and whelk (clam/mussel/oyster/scallop digging, clam dredging, and whelk/conch pots).

Shellfish prohibitions apply for the backbarrier lagoon portions of the NY Project Area (see Figure 4.6-1).

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 described in Section 4.6.1 and discussions with the fishing industry have helped identify the extent of fishing activity and the various gear types used in the NY Project Area.

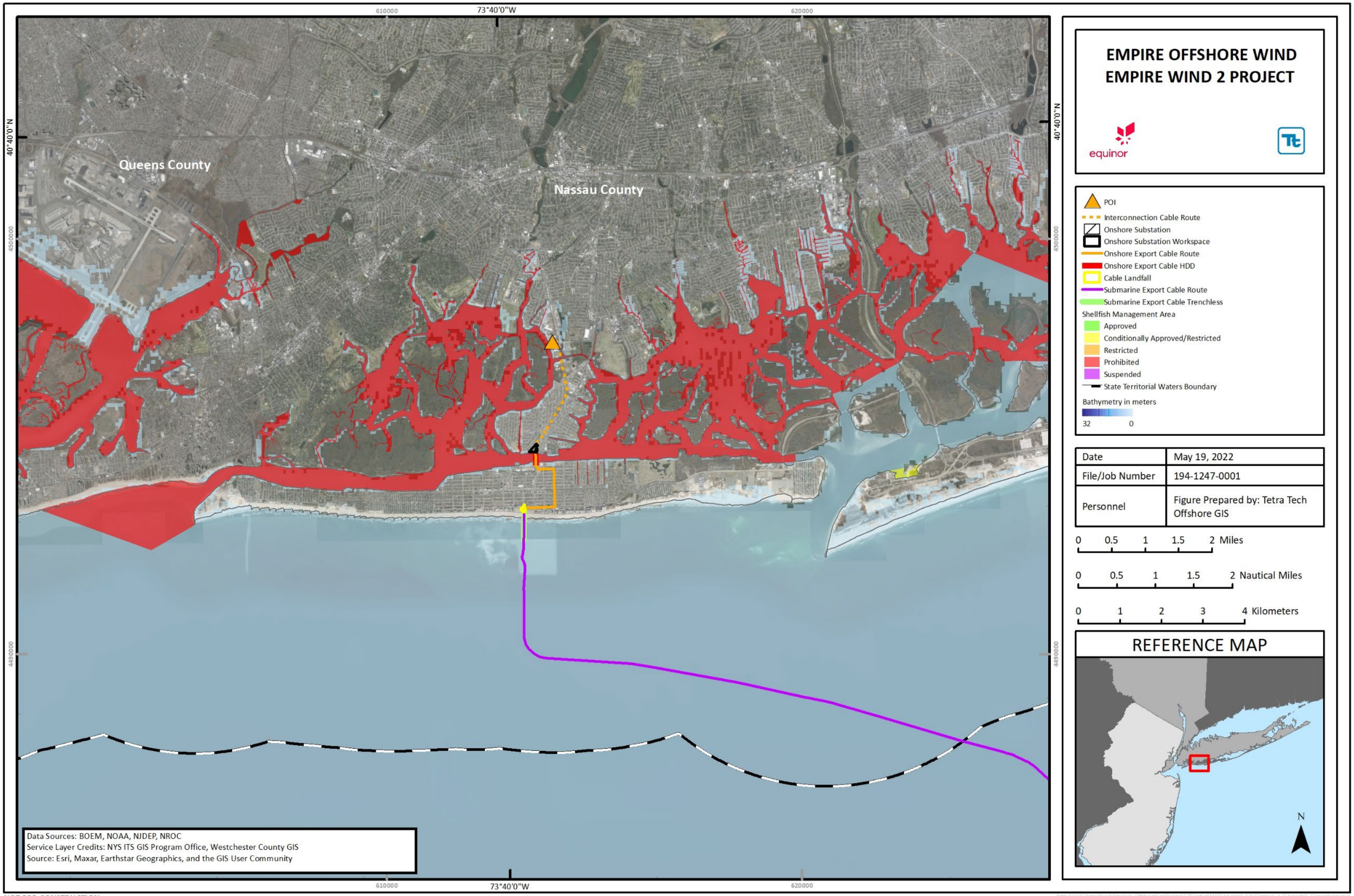


Figure 4.6-2 Shellfish Areas in the NY Project Area

4.6.4 Potential Impacts and Proposed Mitigation: Fisheries and Benthic Resources

Potential impacts of construction, operation, and maintenance of the NY 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

Installation of the submarine export cables and cable protection may affect 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, dredging and armoring activities. These activities will 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/or dredging, which may be completed throughout the NY Project Area prior to cable installation will disturb the bottom in a manner similar to clam dredges and trawls. Such short-term disturbance will injure or kill individual organisms within the immediate cable route but will 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 will 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 will be displaced by the jetting (or other installation equipment) as the cables were installed. The cable installation will move slowly, which will 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 may be crushed or buried. Shelled mollusks 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 will not cause physical breakage of surfclam shells. The cable installation will remain in a given area for only a few hours, representing a transient impact on fish and invertebrates. Surfclams, ocean quahogs, and other burrowing bivalves will use their muscular foot to reposition themselves at the desired depth in the sediment after the cable installation is complete.

The Applicant has conservatively assumed that 10 percent of the NY Project's submarine export cable route will require armoring (surface protection), mostly in areas where sufficient burial cannot be achieved (e.g., at cable and pipeline crossings). Armoring material will be lowered into place from a construction vessel, which will be stabilized by dynamic positioning, spuds, or anchors. Mobile fish and invertebrates will likely leave the area to avoid the noise and physical disturbance during armoring. Sessile organisms within the armored area that are injured or buried by the armoring material will 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 will be suspended and turbidity will 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. 2016).

During the brief disturbance of the bottom as the cable is installed, turbidity will temporarily increase, temporarily reducing visibility and altering the behavior of some fish and invertebrates in the immediate vicinity. 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 will be transient and similar to those described for other large mobile demersal crustaceans such as lobster and swimming crabs.

Sediment modeling for the NY Project indicates that suspended sediment will 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 NY 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 2015).

Suspended sediments from construction activities will settle in and adjacent to the submarine export cable routes. The duration and height of the suspended sediment above the bottom is influenced by particle size and bottom currents. Along the submarine export cable routes, pre-sweeping activities may result in the side-casting of material along sandwaves and megaripples; at submarine cable and pipeline asset crossings, material has the potential to be sidecast or removed (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 modeling indicates that measurable sediment deposition will 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 NY 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 will 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 will be short-term and minor. This disturbance will 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 NY 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 NY Project Area will 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 to be within three years (NOAA Fisheries 2015).

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. However, constituents of concern 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 is not likely to cause an increase in contaminant uptake by local organisms. Direct and indirect adverse impacts on fish and invertebrates exposed to suspended sediment will be short-term, minor, and localized.

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 will require all construction vessels to minimize the risk of fuel spills and leaks, as detailed in the Applicant's OSRP; vessels will not refuel at sea. Construction vessels will 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 and if they occur, impacts will be short-term, negligible, and localized.

NY Project-related marine debris could have an indirect short-term and minor effect on fish and invertebrate resources. However, the Applicant will 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 will move continuously, affecting a given area for a brief time. The area of impact will 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 are likely to be killed, the loss would not be detectable against the background of existing vessels, including hydraulic scallop and clam dredges, in the NY Project Area.

Disturbance of Common Softbottom Sandy Habitat. 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 will 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 sandwaves and sandripples as natural processes constantly reshape the mobile sediments to create a dynamic mosaic of microhabitats (NOAA Fisheries 2018b). The sandwaves and sandripples are expected to reform and provide pre-construction conditions within a few months of cable installation. The only permanent alteration of habitat will be up to 11.5 ac (4.65 ha) of softbottom in the cable corridor that is converted to hardbottom by cable armoring. The remainder of the submarine export cable corridor will remain softbottom habitat.

Minor Short-Term Increase in project-related Noise and Vibrations. The NY Project will generate noise during construction that could directly and indirectly affect marine fish and invertebrates. Construction activities such as jetting, project-related vessel noise, and pile driving associated with the bulkhead replacement at the onshore substation, and installation of the landfall cofferdams will temporarily increase underwater noise in the NY Project Area; this increase in noise has 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 sound 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 4.6-2**).

Table 4.6-2 Relative Sensitivity of Fish and Invertebrates to Sound

Morphological Type	Vulnerability to Barotrauma	Vulnerability to Sound Pressure	Typical Species in NY 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 NY Project construction, pile driving used to install the bulkhead upgrades at the onshore substation, the potential cable landfall cofferdam and/or cable landfall goal posts, and installation of the cable bride at Barnums Channel will 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), sheet piles and support piles. 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 will be conducted to determine appropriate mitigation measures to minimize temporary impacts.

Vessels used for construction will introduce noise into the NY 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) will 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 will be short-term, localized, and negligible.

4.6.4.2 Operations and Maintenance

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 NY Project Area. Noise from project-related operations and support vessels will not contribute substantially to ambient noise levels in the NY Project Area. Vessel activity will be generally within the ambient noise area of established navigational channels and ports utilized by commercial and recreational vessel traffic and will be indistinguishable from those sound sources. The acoustic impact of O&M vessels on fish and invertebrates will 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 NY 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 constituents of concern from re-suspended sediments is not expected to exceed background levels during natural events. Turbidity events will be transient and impacts on fisheries and benthic resources would be negligible.

All project-related vessels will 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 will generate EMF in the NY 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 NY Project Area, and the Applicant's commitment to cable burial, impacts of energized cables on fish and invertebrates will 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 may be detectable by some benthic fish and invertebrates but will 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 36 ft (11 m) wide cable protection area was conservatively assumed for remedial cable protection and a 53 ft (16 m) wide cable protection area is assumed for utility crossings. Approximately 11.5 ac (4.65 ha) of the 7.7 nm (14.2 km) long submarine export cable corridor would be armored.

The armored areas will 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 are expected to emigrate from adjacent habitats or recruit from the plankton and reestablish the infaunal and epifaunal communities in adjacent softbottom habitats.

On balance, the NY Project's impact on benthic and pelagic habitat will 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 will 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 NY 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 Applicant'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 into 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 Sensing and Distributed Vibration Sensing equipment to monitor the submarine export cables. The Distributed Temperature Sensing system will be able to provide real time monitoring of temperature, alerting the Applicant should the temperature change, which often is the result of a change in cable burial depth, for example caused by scouring of cable covering material. The Applicant will also conduct surveys of the submarine export cables to confirm the cables have not become exposed or that the cable protection measures have not worn away. A Distributed Vibration Sensing system will be integrated within the submarine export cables to provide real time vibration monitoring close to the cables, which may indicate potential dredging activities or anchor drag occurring close to the cables. Upon receiving any such alert, the Applicant will warn vessels in the area, investigate the cable condition and identify and take corrective actions, if necessary. In the event of a fault or failure of the offshore components, the Applicant will repair and replace the NY Project component in a timely manner. Should a submarine export cable 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 burial surveys 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 and impact the submarine export cables. The activities requiring deepest burial in the NY 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.

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 NY 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 NY 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 NY 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 NY Project Area consists of the submarine export cable corridor, and the onshore NY Project Area consists of the cable landfall, onshore export and interconnection 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 NY Project Area was conducted using the following resources:

- 2019 National Land Cover Dataset: Land Cover Conterminous United States (Dewitz 2019);
- 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. Long Beach, Island Park, and Oceanside, New York; and
- USFWS IpaC (USFWS 2018a).

Natural Heritage Database inquiries were submitted to NYSDEC Division of Fish and Wildlife on August 22, 2019, July 10, 2020, April 20, 2021, and May 9, 2022 to determine potential New York State and federally protected wildlife species likely to be present in or near the NY Project Area, with responses received on September 20, 2019, August 21, 2020 and June 3, 2021, respectively. Correspondence was updated as refinements were made to the NY Project location.

The NYSDEC provided a list of species that have been documented in the vicinity of the cable landfall, onshore export and interconnection 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 NY Project Area. Additional species data 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 NY Project Area was primarily compiled from eBird citizen science data (Sullivan et al. 2009; eBird 2019).

The Applicant conducted a field reconnaissance of terrestrial vegetation and wildlife habitat in the NY Project Area on November 4, 2021 in conjunction with wetland delineation surveys (see Section 4.4 and **Appendix D**). As part of this field reconnaissance, habitats within the potential NY Project limits of disturbance were assessed and assigned appropriate community classifications according the 2014 Ecological Communities of New York State, Second Edition (Edinger et al, 2010). The field reconnaissance was conducted from publicly-accessible road rights-of-way, with the exception of the onshore substation site, which was assessed in its entirety. Other portions of the NY Project onshore export cable and interconnection cable corridors were not accessible at the time of field surveys.

4.7.1.2 Offshore Studies and Analysis

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

- NOAA National Estuarine Research Reserves (NOAA 2018);
- NOAA EFH Mapper (NOAA Fisheries 2018a);
- NOAA Species/Critical Habitat Information & Maps in the Greater Atlantic Region (NOAA Fisheries 2020)
- 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, 2020, 2021).

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 NY Project Area were 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. 2016a, 2016c, 2017, 2018, 2020, and 2021; 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 (Normandeau Associates and APEM 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 NY Project Area waters.

Additional data sources not specific to the EW 2 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 NY Project.

The offshore NY Project Area includes the submarine export cable corridor from the New York State boundary 3 nm (5.6 km) offshore to the cable landfall. The offshore and nearshore NY Project Area includes marine and estuarine habitats of New York Bight. Marine and estuarine habitats also include tidal channels such as Reynolds Channel and Barnums Channel that are crossed by the onshore export and interconnection cable routes, as further described in Sections 4.2 and 4.6.

The onshore NY Project Area is broadly located within developed landscapes of the Town of Hempstead, City of Long Beach, and Village of Island Park, primarily along or within existing roadway and railroad corridors. Natural vegetation is limited; the vegetation within the NY Project Area almost entirely consists of landscape plants, including trees, shrubs, other ornamental plants, and maintained grass (with exceptions noted below). This includes landscaped areas along roadways, within roadway medians, and in local parks.

The cable landfall onshore workspace is located on Riverside Boulevard and comprises a paved road and a vacant lot with a gravel surface devoid of vegetation. The proposed onshore substation will be located within developed lands of medium to high development intensity (Dewitz 2019). Based on the 2019 NLCD data, the onshore export and interconnection cable routes are situated within developed lands of variable development intensity.

4.7.2.1 Protected Species

Federally and state-listed threatened and endangered species identified as potentially occurring in the NY Project Area based on the USFWS IPaC (2018a), NOAA Fisheries ESA Section 7 mapper tool (2020), Stock Reports (Hayes et al. 2018, 2019, 2020, 2021), NYSDEC correspondence, and other reviewed data sources are summarized in **Table 4.7-1**. No critical habitats, NYSDEC Areas of Concern, Critical Environmental Areas or NYSDOS Significant Coastal Fish and Wildlife Habitats have been identified in the NY 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 and Rare Species Potentially Occurring in the NY Project Area

Common Name	Scientific Name	Location/Habitat within the NY Project Area	New York Status a/	Federal Status a/
Plants				
Seabeach Amaranth	*Amaranthus pumilus*	Coastal	T	T
Sandplain Gerardia	*Agalinis acuta*	Not Identified	E	E
Birds				
Harlequin Duck	*Histrionicus*	Coastal	NL b/	NL b/

Common Name	Scientific Name	Location/Habitat within the NY Project Area	New York Status a/	Federal Status a/
Common Tern	*Sterna hirundo*	Marsh	T	NL
Forster's Tern	*Sterna forsteri*	Marsh	NL b/	NL b/
Gull-Billed Tern	*Gelochelidon nilotica*	Coastal	NL b/	NL b/
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
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
Sperm Whale	*Physter microcephalus*	Offshore Waters	E	E
Sei Whale	*Balanoptera borealis*	Offshore Waters	E	E
Northern Long-eared Bat	*Myotis septentrionalis*	Not identified	T	T
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 c/	T/E c/
Leatherback Sea Turtle	*Dermochelys coriacea*	Coastal; and Offshore	E	E
Atlantic Hawksbill	*Eretmochelys imbricate*	Not Identified	E	E
Finfish				
Atlantic Sturgeon	*Acipenser oxyrinchus oxyrinchus*	Coastal and offshore	NL	E
Shortnose Sturgeon	*Acipenser brevirostrum*	Hudson River	E	E
Insects				
Monarch Butterfly	*Danaus plexippus*	Not Identified	NL	C

Notes:
a/ T= Threatened, E=Endangered, DL= Delisted, NL= Not listed, C=Candidate
b/ These species are not federally and state listed as threatened or endangered, but have been identified in NYSDEC consultation as rare species potentially occuring in the vicinity of the NY Project.
c/ Individuals from the threatened population of the North Atlantic District Population Segment are more likely to be found in the NY Project Area than individuals from other Distict Population Segments.

In 2019, NYSDEC 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 (NYSDEC 2019c).

Plants

Two federally listed plant species, the seabeach amaranth (*Amaranthus pumilus*) (threatened) and the sandplain gerardia (*Agalinis acuta*) (endangered), were initially identified on the USFWS IPaC (2018a) as potentially present within and/or near the onshore components of the NY Project. However, because sandplain gerardia was not identified on the most recent IPaC update for the NY Project (as of March 3, 2022) and is not recorded in the New York Natural Heritage Program database in the vicinity of the onshore NY Project Area, based on NYSDEC correspondence, it will not be discussed further in this section.

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. 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 66 ft (20 m) wide, and typically inhabit between the wrack line and the first dune (NYNHP 2020a). The combination of 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.).

According to consultation from the NYSDEC, the New York Natural Heritage Program database does not have records of seabeach amaranth in the vicinity of the proposed cable landfall in the City of Long Beach and the onshore NY Project Area. Moreover, since the Applicant is avoiding direct trenching across the beach at the cable landfall via HDD installation of the export cables, seabeach amaranth is not expected to be affected within the NY Project Area. Only limited temporary access across beach habitat may be required to adjacent to the selected HDD staging and pipe fabrication area (see Section 4.1).

Birds

Based on the USFWS IPaC (2018a) review, three species listed under the ESA may be present in the vicinity of the NY Project Area: the piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), and roseate tern (*Sterna dougallii*). Piping plovers nest along New York and New Jersey beaches, and will also migrate (spring and fall) through the region to and from northern breeding sites. Red knots pass through the region during migration in transit to far northern breeding sites. Roseate terns also fly through the Mid-Atlantic region on their way north to breeding sites in New York and New England.

Additionally, correspondence from NYSDEC indicated that a state-listed species common tern (*Sterna hirundo*) has been documented in the vicinity of the onshore export and/or interconnection cable routes (see **Appendix A** for agency correspondence). Other bird species of concern in the vicinity of the onshore export and/or interconnection cable routes include Forster's tern (*Sterna forsteri*) and Gull-billed tern (*Gelochelidon nilotica*). Harlequin duck (*Histrionicus histrionicus*) is a rare species that may occur along the submarine export cable route offshore of the cable landfall area.

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 56 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 NY 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, but 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, 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 2019). 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 2019). 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).

Piping plovers are known to nest east of the NY Project Area on Lido Beach, where the nests are actively monitored. Nests on Lido Beach fledged 26 chicks from 14 pairs in 2018 (Dazio 2018). Correspondence from NYSDEC did not identify breeding records closer to the cable landfall in the City of Long Beach.

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).

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 2014a). 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).

Common Tern (*Sterna hirundo*)

Common terns are similar in appearance to roseate terns, with darker wingtips, a more compact structure with a thicker bill. Common terns also have light gray upperparts and a black cap in adult breeding plumage. They are colonial breeders, arriving at colonies, which may be mixed with other tern species, from late April to mid-May and depart for wintering grounds by mid-October (NYSDEC 2022a). Nesting is on open sand, gravel, shell or cobble, with some scattered vegetation or cover areas. They are present in New York from April to September (NYSDEC 2014b). Threats include human disturbance and development, high predation rates, flooding and climate change (NYSDEC 2014b). Common terns, along with least terns (*Sterna antillarum*) and black skimmers (*Rynchops niger*), are known to breed on Lido Beach, which is to the east of the NY Project Area. Correspondence from NYSDEC did not identify breeding records closer to the cable landfall in the City of Long Beach but did note records in the vicinity of the onshore export and interconnection cable routes traversing the Village of Island Park.

Bats

The only federally listed bat species with potential to occur within the onshore NY Project Area is the northern long-eared bat. Under the ESA, the northern long-eared bat is listed as threatened. The northern long-eared bat hibernates in caves, mines, and other locations (e.g., possibly talus slopes) in winter, and spends the remainder of the year (March–November) in forested habitats (Brooks and Ford 2005; Menzel et al. 2002). During the non-winter hibernation, the species prefer to roost in clustered stands of large trees with living and/or dead trees that have shelter (loose bark, crevasses, large cavities), and forage under the forest canopy above freshwater, along forest edges, and along roads (MA NHESP 2015). At summer roosting locations, the bats form maternity colonies. These consist of aggregations of females and juveniles and are where females give birth to young in mid-June (USFWS 2016). Roosting tree selection varies and the size of tree and canopy cover changes with reproductive stage (USFWS 2016). Adult females and juveniles able to fly remain in maternity colonies until mid-August, at which time the colonies begin to break up and individuals begin migrating to their hibernation sites (Menzel et al. 2002). Bats will continue to forage around the hibernacula site and mating occurs prior to entering hibernation in a period known as the fall swarm (Broders and Forbes 2004; Brooks and Ford 2005). Throughout the summer months and during breeding, the species have small home ranges of less than 25 ac (10.1 ha) (Silvis et al. 2016). Migratory movements, however, can be up to 170 mi (274 km; Griffin 1945).

Due to impacts from white-nose syndrome (WNS), a fungal pathogen that leads to high mortality in hibernating bats, the species has declined by 90 to 100 percent in most locations where the disease has occurred, and declines are expected to continue as the disease spreads throughout the remainder of the species' range (USFWS 2016; WNSRT 2019). The devastating and ongoing impact of WNS on the northern long-eared bat resulted in the species being listed as threatened under the ESA in 2015. WNS was first detected in New York in 2006 and New Jersey in 2008 (WNSRT 2019).

Northern long-eared bats may be present in the vicinity of the NY Project, in areas of fragmented forested land near suitable habitat and known populations on Long Island. Long Island has a persistent federally threatened northern long-eared bat population that appears to have some resistance to WNS (Fishman 2013; Young 2019; WNSRT 2019). No known hibernacula or maternity roost trees are located near the NY Project in New York (USFWS NYFO 2019).

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).

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 NY Project. Federally or state-listed T&E marine mammals with the potential to occur in the NY 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.

MMPA species that may be present in nearshore waters (meaning waters along the shoreline) of the NY 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 a Species of Special Concern in New York State), harbor seal (*Phoca vitulina*), and gray seal (*Halichoerus grypus*).

Some marine mammal species found in U.S. waters are also 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** are additionally protected by the MMPA.

ESA-listed large whales that may occur in the region include the North Atlantic right whale (*Eubalaena glacialis)*, fin whale (*Balaenoptera physalus*), sei (*Balanoptera borealis*),), and sperm whale (*Physeter macrocephalus*); however, sperm whales are highly unlikely to occur in the NY Project Area. 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 New York. The sei whale has been acoustically detected offshore of New York in all seasons except summer; however, its geo-location is unknown (WHOI 2018; WCS Ocean Giants 2020) and is only uncommonly observed. The blue whale has been seen in fall and winter including just off Sandy Hook, New Jersey, and has also been acoustically detected in fall, winter and spring. The blue whale has not been observed in the EW 2 Project Area.

Most of the large whales found in EW 2 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. Sperm whales would not be expected to occur in the shallower water depths of the NY Project Area, though they are commonly found in all seasons in the deeper offshore waters of the OCS on the shelf break (Tetra Tech and SES 2018; Tetra Tech and LGL 2019 and 2020).

Sei, blue and sperm whales are considered to be rare and are not expected; therefore, these species will not be discussed further in this analysis. The following subsections provide additional information on the biology, habitat use, abundance, distribution, and existing threats to the marine mammals that are considered common in the waters of the New York Bight.

Of the large whales most frequently detected in EW 2 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 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 to Long Island for occurrence of Atlantic large whales (e.g,, fin whale and right whale). Additionally, correspondence from the NYSDEC identified both humpback whale and fin whale as species documented in offshore waters along the submarine export cable route.

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.

North Atlantic Right Whale (Right Whale) (*Eubalaena glacialis*)

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 (Roberts et al. 2018b; 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 kilometers per hour [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 submarine export cable corridor in New York traverses this SMA (**Figure 4.7-1**).

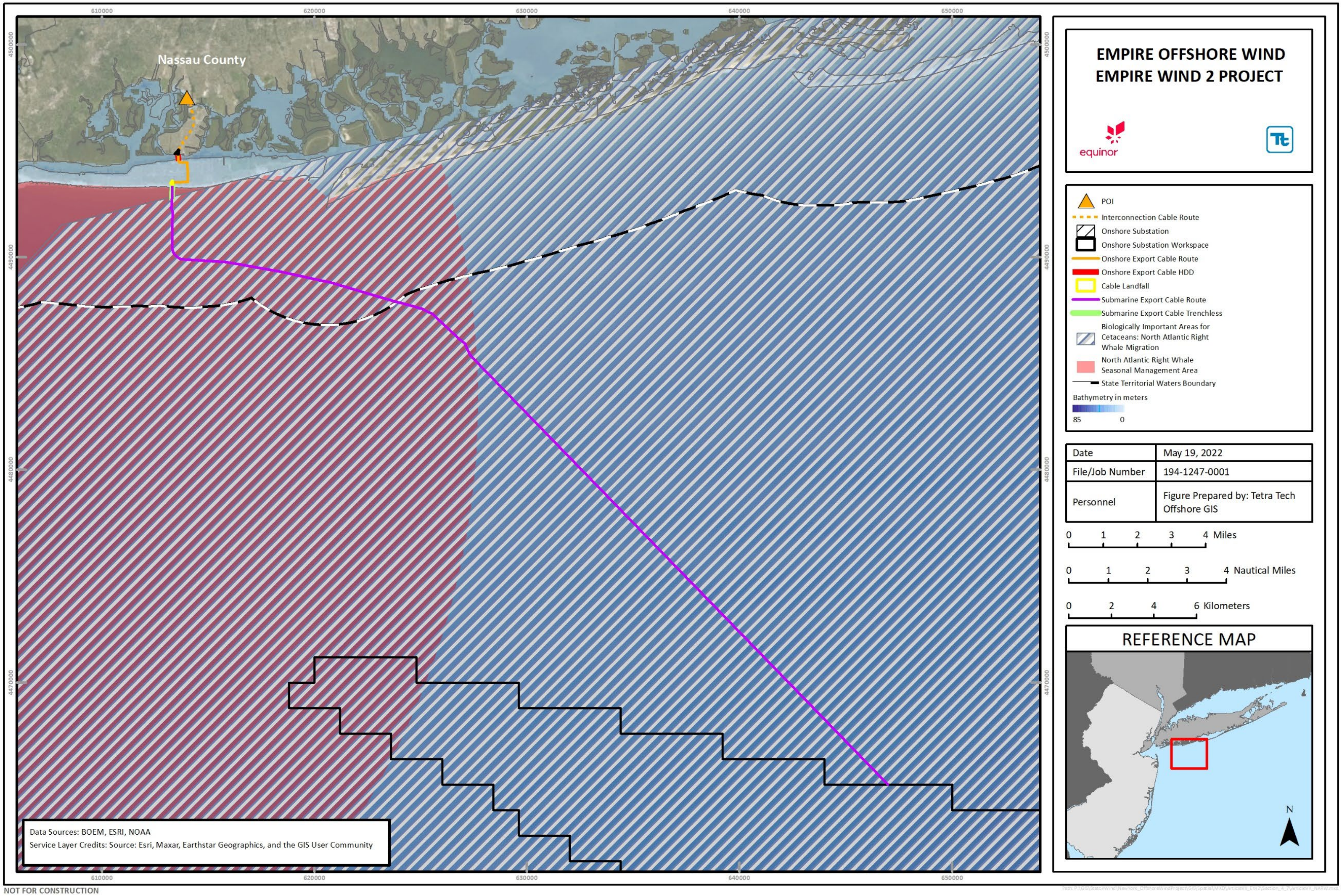


Figure 4.7-1 North Atlantic Right Whale Seasonal Management Area and Biologically Important Area

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 (Normandeau Associates and APEM 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). In a large analysis of multiple acoustic datasets over a 10-year period covering the Atlantic from Florida to Greenland, Davis et al. (2017) found year-round acoustic presence of right whales in the Atlantic with the lowest rates of call detections in the summer and highest rates in the late winter and spring. This study reports trends that indicate the right whale may be shifting its range from previously prevalent occurrences in northern grounds (e.g., Bay of Fundy and the Gulf of Maine) to more frequent occurrences in the Mid-Atlantic regions throughout the year. 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 2 Project and near the OCS and are less likely to occur in New York State waters and the NY Project 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 2018c). 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., Normandeau Associates and APEM 2018a, 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 occasional 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 2 Project and are possible but less likely to occur in the NY Project Area.

Humpback Whale (*Megaptera novaeangliae*)

The humpback whale was listed as endangered under the ESA in 1970, but the status was revised according to distinct population segments (DPSs), some of which are no longer listed as endangered or threated as of 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 DPS, which are not considered threatened or endangered. While humpback whales along the East Coast of the US 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 state 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 2018c). 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 2 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 NY Project Area.

Humpback whales are one of the most common species seen in New York Harbor and the greater New York Bight area 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 NY 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. These species include 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 extralimital and 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 NY Project Area, along the submarine export cable corridor. The NOAA Fisheries ESA Section 7 Mapper (NOAA Fisheries 2020) indicates the possible presence of sea turtles throughout the offshore NY Project Area south of the Long Beach barrier island. 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. 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 NY Project has been routed to avoid sensitive benthic habitats to the extent feasible.

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

Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)

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 turtles inhabit open-ocean areas within the North Atlantic Ocean. The northern extent of this species' range is considered to be Nova Scotia, although northern travel is typically only noticed during the juvenile stage. Primary habitation tends to be in the Gulf of Mexico, with large juveniles and adults moving towards benthic, nearshore habitats along the U.S. Atlantic and Gulf coasts (Lazell 1980). This stage typically includes sounds, bays, estuaries, tidal passes, shipping channels, and beachfront waters within warm-temperate to subtropical conditions (Lutcavage and Musick 1985). Within the vicinity of the EW 2 Project, juveniles primarily occur (NYSERDA 2017b; Normandeau Associates and APEM 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, anywhere 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 2 Project, particularly in summer but also into the fall. Thus, the Kemp's ridley sea turtle may occur in the NY Project Area, though at lower frequencies other sea turtles.

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 2 Project (either as juveniles or adults) are most frequently from the North Atlantic DPS (federally listed as threatened).

As the largest species of 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 2 Project. The species may occur in the waters of the Long Island Sound but is unlikely to occur in the NY 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 (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 2 Project and the NY Project Area.

Leatherback Sea Turtle (*Dermochelys coriacea*)

The leatherback sea turtle is federally and state-listed as endangered. 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 2 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), which is to the west of the NY Project Area.

This species is typically found offshore and may occur in federal waters of the EW 2 Project but is unlikely to occur in the NY Project Area.

Finfish

Two federally and state listed finfish species potentially occur in the NY 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, but with no overlap of Designated Critical Habitat. Shortnose sturgeon are not included along the submarine export cable corridor in the NOAA Fisheries ESA Section 7 mapper tool (NOAA Fisheries 2020) and are less likely to occur, as they generally don't disperse beyond coastal estuarine waters associated with large river systems, such as the Hudson River (NYSDEC 2019h) beyond the Verrazzano-Narrows Bridge, and therefore are unlikely to reach the coastal habitats of the NY Project Area in southern Long Island.

Harvested fishes and macroinvertebrates with designated EFH, as managed under the MSFCMA or other fisheries programs, occur throughout the NY Project Area, although restrictions for shellfish harvest exist within the back bays and Reynolds Channel portion of the NY Project Area (see Section 4.6). Information on managed species and designated EFH found within the NY 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 NY 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 2017). 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). Known aggregation areas for Atlantic sturgeon, such as the area between Sandy Hook NJ and East Rockaway NY (Dunton et al. 2015) to the west of the NY Project Area, overlap with high concentrations of vessel traffic, potentially increasing the risk of vessel strike. In the lower Hudson River, 69 Atlantic sturgeon mortalities between 2007 and 2015 were suspected of being attributed to vessel strikes (NOAA Fisheries 2016). In southern New Jersey's Delaware Estuary, 14 Atlantic sturgeon deaths were attributed to vessel strikes (Brown and Murphy 2010).

Atlantic sturgeon may occur in the NY Project Area; however, the NY 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 2017). Atlantic sturgeon form aggregations that are concentrated along the coasts of New York and New Jersey generally within 5 mi (8 km) of the shoreline (Dunton et al. 2010; Frisk et al. 2019). According to Dunton et al. (2015), Atlantic sturgeon are largely confined to water depths less than 65.6 ft (20 m), and aggregations tend to occur at the mouths and nearshore waters of large bays or estuaries (e.g., Hudson River) during the fall and spring, then disperse throughout the Mid-Atlantic Bight during the winter.

The NOAA Fisheries ESA Section 7 mapper tool (NOAA Fisheries 2020) includes the coast south of the Long Beach barrier island and the back bay areas of West and Middle Hempstead Bays as areas where Atlantic Sturgeon may opportunistically forage year round during migration along the coast to and from spawning areas. Aggregation areas have also been documented between Sandy Hook NJ and East Rockaway NY and along the southern coast of Long Island, particularly between May through November (Dunton et al. 2015). Aggregation areas include the area off the southern shore of the Long Beach barrier island, which is crossed by the NY Project. The highest catches of Atlantic sturgeon within the New York Bight occurred in waters 32.8 ft to 49.2 ft (10 to 15 m) deep, particularly during the early spring and early fall. The seasonal migratory patterns of the Atlantic sturgeon are a south-westward migration during the spring increase in sea surface temperature and a north-eastward migration during winter, when water temperatures are lowest (Melnychuk et al. 2017).

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. While concentrated within rivers/estuaries, shortnose sturgeon do venture into/along nearshore coastal habitats to migrate between region. As such, this species may transit through the NY Project Area and may be temporarily exposed to project-related activities but is not expected to be adversely affected by the NY Project.

Insects

Monarch Butterfly (*Danaus plexippus*)

On December 17, 2020, the USFWS released its determination that listing the monarch butterfly as endangered or threatened is warranted but precluded by higher priority actions. The USFWS will develop a proposed rule to list the monarch butterfly as priorities allow (USFWS 2020).

Monarchs feed on the nectar from a variety of flowering plants but can only lay eggs on milkweed plants (primarily *Asclepias* spp.). Larvae emerge after two to five days. Larvae develop through five larval instars (intervals between molts) over a period of 9 to 18 days, feeding on the milkweed host and sequestering toxic chemicals (cardenolides) as a defense against predators. The larva then pupates into a chrysalis before emerging 6 to 14 days later as an adult butterfly. There are multiple generations of monarchs produced during the breeding season, with most adult butterflies living approximately two to five weeks (USFWS 2022). In New York, monarchs begin migrating in late August to overwintering habitat in the mountaintops in Central Mexico (NYSDEC 2022b).

As the monarch is currently listed as a Candidate species, there is no required action for the species, but any action to conserve the species is recommended. Due to the developed nature of the NY Project Area, suitable habitat for monarchs is limited but may be present along roadsides, fallow urban lots, and undeveloped open areas.

4.7.2.2 Important Habitats

To determine the important habitats potentially present in the NY 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, IBAs, NYSDEC-designated Significant Coastal Fish and Wildlife Habitat (SCFWH), 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 NY Project Area.

Wildlife Management Areas

New York State Wildlife Management Areas (WMAs) are lands owned by New York State and operated by the NYSDEC's Bureau of Wildlife. There is only one NYSDEC WMA on Long Island (NYSDEC, n.d.), the

Young's Island WMA in Suffolk County. This WMA consists of an island that was formed from dredge placement, accessible only by boat (NYSDEC 2019i). This WMA is located near Stony Brook, New York, more than 30 mi (48 km) to the northeast of the NY Project Area.

A USFWS property that is called the Lido Beach WMA is located closer to the NY Project, on the north/bay side of the Long Beach barrier island, at the location of a former Nike missile site (USFWS, n.d.). This area is part of the USFWS Long Island Wildlife Refuge Complex and is not open to the public. State-designated Lido Beach State Tidal Wetland is located immediately to the east of the WMA. Lido Beach WMA is located approximately 1.8 mi (2.9 km) northeast of the NY Project.

There are no WMAs crossed by the NY Project.

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. The only Critical Environmental Area in Nassau County is Jamaica Bay.

There are no Critical Environmental Areas within the NY 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 NY 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 NY Project.

Estuarine 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 2019j). There are no National Estuarine Research Reserves crossed by the NY Project.

Estuarine habitats along the south shore of Long Island are protected by the Long Island South Shore Estuary Reserve (SSER) Act under the management of the SSER Council pursuant to New York State Executive Law Article 46. This act states that the tidal waters located between the southern shore of Long Island and the coastal barrier beaches, referred to as the South Shore Estuary, constitute a maritime region of statewide importance. The SSER Council prepared a Comprehensive Management Plan, which recommends that projects involving construction within the SSER incorporate best management practices to control erosion and sedimentation before and during site preparation and construction and minimize detrimental effects on the water quality of waterbodies before and during site preparation and construction (SSER Council 2001).

Important Bird Areas

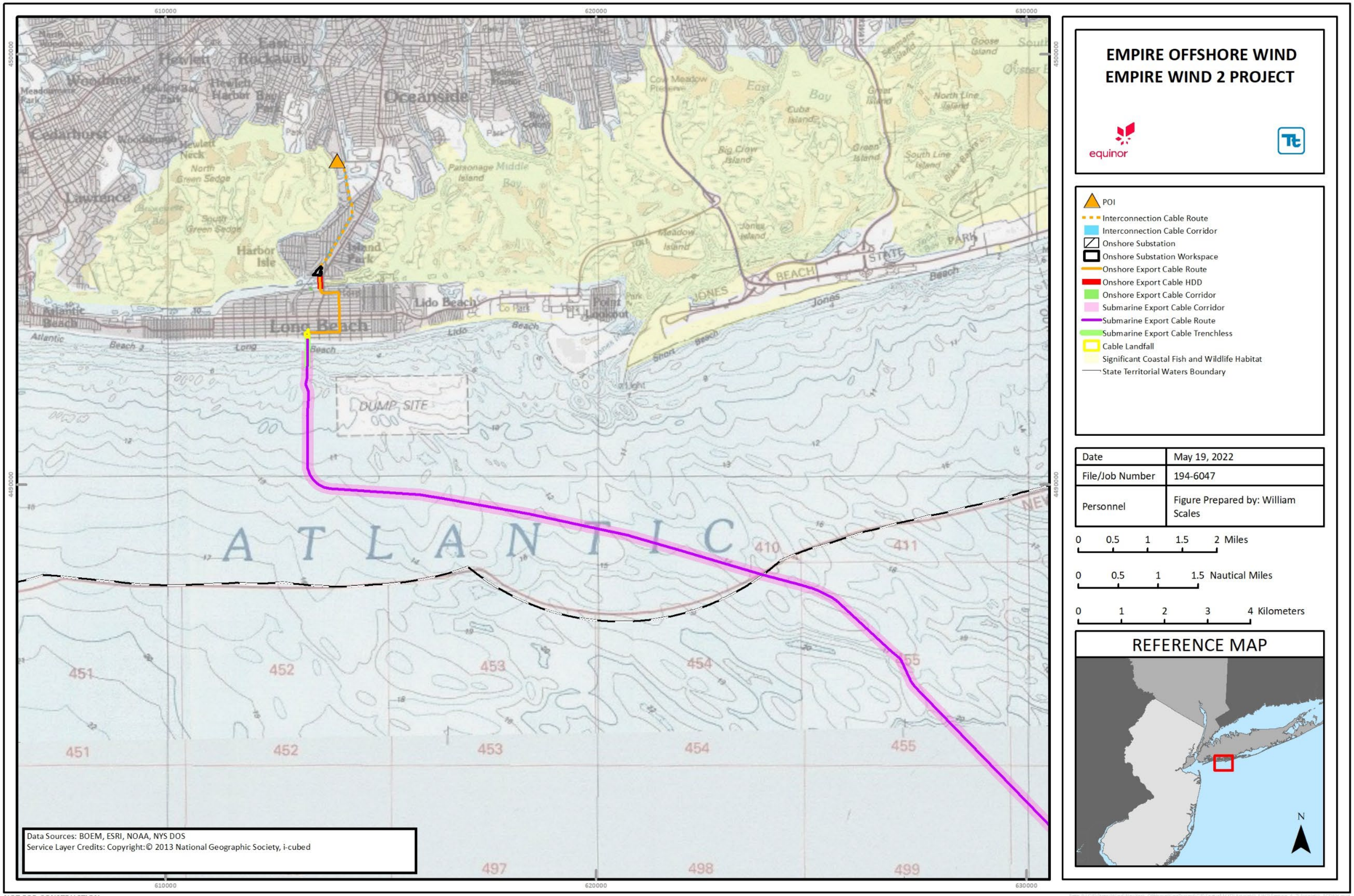
Important Bird Areas in the United States are identified by the National Audubon Society as part of an international collaboration to identify the most important places to support bird populations The onshore NY Project Area is surrounded by the West Hempstead Bay/Jones Beach West IBA, a global IBA. This IBA has over 60 recorded species known to occur, with known breeding of the piping plover and short-eared owl (National Audubon Society 2018). The nearshore submarine export cables, cable landfall and onshore export cable crossing at Reynolds Channel cross through the West Hempstead Bay/Jones Beach West IBA. This IBA does not include the islands of Long Beach and Barnum Island, although sand beach and dune systems, natural salt marshes, and spoil islands are included. Sand beach includes the Ocean Beach Park within the City of Long Beach in the vicinity of the cable landfall. Since the area is highly developed, the birds mostly likely to be present are common coastal, urban (some introduced), and upland species, and direct impacts to the beach habitat itself will be avoided by the HDD installation of the cable landfall.

Significant Coastal Fish and Wildlife Habitats

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).

Designated SCFWH in the vicinity of the NY Project is depicted in **Figure 4.7-4.** Designated SCFWH is present in the back bay areas to the east and west of the NY Project, associated with Middle Hempstead Bay and West Hempstead Bay. Middle Hempstead Bay and West Hempstead Bay are considered to be two of the largest undeveloped coastal wetland systems in New York State, with a significant nesting habitat for coastal shorebirds and colonial wading birds, as well as being a productive area for marine finfish, shellfish, and other wildlife (NYSDOS 2008a, 2008b).

The NY Project does not directly cross SCFWH a within the NY Project Area but is located in close proximity to SCFWH adjacent to the onshore export and interconnection cable route crossings at Reynolds Channel and Barnums Channel.



NOT FOR CONSTRUCTION

Figure 4.7-2 Significant Coastal Fish and Wildlife Habitat in the Vicinity of the NY Project

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.

Correspondence from NYSDEC (**Appendix A**) identified three significant communities as potentially occurring within the tidal channels in the vicinity of the NY Project interconnection cable. Two additional significant natural communities, both comprising sensitive beach habitats were additionally identified in the area of Lido Beach West Town Park to the east of the NY Project. Significant natural communities in the vicinity of the NY Project are depicted in **Figure 4.7-5.**

The significant natural communities potentially occurring within the tidal channels in the vicinity of the northern portion of the interconnection cable route are described as:

- Low Salt Marsh: a coastal marsh community that occurs in sheltered areas of the seacoast, in a zone extending from mean high tide down to mean sea level or to about 2 m (6 ft) below mean high tide. It is regularly flooded by semidiurnal tides. Low salt marsh grades into high salt marsh at slightly higher elevations, and into intertidal mudflats at slightly lower elevations. The vegetation of the low salt marsh is a nearly monospecific stand of smooth cordgrass (NYNHP 2021a).
- High Salt Marsh: a coastal marsh community that occurs in sheltered areas of the seacoast, in a zone extending from mean high tide up to the limit of spring tides. It is periodically flooded by spring tides and incoming, rising tides. High salt marsh grades into salt shrub and brackish meadow habitats at the upland border, and into low salt marsh and salt panne habitats at the seaward border. High salt marsh typically consists of a mosaic of patches that are mostly dominated by saltmeadow cordgrass or a dwarf form of smooth cordgrass (NYNHP 2021b).
- Salt Panne: a shallow depression in a salt marsh where the marsh is poorly drained. Pannes occur in both low and high salt marshes. Pannes in low salt marshes usually lack vegetation, and the substrate is a soft, silty mud. Pannes in a high salt marsh are irregularly flooded by spring tides or flood tides, but the water does not drain into tidal creeks. After a panne has been flooded the standing water evaporates and salinity of the soil water is raised well above the salinity of seawater. Characteristic plants of a salt panne include the dwarf form of smooth cordgrass, glassworts (*Salicornia depressa* and *Sarcocornia pacifica*), marsh fleabane (*Pluchea odorata*), salt marsh plantain (*Plantago maritima* ssp. *juncoides*), arrow-grass (*Triglochin maritimum*), spikegrass, sea-blites (*Suaeda* spp.), and salt marsh sand spurry (*Spergularia marina*) (NYNHP 2021c).

Based on the siting of the onshore export and interconnection cable routes predominantly along existing, disturbed rights-of-way direct impacts to Significant Natural Communities are not anticipated.

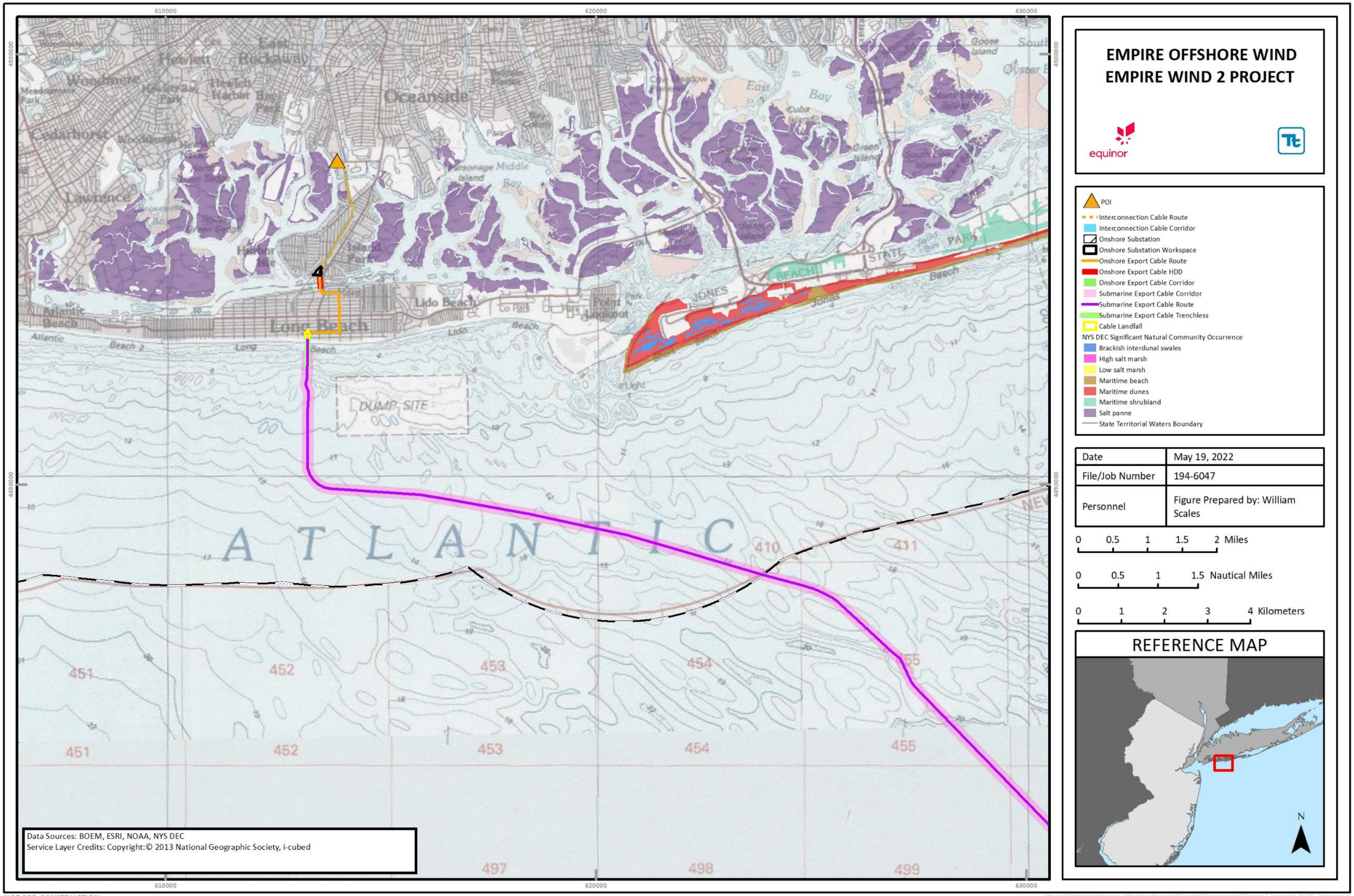


Figure 4.7-3 Significant Natural Communities in the Vicinity of the NY Project

Essential Fish Habitat

Harvested fishes and macroinvertebrates managed under the MSFCMA or other fisheries programs occur throughout the NY Project Area. Most of the managed species have designated EFH in the NY Project Area. Information on managed species and designated EFH found within the NY 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 NY 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 NY 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 NY Project within a highly developed area and use of HDD installation for the export cable landfall to cross the beach area, potential impacts to protected species and important habitat associated with onshore NY Project construction are anticipated to be minor or negligible. Disturbance caused by construction of the onshore NY Project facilities, including the cable landfall, onshore export and interconnection cables and the onshore substation, and may consist of the following potential impacts:

- Short-term, minor alteration of terrestrial habitat; and
- Short-term, minor disturbance and displacement from terrestrial habitat.

Protected marine species, including marine mammals, sea turtles, and sturgeon, may be present in or near the offshore NY 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 marine 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 NY Project:

- Siting of NY 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 NY 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 alteration of terrestrial habitat: During construction, the onshore export and interconnection cables and the onshore substation may require some tree removal. To minimize disturbance, the majority of the proposed onshore export and interconnection cable routes will be sited in already disturbed areas. Minimal clearing is possible at the onshore substation site.

Live tree and snag removal eliminates potential roosting opportunities for both cave and migrating bat species (Harvey et al. 2011). Removal of roost trees during the maternity season risks injuring juveniles that are unable to fly. Forest and forest edges provide a protected foraging environment that reduces the chances of bat predation. Forested habitat is also an important insect breeding ground to provide prey items for all bat species (Burford et al. 1999). If trees are entirely removed, there is a risk of eliminating habitat that may be important for insect richness and abundance (Didham 1997).

Due to the known presence of the northern long-eared bat on Long Island, the Applicant will comply with the New York State tree clearing restriction between November through March on Long Island, unless further agency coordination or studies indicate an exception to this restriction would not adversely impact these species.

Impacts to the nearshore and beach habitats will be avoided and minimized to the extent practicable through the use of HDD installation for the export cable landfall. Only limited temporary access across beach habitat may be required adjacent to the selected HDD staging and pipe fabrication area (see Section 4.1).

The Applicant proposes to implement the following additional measures to avoid, minimize, and mitigate potential impacts to protected species:

- Onshore components will be sited in previously disturbed areas, existing rights-of-way, or otherwise unsuitable bat summer habitat, to the extent practicable; and
- The Applicant will work with the applicable agencies to develop an appropriate tree clearing window if tree clearing is required within the restriction windows.

Short-term disturbance and displacement from terrestrial habitat: During construction, bird species may be temporarily displaced from nesting or foraging habitat due to noise, vibrations, and general human activity, even if permanent habitat alteration is not experienced. Birds are expected to return to the area once construction is complete in areas where habitat alteration is minor and/or temporary. Lighting not required during construction will be limited, as appropriate and practicable, to reduce attraction of avian and bat species.

Short-term disturbance of marine habitat and loss of prey species. Installation of the submarine export cables 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 NY 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 the 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 sea turtle species in the NY Project Area are most likely to occur near the continental shelf edge, some may also occur in nearshore portions of the NY 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 NY Project route.

Atlantic 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 then return when construction is complete. Thus, no permanent disturbance to or displacement from suitable habitat in the NY 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.

Short-term 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 NY 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.

Short-term increase in 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 NY 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.

Short-term increased risk of entrapment and entanglement. During construction, seabed preparation and the installation of the NY 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 NY 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 NY Project construction materials and activities will entangle marine mammal, sea turtle, or sturgeon species. In addition, NY 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 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 NY 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.

Short-term increase in underwater noise. Construction activities such as jet-plowing, project-related vessel noise, and sheet pile installation with a vibratory hammer for cofferdams and/or bulkhead upgrades will temporarily increase underwater noise in the NY 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.

Temporary sheet-pile cofferdams may be installed at the export cable landfall where the submarine export cables would transition from subsea burial in trenches to placement using HDD. The sheet piles would be placed in a tight configuration around an area approximately 20 ft by 50 ft (6 m by 15 m). It is anticipated that three cofferdams would be installed, one for each submarine export cable. Vibratory pile drivers used to install the cofferdams would temporarily elevate underwater sound pressure and particle velocities, which could affect marine wildlife in the vicinity.

Vibratory pile driving may also be used to perform bulkhead replacement along the shoreline of Reynolds Channel (see Section 4.1). 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. Cofferdams constructed on the submarine export cable near the cable landfall would be within open coastal waters where fish and other organisms would be free to adjust their location. In the vicinity of Reynolds Channel, vibratory pile driving would be within a relatively confined area. Marine mammals and sea turtles are not likely to be present within Reynolds Channel. Atlantic Sturgeon may be present within Reynolds Channel but limited to individuals that may stray into this estuarine habitat, since most Atlantic sturgeon in this part of Long Island are found in nearshore habitats, rather than inshore habitats.

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.

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 NY Project will cause an insignificant increase in vessel traffic, and the noise impact of vessel traffic from NY Project construction vessels will be short-term and negligible.

Short-term increased risk of 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 strikes occur 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; Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (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). 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 are also expected to be protective of 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 (Marine Mammal Commission [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 2018d).

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 NY Project Area. The NY Project Area is located within the New York Bight SMA; therefore, 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. 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 to the Project in the Mid-Atlantic U.S. SMA. The Right Whale Sighting Advisory System is a NOAA Fisheries program designed to reduce collisions between ships and the critically endangered right whale.

Short-term 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 NY 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 is also completing initial chemical analysis of the sediment and will take measures to minimize impacts during installation activities in the case that constituents of concern are 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 spill. 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 NY Project within a highly developed area, potential impacts to protected species and important habitat associated with onshore NY Project operations and maintenance are anticipated to be negligible. During operations, the potential impact-producing factors to protected aquatic species in the offshore NY Project Area may include the presence of new buried submarine export cables and vessel traffic associated with operation and maintenance of the NY 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.

Long-term 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 NY Project Area, alternate equivalent habitats exist outside of the NY 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 NY 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 NY 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).

Long-term project-related EMF. The installation of submarine export cable in the NY 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 NY 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 G 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 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).

Long-term Project-related underwater noise. Operations and maintenance activities will result in a slight increase in the ambient underwater noise in the NY Project Area. Noise from project-related operations and support vessel traffic is not anticipated to be greater than the ambient noise levels in the NY Project Area, as vessel traffic is expected to have an insignificant increase above the existing baseline conditions as a result of the NY Project. Nearshore vessel activity along the submarine export cable corridor during operations will be minimal and is only in expected for occasional survey activities and in the case a cable repair is needed.

Therefore, impacts from underwater sound due to NY Project construction, including vessel activity, will be negligible and are unlikely to affect biological resources in the NY Project Area.

Short-term change in water quality, including oil spills. During operations, routine maintenance activities will have the potential to result in temporary increases in turbidity and sedimentation in the NY 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 the reasons described above, such spills have potential 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.

Short-term 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 NY 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.

Long-term increase in 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 NY 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 NY 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 Letter of Authorization (LOA) for the NY 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 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." BOEM, in its capacity as lead federal agency, is tasked with defining the APE. The Applicant, when referring to the APE, does so in terms of a recommended preliminary APE (PAPE).

Discussion in this section is limited to the portions of the terrestrial archeological, marine archaeological resources and analysis of visual effects on historic and architectural properties (AVEHAP) PAPEs 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 PAPE 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 export and interconnection cable corridors, 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 export and interconnection cable routes, for a 0.5-mi (0.8-km) buffer total (see **Appendix A**).

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 NY 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 terrestrial archaeological Study Area, precluding any indirect effects to terrestrial archaeological resources caused by NY Project activities; therefore, the terrestrial archaeological PAPE is equivalent to the area of potential ground disturbance.

The referenced reduction in the terrestrial archaeological Study Area as well as the PAPE along the onshore export and interconnection cable routes was implemented into the next steps of the assessment. The terrestrial archaeological PAPE, which included assessed alternative routes (see **Exhibit 3**), is depicted in **Figure 4.8-1**.

The marine archaeological APE is defined as the portion of the Study Area affected by bottom-disturbing activity. Direct disturbance resulting from installation will be up to approximately 33 ft (10 m) wide for each cable along the 7.7-nm (14.2-km)-long submarine export cable corridor, including the width of the burial tool penetrating the seafloor, plus the additional width of seafloor contact and sediment sidecast (see **Exhibit 2**). The cables will be buried to a target depth of 6 ft (1.8 m) in general. A marine archaeological PAPE was defined as the area where bottom-disturbing activities have the potential to occur and was based on a potential export cable route area that includes the corridors associated with assessed submarine export cable route alternatives (see **Exhibit 3: Alternatives**); this marine archaeological PAPE (**Figure 4.8-2**) is reflected in the **Appendix H**

Marine Archaeological Resources Assessment Summary Memorandum. As discussed in detail in Section 4.8.1.2 below, the marine archaeological Study Area consists of a 1.0-mi (1.6-km) buffer around the PAPE.

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) based on maximum theoretical visibility of up to 4 mi (6.4 km) away for the onshore substation, including portions of Long Island, Long Beach, Barnum Island, and the Town of Hempstead, all within Nassau County, New York. The use of a 4-mi (6.4-km) Study Area for the NY Project was determined by the location of the onshore substation adjacent to open water and across the water from Long Beach. The use of a larger visual Study Area captures more of the eastern and western portions of Long Beach, where visual receptors may have unobstructed views toward the NY Project across open water (i.e., Reynolds Channel). 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, a PAPE for the analysis of visual effects on historic and architectural properties was refined (**Appendix J Analysis of Visual Effects to Historic and Architectural Properties Summary Memorandum**). The AVEHAP PAPE 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 NY Project will be installed underground (with the exception of the interconnection cable crossing at Barnums Channel; see Section 4.1) 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 AVEHAP PAPE 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 AVEHAP in a letter dated December 27, 2018 (**Appendix A**).

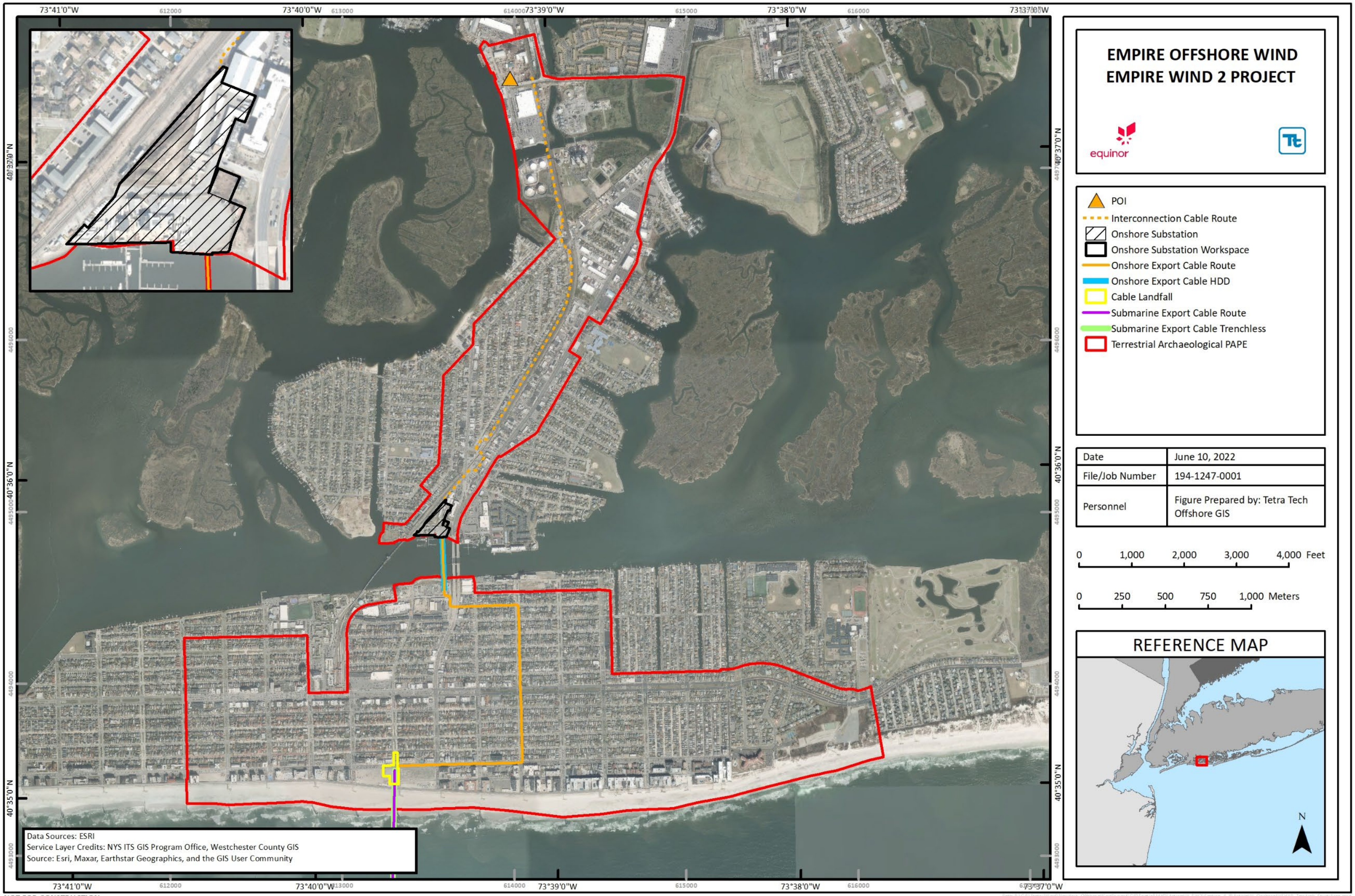


Figure 4.8-1 Terrestrial Archaeological Resources PAPE

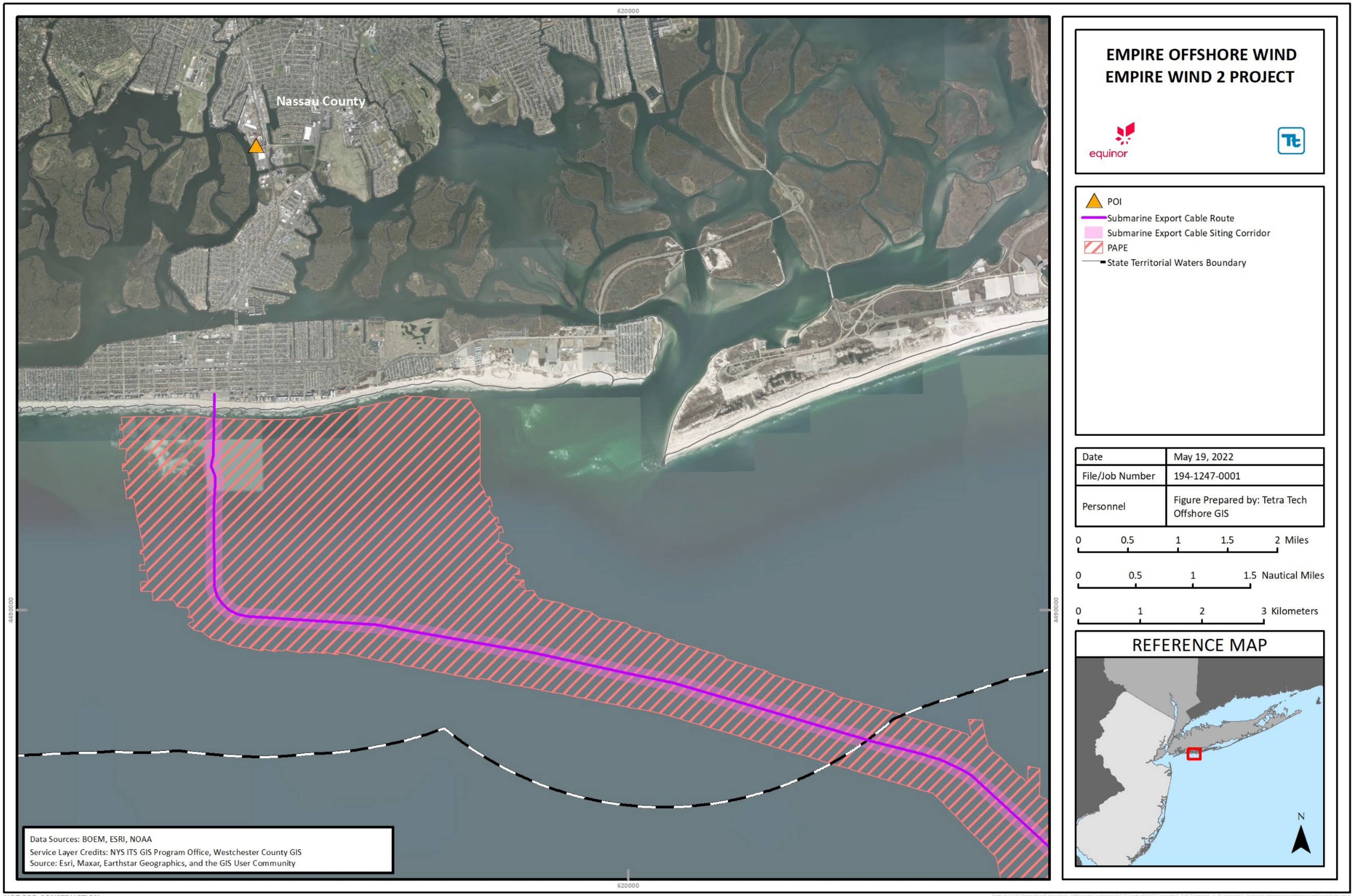


Figure 4.8-2 Marine Archaeological Resources PAPE

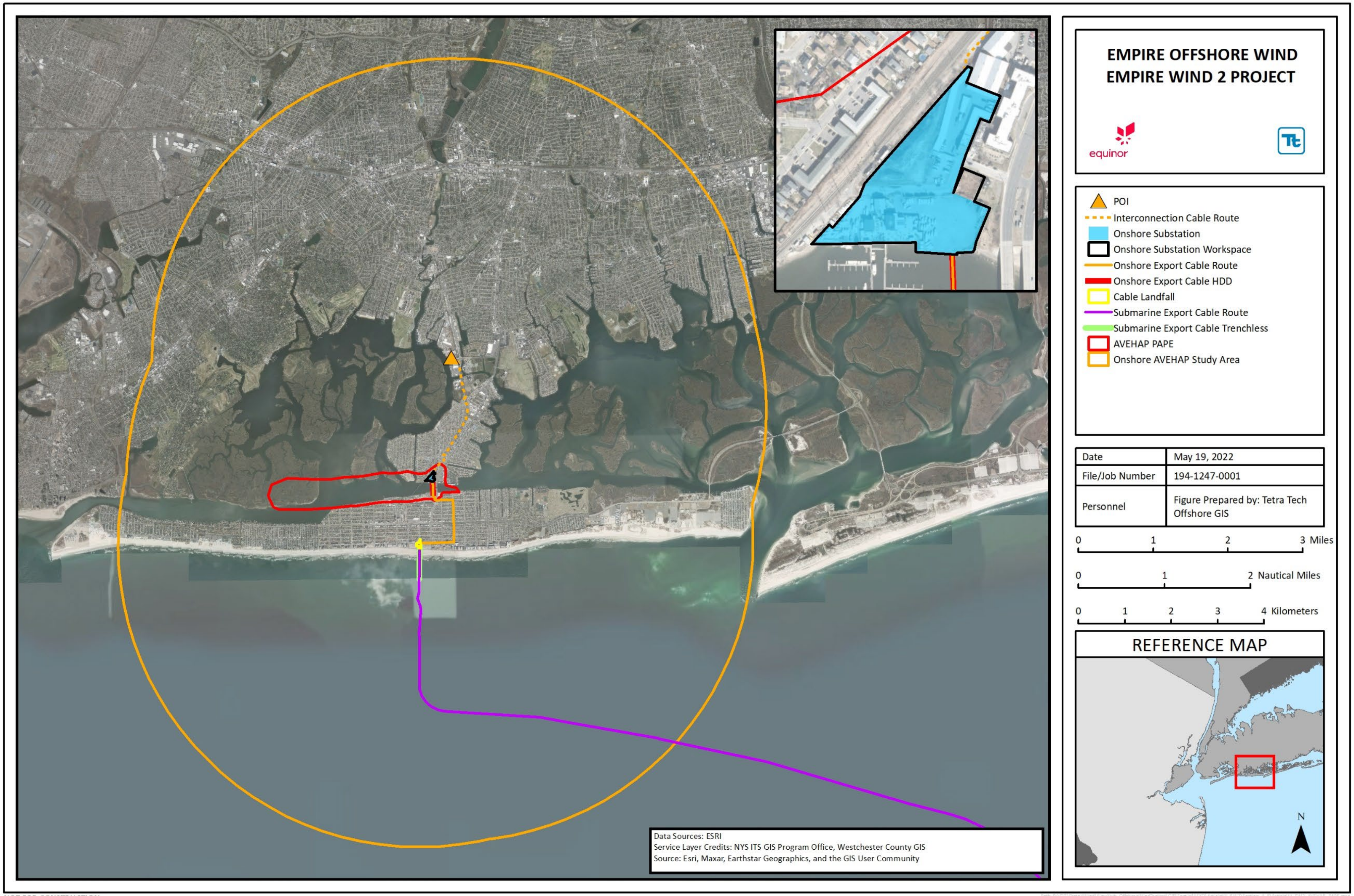


Figure 4.8-3 Analysis of Visual Effects on Historic and Architectural Properties Study Area and PAPE

4.8.1.1 Terrestrial Archeological Resources

To assess the NY 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.

After completing the literature review, site file review, and pedestrian surveys, the Applicant submitted updates to the NY SHPO on August 22, 2019 and April 19, 2021 for the NY Project Area. 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 responses via the New York State Cultural Resource Information System (CRIS) dated August 30, 2019 and April 22, 2021 with no further comments (see **Appendix A** and **Appendix K Phase I Terrestrial Archeological Survey Summary Memorandum** for additional information). An additional project update for the onshore substation site and onshore export and interconnection was submitted on May 9, 2022.

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 NY 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, the evaluation relied heavily on magnetometer data and side-scan sonar imagery, while pre-contact resources were 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 PAPE, which can be helpful in detecting landforms with pre-contact period archaeological potential.

The Qualified Marine Archaeologist reviewed the submarine export cable corridor data from the 2018, 2019 and 2021 survey efforts. A Marine Archeological Resources Assessment Summary Memorandum is provided in **Appendix H**.

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 and 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 NY Project's onshore AVEHAP Study Area and PAPE, and to identify and evaluate historic architectural resources:

- A desktop analysis to identify known/listed sites in the vicinity of the NY Project, utilizing resources from National Park Service (NPS) and the NY SHPO (New York CRIS) in 2018, 2019, and 2021;
- The completion of a viewshed analysis computer model to allow for refinement of the proposed PAPE;
- Preliminary fieldwork and desktop research to ground-truth and refine the proposed AVEHAP PAPE, 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 AVEHAP Study Area between November 4 and November 13, 2018; and
- Additional field visits between June 3 and June 6, 2019, for the proposed onshore cable corridor, and between May 13 and May 14, 2021, for the proposed onshore substation.

Based on the NY Project desktop research, viewshed computer model, ground-truthing and the field visits, the Study Area and PAPE were defined as shown in **Figure 4.8-3**. Since submarine export cables will be entirely subsea, and the onshore export and interconnection cable route will be entirely underground (except where crossing Barnums Channel; see Section 4.1) and because visual impacts to historic resources will be temporary during the construction phase, the proposed submarine export and underground onshore export and interconnection cable routes were not included in this analysis.

The historic architectural resources analysis and AVEHAP (**Appendix J**) 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 NY Project, based on the defined Study Areas and PAPEs.

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 (New York State Parks Recreation and Historic Preservation [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. Following the review of recorded archaeological resources and previously conducted archaeological surveys within the terrestrial archaeological Study Area, qualified, professionally registered archaeologists conducted pedestrian and windshield reconnaissance of the onshore export and interconnection cable routes. The goal of the reconnaissance was to identify specific areas along the onshore export and interconnection cable routes 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 (see **Appendix K**).

A review of CRIS identified no recorded terrestrial archaeological sites or previously conducted archaeological surveys within 1 mi (1.6 km) of the onshore facilities of the Project. Within the terrestrial archaeological Study Area radius, two underwater anomalies of undetermined NRHP status are present in the Atlantic Ocean south of Long Beach Island, and within a 2-mi (3.2-km) radius of the NY Project, CRIS records a possible shipwreck location of the *Mexico* in the Atlantic Ocean. , a nineteenth century sailing vessel. Section 4.8.2.2 provides discussion of marine archeological resources. There are no recorded terrestrial archaeological sites along the 9.5-mi (15.3-km) length of Long Beach Island nor on Barnum Island.

The Applicant's archaeological consultant concluded that the overall sensitivity of the direct effects terrestrial archaeological PAPE is low due to (1) barrier island dynamics, (2) early twentieth century dredging and land-filling of marshland, (3) the construction of suburban developments on the barrier island of Long Beach and Barnum Island, (4) the cyclical episodes of infrastructure repair and replacement beneath surface roads where the onshore export and interconnection cables are to be installed, (5) industrial development in the vicinity of the POI, and (6) shoreline armoring and land-making at the onshore substation site. Based on the site file review and pedestrian reconnaissance, the archaeological consultant concluded that no further archaeological investigations were warranted. 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. The Applicant continues to consult with the NY SHPO regarding routing changes to update this concurrence.

Notwithstanding the high degree of suburban development on Barnum Island and resulting low overall sensitivity of the area, a short section of the NY Project PAPE exhibits moderate sensitivity for the presence of archaeological resources where the onshore interconnection cable corridor will cross the eastern edge of an upland depicted on late-nineteenth century maps. This upland was one of the few mapped uplands depicted in the Hempstead Bay region prior to the development of suburban communities on the barrier island of Long Beach and Barnum Island. The archaeological consultant has recommended that, as deemed necessary by the NY SHPO, an archaeological monitor be present during excavation of the interconnection cable trench in this area.

4.8.2.2 Marine Archeological Resources

Marine archaeological resources that have the potential to be identified in the marine archaeological resources PAPE 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 NY Project assessed the potential for submerged archaeological resources to exist within the Study Area. There are two targets resembling potential submerged archaeological resources within the PAPE based on assessment of HRG surveys between March 2018 and April 2021 (**Error! Reference source not found.**).

Table 4.8-1 Targets Representing Potential Submerged Archaeological Resources within the marine archaeological PAPE

Remote-Sensing Target	Possible Source	Recommended Avoidance Buffer ft (m)
Target-14	Unknown	164 ft (50 m)
Target-28	AWOIS 15087, GMWD 34784, and NOAA ENC 3826 and 3827	164 ft (50 m)

Additionally, paleochannel complexes associated with the Holocene and late Pleistocene correspond to human habitation of North America. Two targets (Targets 31 and 32) were delineated corresponding to portions of the Holocene and Pleistocene paleochannel complexes and are further described in **Appendix H**. These targets were identified as ancient submerged landform features (ASLFs) within the vertical and horizontal marine archaeological resources PAPE.

4.8.2.3 Historic and Architectural 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).

Based on a review of the CRIS database, the onshore substation AVEHAP Study Area, defined as a 4-mi (6.4 km) radius around the proposed substation location, contains 13 NRHP-listed properties, 512 NRHP-eligible properties, and 1,413 unevaluated architectural properties. Viewshed analyses were conducted on the 130 NRHP-eligible and 8 NRHP-listed historic properties occurring on the barrier island of Long Beach, resulting in 85 properties with potential views of the onshore substation. Barnum Island contains no NRHP-listed or eligible resources.

The City of Long Beach elevated water tower (USN 05946.001723), located between Water Street and Park Place, reaches a height of approximately 160 ft (49 m), or more than twice the height of the proposed substation. Its position on the south shore of Reynolds Channel, opposite the site of the proposed substation, makes the tower a useful visual reference point vis-à-vis historic properties across the PAPE. An assessment of street-level views toward the tower's midpoint, resulted in an onshore zone of visual impact extending not beyond approximately 0.25 mi (0.15 km) from the tower, encompassing an area around 125 acres (50 ha). Beyond approximately 0.25 mi (0.15 km) ground-level views of the tower are obscured by the built environment of the surrounding neighborhoods.

The proposed substation's location on the north shore of Reynolds Channel allows potential views largely limited to the channel shorelines. The street-level analysis identified one historic property within the AVEHAP PAPE, the Cobble Villa house (NR No. 14001214) located at 657 Laurelton Boulevard on the south shore of Reynolds Channel (**Table 4.8-2, Figure 4.8-4**).

Table 4.8-2 Historic Property Data within the AVEHAP PAPE

Resources	Location	NRIS No.	Status	NRHP/ SRHP Criteria a/	Reason for NRHP Designation
Cobble Villa	Long Beach, NY	14001214	NR Listed	A, C	The resource is a two-story house listed under Criterion A for its association with town planning and the development of Long Beach as a resort community during the early twentieth century, and under Criterion C for its Mediterranean Revival style. The 'cobble' in its name refers to the use of cobble stone as a decorative element on the front façade.

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).

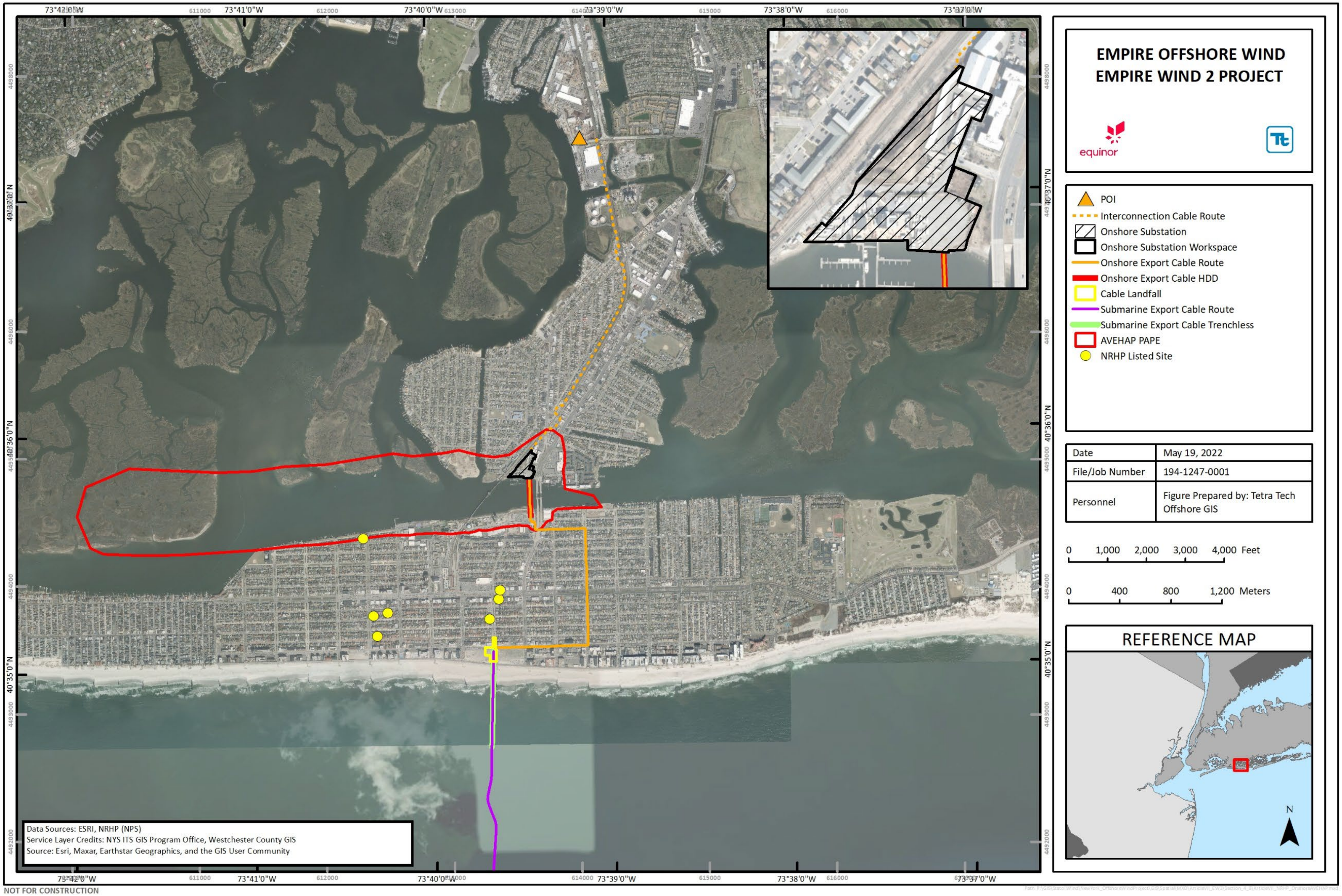


Figure 4.8-4 Previously Identified Historic and Architectural Properties within the AVEHAP PAPE and Surrounding Area

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 and architectural properties resulting from construction and operation of the NY 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 PAPE 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 PAPE 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 PAPE. One NRHP-listed individual property, Cobble Villa, was identified within the AVEHAP PAPE.

4.8.3.1 Construction

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

- Construction of the onshore export and interconnection cables, including ground disturbance within the terrestrial archaeological PAPE;
- Construction of a new onshore substation within the terrestrial archaeological and AVEHAP PAPEs; and
- Installation of the submarine export cables within the marine archaeological PAPE, including the anchoring of working vessels and installation of NY Project infrastructure.

The potential impacts and measures to avoid, minimize, and mitigate potential impacts associated with these factors are described in the subsections below for terrestrial archaeological resources, marine archaeological resources, and historic and architectural 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 on the Long Beach barrier island and Barnum Island during the early twentieth century. 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 NY Project components in existing rights-of-way and previously disturbed areas, to the extent practicable;
- Have an archaeological monitor present during construction period excavation of the interconnection cable trench within the short section of the terrestrial archaeological PAPE that exhibits moderate sensitivity for the presence of archaeological resources; 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, including ASLFs, have been identified within the submarine export cable corridor and marine archaeological resources PAPE (**Table 4.8-1)**. Avoidance measures may include micro-siting facilities and work zones away from features and avoidance buffers and/or adjusting burial depth of cabling across features. 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 representing potential submerged cultural resources 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 and architectural properties will be limited to short-term visual impacts during offshore and onshore construction activities. Direct impacts to historic and architectural resources during construction are not expected.

Visual impacts during offshore construction activities. During NY 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 NY Project construction will be similar in size and form to existing commercial vessels.

Short-term visual effects will occur during construction of the offshore submarine export cable corridors and will result from visual evidence of construction activities and the presence of construction equipment and work crews. Installation of the submarine export cables in nearshore waters will introduce project-related vessels relatively close to shore (within 3 nm [5.6 km]) along the southern coast of Long Island, New York and in the areas near the cable landfall approximately 2,460 ft (750 m) offshore. While these vessels will be easily visible from shore, it is not uncommon to see vessel traffic in this area and vessels will only be present during temporary installation activities. Because of the temporary nature of the activities these project-related installation vessels are not anticipated to adversely affect onshore historic and architectural 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 will result from construction activities and the presence of construction equipment and work crews. Construction activities will 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 will be introduced during NY Project construction of the onshore substations primarily for views from residential areas located in proximity to the proposed onshore substation, where the presence of construction equipment, materials, and crews will be dominant in the foreground. However, the construction-related visual effects will be temporary because construction equipment and crews would be removed once construction is complete. Views of NY Project construction from areas not immediately adjacent to the onshore substation site will be mostly screened by buildings and structures.

The construction of other NY Project onshore components, including the submarine and onshore export and interconnection cables, will occur at grade (with the exception of the interconnection cable crossing of Barnums Channel, see Section 4.1) 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 NY 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 (see **Appendix B: Public Involvement Plan**).

4.8.3.2 Operations and Maintenance

During operations and maintenance, the potential impact-producing factor to historic and architectural resources is the presence of new fixed structures onshore (e.g., onshore substation). Because the PAPE is a busy maritime center with vessels, barges, ferries and cranes present throughout the year, vessels used for inspections or repairs associated with NY 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 repairs to onshore cables, ground disturbance is anticipated to be within the area previously disturbed during NY 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. To avoid and minimize any such potential impacts, buffers will be implemented around identified potential submerged contacts, to the extent practicable.

Historic and Architectural Resources

Long-term visual impacts resulting from the presence of a new onshore substation may occur. There is one NRHP-listed individual property within the AVEHAP PAPE (**Table 4.8-3**). The addition of new structures to the viewshed of the Cobble Villa house does not diminish the feeling, association, or craftsmanship of the resource. There are expected to be no adverse effects to Cobble Villa house by the introduction of the onshore substation.

At a maximum height of approximately 30 ft (9 m) above MSL, the cable bridge at Barnums Channel is screened by the local built environment at distances ranging from approximately 280 ft (85 m) to 660 ft (200 m). To the north the view is screened by the Costco Wholesale building at 3705 Hampton Road, Oceanside, New York; to the east and northeast the view is screened by the E.F. Barrett Power Station and its substation; and, to the southwest, fuel storage tanks obstruct views of the proposed cable bridge. A narrow corridor of visibility to the west takes in undeveloped salt marsh. It is concluded that the proposed cable bridge crossing between Village of Island Park and Oceanside, New York, will not introduce new visual effects on NRHP historic properties or potentially eligible architectural properties.

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 historic and architectural resources. Additional information on visual effects of the NY Project is provided in Section 4.9 and the Visual Impact Assessment in **Appendix I**.

Table 4.8-3 Historic and Architectural Properties within the Onshore AVEHAP PAPE

Resources	NRIS/CRIS No.	Status	NRHP Criteria a/	Assessment of Effect
Cobble Villa	14001214	NR listed	A, 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 NY Project Area. Potential impacts to visual resources resulting from construction and operation of the NY 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 AVEHAP is attached as **Appendix J.**

4.9.1 Visual and Aesthetic Resources Studies and Analysis

The visual resources study area (Visual Study Area) for the NY Project was defined based on locations from which the onshore NY Project facilities are potentially visible and noticeable to the casual observer. 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 NY Project was determined by the location of the onshore substation within a developed area but adjacent to open water (i.e., Reynolds Channel). For onshore substations in a relatively flat area that is heavily developed and/or wooded, such as the ones proposed for the NY 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 visual receptors that may have unobstructed views toward the NY 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, onshore export and most interconnection cables will be entirely underwater or underground and therefore will not be visible once installed. The interconnection cable route includes an inland waterway crossing (Barnums Channel) between Island Park and Oceanside, New York, which will utilize an above-water cable bridge. The Visual Study Area focuses on the onshore substation, but visual impacts related to construction and operation of the submarine export onshore export and interconnection cables are included in the analysis. **Figure 4.9-1** depicts the extent of the Visual Study Area for the NY Project.

The VIA (**Appendix I**) was coordinated with the AVEHAP (see Section 4.8 and **Appendix J**). 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 Area might experience the visual effects of the NY Project. In general, the types of viewers present within the Visual Study Area 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.

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 III 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 (VRM) 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 Visual Study Area is located in the Atlantic Coastal Pine Barrens Level III ecoregion of New York. Landscape conditions within this Level III ecoregion are discussed below.

Atlantic Coastal Pine Barrens

This ecoregion is characterized by gently undulating, low-elevation coastal plain and distinguished by sandy, droughty, infertile soils, and extensive pine-oak woodlands (Woods et al. 2007). Streams occur throughout this ecoregion, which are fed by a large aquifer of fresh water supplied by precipitation. Vegetation type consists of pine-oak forests in upland areas and include pitch pines, shortleaf pines and various oak species. Low-lying areas support white cedar swamps, swamp hardwoods, pitch pine lowlands, and mineral-poor fens. Cultural modifications in this ecoregion include residential and commercial development and agriculture.

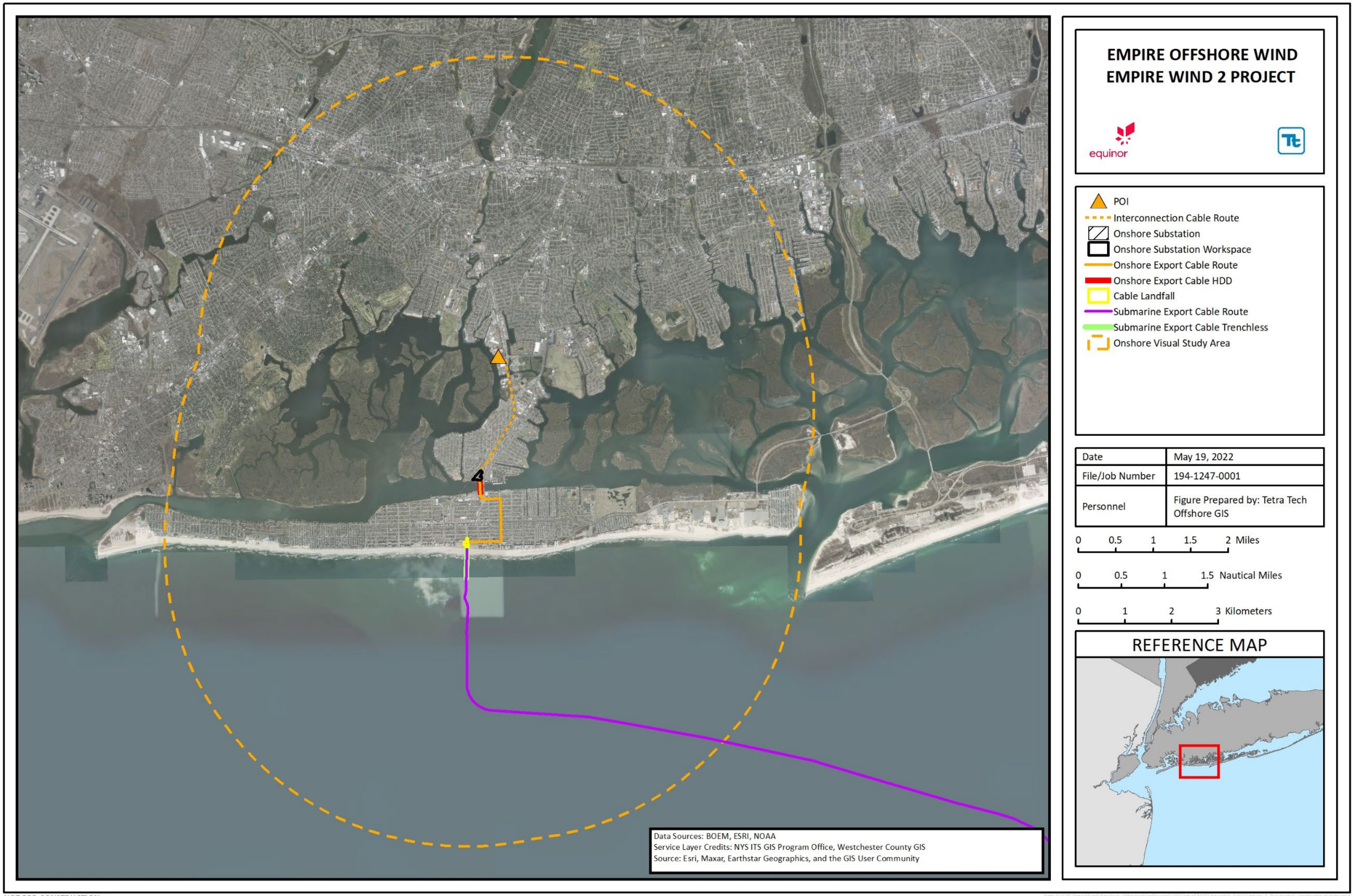


Figure 4.9-1 Visual Study Area for the NY Project

4.9.1.3 NY Project Area

The NY Project Area includes the submarine export cable corridor in New York, the onshore substation, cable bridge, and the onshore export and interconnection cable corridors. The Oceanside POI, which will support the interconnection of the NY Project to the existing electrical grid, is north of the onshore substation site. The topographic character of the NY Project Area ranges from approximately 0 ft (0 m) AMSL to 38.25 ft (11.66 m) AMSL elevation NAVD88.

The onshore substation will be located in an approximately 5.2-ac (2.1-ha) area located on Long Island in the incorporated Village of Island Park, in Nassau County, New York. The onshore substation site is located in an urban area characterized by a mixture of industrial, commercial, and residential uses.

The proposed onshore substation is located on land that is currently developed with a restaurant and storage unit buildings. The onshore substation site is bounded by Long Beach Road to the east, Reynolds Channel to the south, and the LIRR to the north and west. The portion of the parcel on which the onshore substation site is proposed is currently developed with several commercial businesses. Areas that are undeveloped at the site are vegetated primarily with low growing weeds, grasses, and shrubs and scattered trees. The onshore substation site is surrounded by buildings to the north.

The interconnection cable route includes an inland waterway crossing (Barnums Channel) between the Village of Island Park and Oceanside, New York, which will utilize an above-water cable bridge. The crossing will be located adjacent to the existing LIRR railway bridge. The cable bridge crossing will use up to four support columns (pile caps) located within the waterway to support the truss system which will hold the cables above the water. These supports may be installed by hammer or other installation methods, up to 100 ft (30 m) below the seabed, with final design subject to geotechnical investigation. The supports will include up to three 1.5-ft (0.5-m)-diameter steel pipe piles per pile cap, for a total of 12 steel pipe piles within the waterway. The cable bridge will be constructed from a prefabricated steel truss system assembled offsite and set in place, and the structure will measure up to 25 ft (7.6m) wide and 8 ft (2.4 m) tall and span a length of approximately 300 ft (91 m). The structure is anticipated to have a total height of up to 15 ft (4.6 m) above MSL, with a maximum total height of 30 ft (9.1 m). A conceptual drawing of this cable bridge is provided in **Exhibit 5: Design Drawings**.

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 NY 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 VRM 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 NY Project will affect visual resources.

Onshore NY 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 NY Project components in the background and seldom seen distance zones.

The Visual Study Area for the onshore substation covers Long Island, New York, including areas of Long Beach, the Village of Island Park, Oceanside, Lido Beach, east Rockaway, and the western portion of Jones Beach, New York (see **Figure 4.9-1**). Additional discussion of land use in the vicinity of the onshore NY 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 2019k). 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 2019k). 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 twelve properties on or eligible for inclusion in the NRHP within the Visual Study Area (see **Appendix J**), as well as one wildlife management area and one scenic pier. Additionally, there are three resources of statewide or regional significance, and 72 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 4.9.1.4, the use of a 4-mi (6.4-km) Visual Study Area for this NY Project is conservative and was determined by the proximity to views across open water (i.e., Long Beach). 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 NY Project mi (km)	NY Project Visibility
1. Properties Listed in the National or State Register of Historic Places a/			
Barkin House	Long Beach	0.7 (1.1)	Possible Views
Cobble Villa	Long Beach	0.8 (1.3)	Possible Views
Denton Homestead	East Rockaway	3 (4.8)	No Views
Pauline Felix House	Long Beach	1 (1.6)	Possible Views
Granada Towers	Long Beach	0.6 (1)	Possible Views
Haviland-Davison Grist Mill	East Rockaway	3.3 (5.3)	No Views
House at 226 West Penn Street	Long Beach	0.9 (1.4)	No Views
House at 251 Rocklyn Avenue	Lynbrook	3.8 (6.1)	No Views
House at 474 Ocean Avenue	Lynbrook	4 (6.4)	No Views
US Post Office - Long Beach	Long Beach	0.6 (1)	No Views
Samuel Vaisberg House	Long Beach	0.9 (1.4)	No Views
Jones Beach State Park, Causeway, and Parkway System	Freeport	3.4 (5.5)	Possible Views
2. State Parks			
None in Study Area			
3. Urban Cultural Parks (now termed the Heritage Area System)			
None in Study Area			
4. State Forest Preserves			
None in Study Area			
5. National Wildlife Refuges, State Game Refuges and State Wildlife Management Areas			
Lido Beach Wildlife Management Area	Lido Beach	2.1 (3.4)	Possible Views
6. National Natural Landmarks			
None in Study Area			
7. National Parks, Recreation Areas, Seashores, Forests			
None in Study Area			
8. Rivers Designated as National or State Wild, Scenic, or Recreational			
None in Study Area			
9. A site, area, lake, reservoir or highway designated or eligible for designation as scenic			
Woodcleft Scenic Pier	Oceanside	2.2 (3.5)	No Views
10. Scenic Areas of Statewide Significance			
None in Study Area			
11. State or federally designated trail, or one proposed for designation			
None in Study Area			
12. Adirondack Park Scenic Vistas			
None in Study Area			

Site	Location	Distance to NY Project mi (km)	NY Project Visibility
13. State Nature and Historic Preserve Areas			
None in Study Area			
14. Palisades Park			
None in Study Area			
15. Bond Act Properties			
None in Study Area			
16. National Heritage Properties			
None in Study Area			
Other Resources of Statewide or Regional Significance b/			
Bedell Creek Tidal Wetlands Area (SCA)	Oceanside	2.3 (3.7)	No Views
Lido Beach Tidal Wetlands Area (SCA)	Lido Beach	2.3 (3.7)	Possible Views
Nike Missile Site NY-29/30	Lido Beach	2.2 (3.5)	Possible Views
Locally Important Resources b/			
Atlantic Village Lands	Atlantic Village	3.4 (5.5)	No Views
Baldwin Park	Hempstead	3 (4.8)	Possible Views
Barrett Park	Valley Stream	4 (6.4)	Possible Views
Bay County Park	Bay Park	1.7 (2.7)	Possible Views
Bistrol Park	Hempstead	2.7 (4.3)	No Views
Cedarhurst Park	Cedarhurst	3.9 (6.3)	Possible Views
Clark Street Playground	Long Beach	0.9 (1.4)	Possible Views
Department Of Recreation Campus	Long Beach	0.4 (0.6)	Possible Views
East Atlantic Town Beach	Hempstead	2.4 (3.9)	Possible Views
Georgia Avenue Park	Long Beach	2.1 (3.4)	No Views
Grant County Park	Hewlett	3.4 (5.5)	Possible Views
Hewlett Point Park	Hempstead	2.2 (3.5)	Possible Views
Kennedy Plaza	Long Beach	0.6 (1)	No Views
Leroy Conyers Park	Long Beach	0.4 (0.6)	Possible Views
Lido Beach District Park	Lido Beach	1.7 (2.7)	Possible Views
Lido Beach Town Park	Lido Beach	2.1 (3.4)	Possible Views
Lido Beach West Town Park	Lido Beach	1.4 (2.3)	Possible Views
Long Beach City Lands	Long Beach	0.2 (0.3)	Possible Views
Long Beach Dog Run	Long Beach	0.4 (0.6)	No Views
Long Beach Park	Long Beach	0.9 (1.4)	No Views
Magnolia Playground	Long Beach	1 (1.6)	No Views
Malibu Town Park	Hempstead	3.2 (5.1)	Possible Views
Margie Street Park	Hempstead	1.9 (3)	Possible Views
Marina West Town Boat Launch	Lido Beach	3.3 (5.3)	Possible Views

Site	Location	Distance to NY Project mi (km)	NY Project Visibility
Marine Nature Study Area	Hempstead	2.4 (3.9)	No Views
Mayor George Landgarf Memorial Playground	Island Park	1 (1.6)	No Views
Memorial Park	East Rockaway	3.3 (5.3)	Possible Views
Mill River Complex Park	Rockville Centre	3.7 (6)	Possible Views
Nassau Beach County Park	Lido Beach	2.5 (4)	Possible Views
North Street Park	Lawrence	3.6 (5.8)	Possible Views
Oceanside Park	Hempstead	2 (3.2)	No Views
Pacific Playground	Long Beach	1.2 (1.9)	No Views
Point Lookout Town Park	Hempstead	3.3 (5.3)	Possible Views
Reynolds Channel Esplanade	Long Beach	0.6 (1)	Possible Views
Sands At Lido Beach Town Park	Hempstead	2.4 (3.9)	Possible Views
Shell Creek Park	Island Park	0.4 (0.6)	Possible Views
Sherman Brown Park	Long Beach	0.3 (0.5)	Possible Views
Silver Lake County Park	Baldwin	4 (6.4)	Possible Views
Skateboard Park	Long Beach	0.4 (0.6)	Possible Views
Unnamed Local Park - Long Beach	East Atlantic Beach	2.3 (xx)	Possible Views
East Rockaway Recreation Center	East Rockaway	2.5 (4)	Possible Views
Veterans Memorial Park - Long Beach	Long Beach	0.4 (0.6)	Possible Views
Wrights Field	Hempstead	2.4 (xx)	No Views
Long Beach City Lands (LRMA)	Long Beach	0.2 (0.3)	Possible Views
Long Island Water Lands (LRMA)	Barnum Island, Lakeview	0.9 (1.4)	Possible Views
Parkway Dr Baldwin Harbor	Baldwin	3.7 (6)	No Views
Curtis E. Fisher West Marina Fishing Pier	Lido Beach	3.6 (5.8)	Possible Views
Inwood Beach Club	Atlantic Beach	3.6 (5.8)	No Views
Atlantic Beach Club	East Atlantic Beach	2.8 (4.5)	No Views
Neptune Boulevard Beach & Park	Long Beach	1.1 (1.8)	No Views
Atlantic Beach	Atlantic Beach	3.7 (6)	No Views
Long Beach	Long Beach	1 (1.6)	No Views
Nickerson Beach Park	Lido Beach	2.8 (4.5)	No Views
Sands Beach Club	Lido Beach	2.4 (3.9)	Possible Views
Lido Beach	Lido Beach	2.3 (3.7)	No Views
Nickerson Beach Campgrounds	Lido Beach	3.1 (5)	No Views
Lincoln Beach Boardwalk	Long Beach	1 (1.6)	No Views
Ocean Club	Atlantic Beach	3.2 (5.1)	Possible Views
Atlantic Beach Boardwalk	Atlantic Beach	3.5 (5.6)	No Views
Clearwater Beach Club	Atlantic Beach	3.9 (6.3)	No Views

Site	Location	Distance to NY Project mi (km)	NY Project Visibility
Lawrence Beach Club	East Atlantic Beach	3 (4.8)	No Views
Waterview Road Park	Barnum Island	0.2 (0.3)	No Views
Shell Harbor	Barnum Island	1.2 (1.9)	No Views
Vella's Marina	Oceanside	1.7 (2.7)	Possible Views
Harbor Isle Beach	Harbor Isle	0.5 (0.8)	No Views
Little Beach Village of Island Park	Island Park	0.5 (0.8)	No Views
Harbor Isle Marina	Harbor Isle	0.6 (1)	No Views
Boathouse Marina	Harbor Isle	0.4 (0.6)	No Views
Andy's Marine Service (Marina)	Harbor Isle	0.3 (0.5)	Possible Views
Rockaway Hunting Club	Lawrence	3 (4.8)	Possible Views
Inwood Beach Club	Atlantic Beach	3.6 (5.8)	No Views
Trinity Cemetery	Hewlett	3.6 (5.8)	No Views

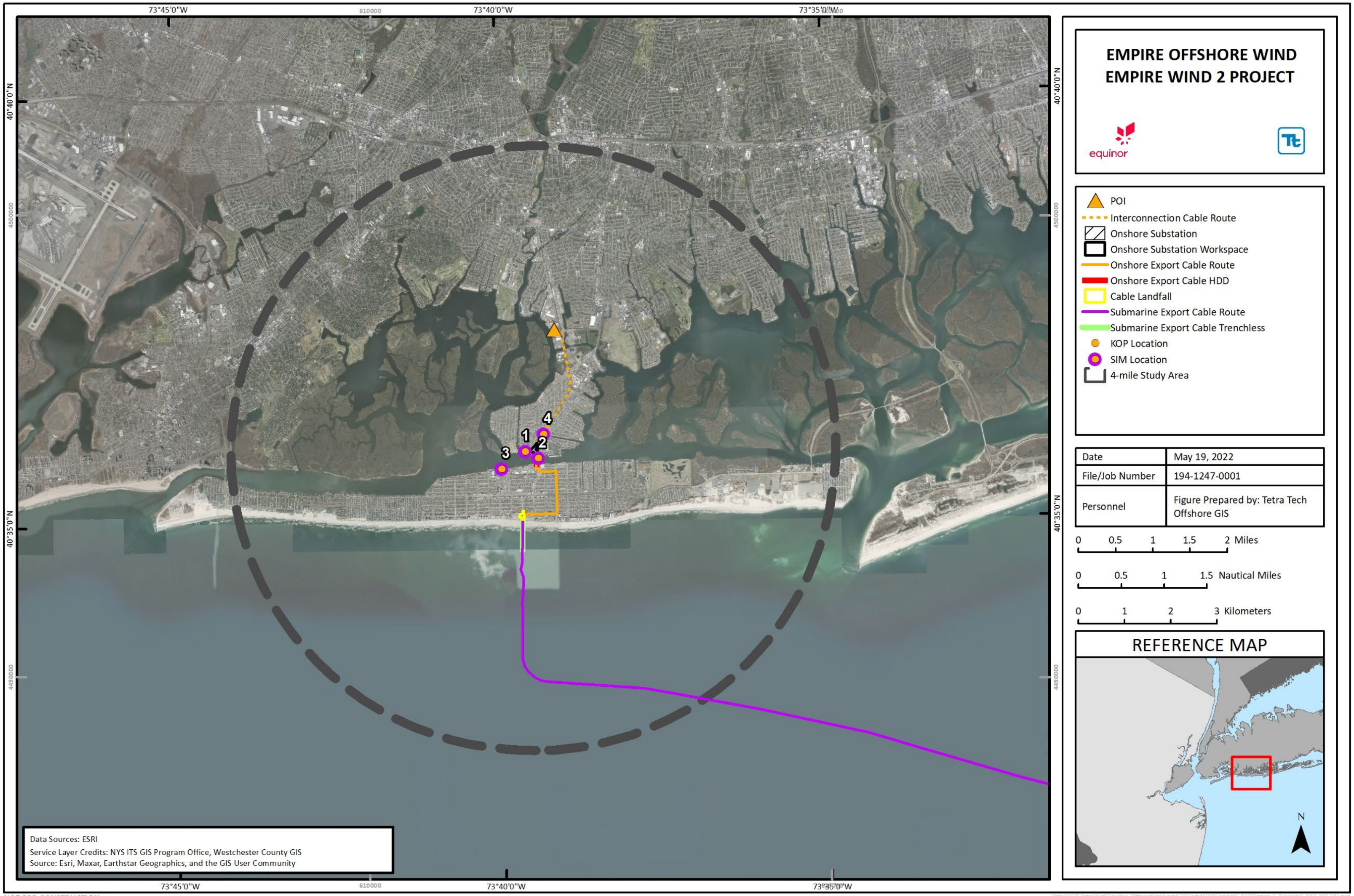
Notes:
a/ Multiple locations can be found in Appendix J, Analysis of Visual Effects to Historic Architectural Properties.
b/ These are not considered resources of statewide significance as identified in VIA Inventory of Aesthetic Resources (NYSDEC 2019k); however, they are important local resources.

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 Nassau County in New York to identify areas within the Visual Study Area where potential screening may be provided by buildings. 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 NY Project visibility from locations visited (**Appendix I**). 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 NY 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.



NOT FOR CONSTRUCTION

Figure 4.9-2 Key Observation Points within the Onshore Visual Study Area

Table 4.9-2 includes a list of KOPs within the Visual Study Area and potential visibility of the NY Project based on the results of the viewshed. KOPs within the Visual Study Area for the onshore substation are shown in **Figure 4.9-2**. 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.

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 NY Project mi (km)	NY Project Visibility
EW 2 Onshore Substation C					
1	Quebec Road/Residential Neighborhood	Island Park, NY	Residential=	0.07 (0.11)	Partially Visible b/
2	Long Beach Bridge	Island Park, NY	Travel Way	0.09 (0.15)	Visible
3	Long Beach Skate Park	Long Beach, NY	Public Recreation	0.43 (0.69)	Partially Visible
4	Island Park Station	Island Park, NY	Travel Way/Residential	0.19 (0.31)	Partially Visible

Note:
a/ Map ID numbers for the EW 2 onshore substation site corresponds to the map shown on **Figure 4.9-2**.
b/ Viewpoint is not visible from the public right-of-way (see simulations in Appendix I); however, there may be partial views from residences adjacent to the substation.

Quebec Road/Residential Neighborhood

This KOP is located at a dead end along Quebec Road in the Village of Island Park, Nassau County, New York. This residential neighborhood is located approximately 0.07 mi (0.11 km) west of the onshore substation site (at its closest point) and is currently bounded by the Wreck Lead Channel to the south, LIRR and Pop's Seafood Shack and Grill to the east, and residential development to the north and west.

Existing View

This KOP is within the Atlantic Coastal Pine Barrens ecoregion. The landscape surrounding this location is typical of this ecoregion and is characterized by gently undulating low-elevation coastal plain with sandy, droughty, infertile soils with extensive pine-oak woodlands. Views from this location primarily include residential development in the foreground, with residential power lines extending above vegetation and fencing crisscrossing the ground. Vegetation consists of landscaping shrubs and grasses, including lawns and trees associated with residential development. Human-made modifications include residences, paved roads, and power lines. From this KOP, views east toward the onshore substation site are mostly to completely screened by foreground vegetation and topography.

View with the NY Project

This location represents residential neighborhoods and travel ways. Views toward the onshore substation site from this location will vary from mostly to completely screened by vegetation and/or residential development. From Quebec Road, views will be screened by existing development and vegetation which block views towards the proposed substation (see simulation in Appendix I). Based on review of aerial imagery, from residential backyards adjacent to LIRR and the substation, views are anticipated to be mostly screened by vegetation. For residential backyard viewers, the upper portions of the substation building may be visible above existing vegetation. However, the portion of the potential building that is visible will be seen in the context of residential development, power lines, and a commuter railroad line that splits the two areas. The substation at the onshore substation site will appear as a subordinate feature in the landscape setting. As such, the NY Project will introduce no to weak visual contrast in this area. Views toward the onshore substation site from residences farther west and north in the residential neighborhood are anticipated to be completely screened by residential development and will experience no visual contrast at this KOP.

Long Beach Bridge

This KOP is located along Long Beach Boulevard at the Long Beach Bridge, which crosses the Wreck Lead Channel. This location is approximately 0.09 mi (0.15 km) east of the onshore substation site and is bounded by the Channel on the east and west, Island Park, New York to the north, and Long Beach, New York to the south.

Existing View

This KOP is within the Atlantic Coastal Pine Barrens ecoregion. The landscape surrounding this location is typical of this ecoregion and is characterized by gently undulating low-elevation coastal plain with sandy, droughty, infertile soils with extensive pine-oak woodlands. Views from this location include Wreck Lead Channel and commercial, industrial, and residential development along the shoreline of Island Park and Long Beach in the foreground/middleground; developed features include marinas, parks, and residential and commercial development along the channel. Vegetation includes low grasses, dispersed trees mainly associated with residential development, and lawn or short grass covering the parks and commercial/industrial development.

View with the NY Project

This location represents travelers along the Long Beach Boulevard Bridge. Views toward the onshore substation site are open. The large geometric forms and light color of the proposed building will contrast with the dark green, irregular forms of the exiting vegetation. The onshore substation will be seen in the context of exiting streetlights and utility lines in the foreground. Although existing structures and utilities are visible in the view, the NY Project will be a dominant feature in the view due to the proximity of the onshore substation to the viewpoint and the large scale and light color of the building. As such, it is anticipated that the NY Project will introduce strong visual contrast in views from the southeast.

Long Beach Skate Park

This KOP is located at the skate park in the Long Beach Park Area located adjacent to the Wreck Lead Channel west of Long Beach Boulevard in Long Beach, New York. This location is approximately 0.43 mi (0.69 km) southwest of the onshore substation site and is bounded by Wreck Lead Channel to the north and recreation, residential, and industrial/commercial development to the south, east, and west.

Existing View

This KOP is within the Atlantic Coastal Pine Barrens ecoregion. The landscape surrounding this location is typical of this ecoregion and is characterized by gently undulating low-elevation coastal plain with sandy, droughty, infertile soils with extensive pine-oak woodlands. Views from this location include Island Park and Wreck Lead Channel in the foreground and development along the shoreline and surrounding this location in the foreground/middleground; developed features include residential, park, and commercial development. Vegetation includes low grasses, trees associated with residential development and lined along streets, and lawn or short grass covering the parks and commercial/industrial development.

View with the NY Project

This location represents recreational viewers associated with the skate park and other park facilities in this area, including the residential areas surrounding the park. For this view, the onshore substation buildings appear to have a similar shape and size to the existing train bridge structure which is currently dominate along the Wreck Lead Channel (see simulations in **Appendix I**). The upper three-quarters of the proposed onshore substation building will be visible but will be seen in the context of existing development, including the train bridge and power lines. The onshore substation building will be comparable in height to the existing train bridge in the foreground. At a distance of 0.43 mi (0.69 km), the onshore substation buildings at the onshore substation site will appear as a co-dominant feature. As such, the NY Project will introduce moderate visual contrast at this KOP.

Island Park Station

This KOP is located at the Island Park Train Station in Island Park, New York located between Long Beach Road and Austin Boulevard. This location is approximately 0.19 mi (0.31 km) south of the onshore substation site and is bounded by residential homes to the north and recreation, residential, and industrial/commercial development to the south, east, and west.

Existing View

This KOP is within the Atlantic Coastal Pine Barrens ecoregion. The landscape surrounding this location is typical of this ecoregion and is characterized by gently undulating low-elevation coastal plain with sandy, droughty, infertile soils with extensive pine-oak woodlands. Views from this location include Island Park in the foreground; developed features include residential and commercial development. Vegetation includes low sparse grasses and trees associated with commercial and residential development and lined along streets.

View with the NY Project

This location represents travelers and residential viewers associated with the train station and nearby residences. Views toward the onshore substation site are partially screened by existing buildings. The upper portion of the proposed onshore substation building will be visible but will be seen in the context of existing development, including the existing buildings and power lines. The onshore substation building will be slightly taller than the existing buildings in the foreground. At a distance of 0.19 mi (0.31 km), the onshore substation buildings at the onshore substation site will appear as a co-dominant feature. As such, the NY Project will introduce moderate visual contrast at this KOP.

4.9.2 Potential Visual and Aesthetic Resources Impacts and Proposed Mitigation

4.9.2.1 Construction

During construction of NY Project facilities, the potential impact-producing factors to visual resources may include construction activities for installation of the submarine export cables and onshore export and interconnection cables, and construction of the onshore substation and cable bridge. 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 inshore and 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 the southern shore of Long Island. Most of the vessels used for NY Project construction will be similar in size and form to existing commercial vessels.

Short-term visual effects will occur during construction of the offshore submarine export cable corridors and will result from visual evidence of construction activities and the presence of construction equipment and work crews. Installation of the submarine export cables in nearshore waters will introduce project-related vessels relatively close to shore along the southern coast of Long Island, New York and 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 vessels will only be present during temporary installation activities. Because of the temporary nature of the activities these project-related installation vessels are not anticipated to adversely affect visual resources.

Nighttime construction activities are also proposed to occur within the NY 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 NY 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, inshore cable bridge, and along the onshore export and interconnection cable corridors 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 NY Project construction primarily for viewers adjacent to the onshore substation site and across the Barnums Channel and cable corridors, where the presence of construction equipment, materials, and crews will be dominant in the foreground.

Along the onshore export and interconnection cable corridors, short-term impacts are anticipated during construction. The onshore export and interconnection cables associated with the NY Project will be entirely underground except when crossing Barnums Channel where a cable bridge would be installed parallel to the LIRR crossing. Construction areas associated with underground cable installation will be restored to a condition similar to that before construction and no significant long-term visual impacts are anticipated. 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.

The cable bridge crossing is bordered to the east by the existing commuter LIRR, to the south by the E.F. Barrett Power Station, to the west by a body of water, and to the north by commercial development which includes a gas station and parking lot. Visibility is limited to industrial workers to the south and east, residents/travelers at the gas station, and a large waterbody to the west. Viewers that may see the cable bridge construction include commercial and industrial buildings primarily between Long Beach Road and Daly Boulevard. Additionally, LIRR commuters may see a glimpse of construction of the bridge while commuting. However, these visual effects will be short-term because construction equipment and crews will be removed once construction is complete. Views of NY Project construction from areas not immediately adjacent to the cable bridge will be mostly screened by commercial or industrial buildings, vegetation and/or topography. Visual effects to these viewers will be mostly limited to seeing construction traffic on local roads and boats and/or equipment in the water.

Viewers associated with the onshore substation include commercial and industrial buildings primarily along Long Beach Road. However, visual effects during construction will be short-term because construction equipment and crews will be removed once construction is complete. Views of NY 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. Visual effects to these viewers will be mostly limited to seeing construction traffic on local roads and boats and/or equipment in the water.

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 export and interconnection cables will be placed underground, except when crossing Barnums Channel where a cable bridge would be installed parallel to the LIRR crossing, and predominantly along existing railroad and roadway rights-of-way, and will therefore have no significant long-term effects. Infrequent maintenance may also be required at the onshore substation, which could cause some minor temporary visual effects from the presence of equipment and disturbance of ground and/or pavement during work activities.

Views of the onshore substation site are limited primarily to viewers adjacent to the east and south, with minimal views to the north and west. Viewers adjacent to the site (i.e., along Long Beach Boulevard and Bridge) and south of the site in Long Beach will perceive a change in the landscape, and it is anticipated that the contrast created by the change will vary from strong to weak. Perceived change will be higher from areas close to the site, such as from along Long Beach Boulevard/Bridge, where the substation will introduce strong contrast. Perceived change will be reduced to moderate for viewers along the north side of Long Beach, where views toward the site will partially screened by topography, vegetation, and/or existing development. Views to the west, north, and northeast will be screened by development, vegetation, and topography and will not be materially changed by the NY Project.

Long-term visual effects during operation of the cable bridge will result from the visibility of the aboveground components associated with the Barnum Channel crossing. The cable bridge crossing will introduce linear geometric forms into the landscape setting which is already highly developed with similar forms and structures, including the LIRR crossing. LIRR commuters may see a glimpse of the bridge while commuting. Views of the cable bridge are limited primarily to commercial and industrial viewers adjacent to the north, east, and south. The presence of the aboveground infrastructure associated with the proposed cable bridge would represent a long-term visual impact; however, that impact is expected to be minor due to limited areas of visibility and the proximity to other existing industrial infrastructure.

4.9.2.3 Mitigation

The undergrounding of the onshore export and interconnection cables, except the cable bridge crossing the Barnums Channel, will mitigate many of the potential visual effects of the NY Project that would otherwise occur. For the onshore aboveground NY Project components (the onshore substation and cable bridge), the following mitigation measures will be incorporated into the NY Project design to minimize visual contrast:

- Construction Phase:
  - A Fugitive Dust Control Plan will be implemented to minimize dust (visual pollution);
  - The onshore NY 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 export and interconnection cables and joint bays will be mostly located underground primarily under roadways and will not be visible during NY Project operation and maintenance, with the exception of potential discoloration of old vs new paved areas in the roadway;
  - A cable bridge will cross the Barnums Channel along the LIRR right-of-way. This crossing will use up to four support columns located within the waterway to support the truss system which will hold the cables above the water. The cable bridge will be constructed from a prefabricated steel truss system assembled offsite and set in place. The Applicant will work with local stakeholders throughout the permitting process;
  - Buildings will be a combination of cladded steel frame and concrete buildings, designed to match the style and visual character of the surrounding urban landscape, and are proposed to be painted a light gray or white color. The Applicant will continue to work with local stakeholders throughout the permitting process and will submit final building architectural design details in the EM&CP;
  - There will be minimal operations impact resulting from the presence of crews and equipment conducting maintenance activities;
  - Lighting at the onshore substation will be designed to reduce light pollution where feasible (e.g., downward lighting, motion-detecting sensors); and
  - As site design progresses, the Applicant will consider mitigation measures to reduce visual contrast, such as repetition of form, line, color, and texture based on other existing elements around the site.

4.10 Land Use

This section describes the existing land uses and local zoning for the onshore portions of the NY Project, including the onshore substation, cable landfall and onshore export and interconnection 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 NY Project. There are no local waterfront revitalization programs in the vicinity of the NY Project. The Applicant reviewed the NY 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 is included in **Exhibit 7: Local Ordinances**.

4.10.1 Land Use Studies and Analysis

Existing land uses in the NY 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. The Applicant reviewed zoning map information from the Town of Hempstead (Town of Hempstead 2022), and the Village of Island Park (Village of Island Park 2008). The City of Long Beach zoning designations are provided by section and block in Appendix A of the City of Long Beach, New York, Code of Ordinances.

The Applicant also evaluated New York State Coastal Zone Management (CZM) requirements (see also **Appendix D: Coastal Zone Management Consistency Statement**) and land use and local comprehensive plans.

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 NY Project Area in Nassau 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 Applicable 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 2016b)	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; Nassau County is within Region 1.
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 (New	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

Land Use Plans	Land Use Plan Description
York State Department of State [NYSDOS] 1982)	Management Act of 1972. The Coastal Management Program contains 44 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.
Regional/County Land Use Plans	
Nassau County Draft Master Plan (2010)	The plan was drafted in 2010 to create sustainable development strategies for business and residential owners. It requires all levels of the community (government, not for profits, private sector, and County residents) to take part in a paradigm shift over the next 20 years with frameworks and policies in place regarding land use, economic development, and infrastructure support.
Nassau County Master Plan Update (2008)	The Nassau County Charter requires plan updates every 5 years. This plan detailed efforts to support and promote industries, target development in growth areas, and invest in infrastructure improvements. The original 1998 Comprehensive Plan outlined 22 goals, 107 policy recommendation and 332 implementation strategies. The 2008 Master Plan Update addresses updates in the areas of housing; land use, subdivision, and zoning; economic development initiatives; environmental resources, initiatives, and local laws; transportation; and inter-agency coordination. The Nassau County Master Plan Update lists the Nassau County Open Space Plan (2001) as a guide for the county to protect and preserve remaining open spaces and parks from development. The plan provides an inventory of existing open spaces and important natural resource areas and recommends policy and protection techniques to implement.
Long Island South Shore Estuary Reserve Comprehensive Management Plan (South Shore Estuary Reserve Council 2021)	Originally implemented in 2001, The Long Island South Shore Estuary Reserve Comprehensive Management Plan (CMP) is the result of The Long Island South Shore Estuary Reserve Act passed in 1993 creating the Long Island South Shore Estuary Reserve (Reserve). The Act also implemented the Long Island South Shore Estuary Reserve Act Council (Council) whose task was to design a Comprehensive Management Plan (South Shore Estuary Reserve Council 2001) to protect the reserve and its inhabitants. Issues outlined in the CMP include improving and maintaining water quality, protecting and restoring living resources of the reserve, expanding public use and enjoyment of the estuary, sustaining and expanding estuary-related economy, and increasing education, outreach and stewardship. An update CMP was drafted in 2021 (South Shore Estuary Reserve Council 2021). The draft 2021 CMP has added resilience as an issue of the plan. The CMP emphasizes the importance of the Long Island South Shore Estuary Ecosystem and outlines actions necessary to preserve, protect, and enhance the natural, recreational, economic, and educational resources that the reserve provides.
Local Land Use Plans	
City of Long Beach Comprehensive Plan, Creating Resilience: A Planning Initiative (2018)	The City of Long Beach's 2018 Plan is an update to the 2007 Comprehensive Plan, focusing on addressing resiliency measures post-Superstorm Sandy and a more sustainable economy post-economic downturn. The focus is environmental resilience, productive sustainable economy, and transportation and mobility. The Long Beach shoreline is part of the plan. The 2007 Comprehensive Plan outlines ten goals and objectives, including: land use and community character; public policies; visual character; economic development; housing and neighborhood stabilization; historic and cultural resources; community facilities and services and infrastructure; parks, recreation and open space; waterfront and environmental; and traffic, transportation and parking.

Land Use Plans	Land Use Plan Description
Barnum Island/Oceanside/the Village of Island Park/Harbor Isle NY Rising Community Reconstruction Plan (2014)	This plan was developed as a part of the New York Rising Community Reconstruction (NYRCR) program enacted by the Governor's Office of Storm Recovery as a result of the increasing impacts on coastal communities due to increased frequency and intensity of coastal storms. The focus behind the NYRCR is for communities to create locally driven and relevant recovery plans for reconstruction and revitalization of their communities. This plan is a result of NYRCR's goals and outlines proposed projects and their implementation to ensure protection and resilience against future storms. Critical issues identified included vulnerable public facilities, limited emergency transportation routes, access to power before and after an emergency, stormwater, threat of flooding and threatened marshland.
Town of Hempstead, Energy and Sustainability Master Plan (2012)	The development of this plan was funded by the U.S. Department of Energy (DOE) Energy Efficiency and Conservation Block Grant (EECBG), which was put in place to promote sustainable transitions away from fossil fuel dependence and towards local energy efficient solutions. The plan outlines proposed measures with varying time frames broken down into four action area categories: energy savings; fleet savings; waste, water and green infrastructure; and leadership and communication.

4.10.2 Existing Land Use

Dominant land uses on Long Island are developed, open space and forest land, with a notable pattern of open and forested lands to the north and east on the island, and dense urban development increasing towards the west and south to the New York metropolitan area (New York Water Science Center 2017). In Nassau County, residential development is the predominant land use, accounting for approximately 60 percent of the total land area. Open space uses, including recreation, conservation land and agricultural use, account for a combined 17 percent and institutional uses are 11 percent. Commercial land use, including both retail commercial and office space, is only 6 percent. Industrial use is approximately 2 percent of the land area and is concentrated near existing rail lines (Nassau County 2010). Overall, the existing land use within the onshore NY Project Area is predominantly characterized by medium- and high-intensity developed land (**Figure 4.10-1**; MRLC 2021), and residential and commercial land uses.

The cable landfall is located within the City of Long Beach public right-of-way at Riverside Boulevard and E Broadway, and an adjacent privately-owned vacant parcel.. The adjacent parcel to the east of Riverside Boulevard is under redevelopment as part of the Long Beach Superblock Project[7]. Immediately to the north of the cable landfall across East Broadway there are various high-rises. To the south of the cable landfall the export cable route traverses underneath the raised oceanfront boardwalk adjacent to Ocean Beach Park. Ocean Beach Park forms a continuous strip of sandy beach along the southern shore of the barrier island of Long Beach within the City of Long Beach.

[7] The Superblock Project is located along Shore Road between Riverside Boulevard and Long Beach Boulevard.

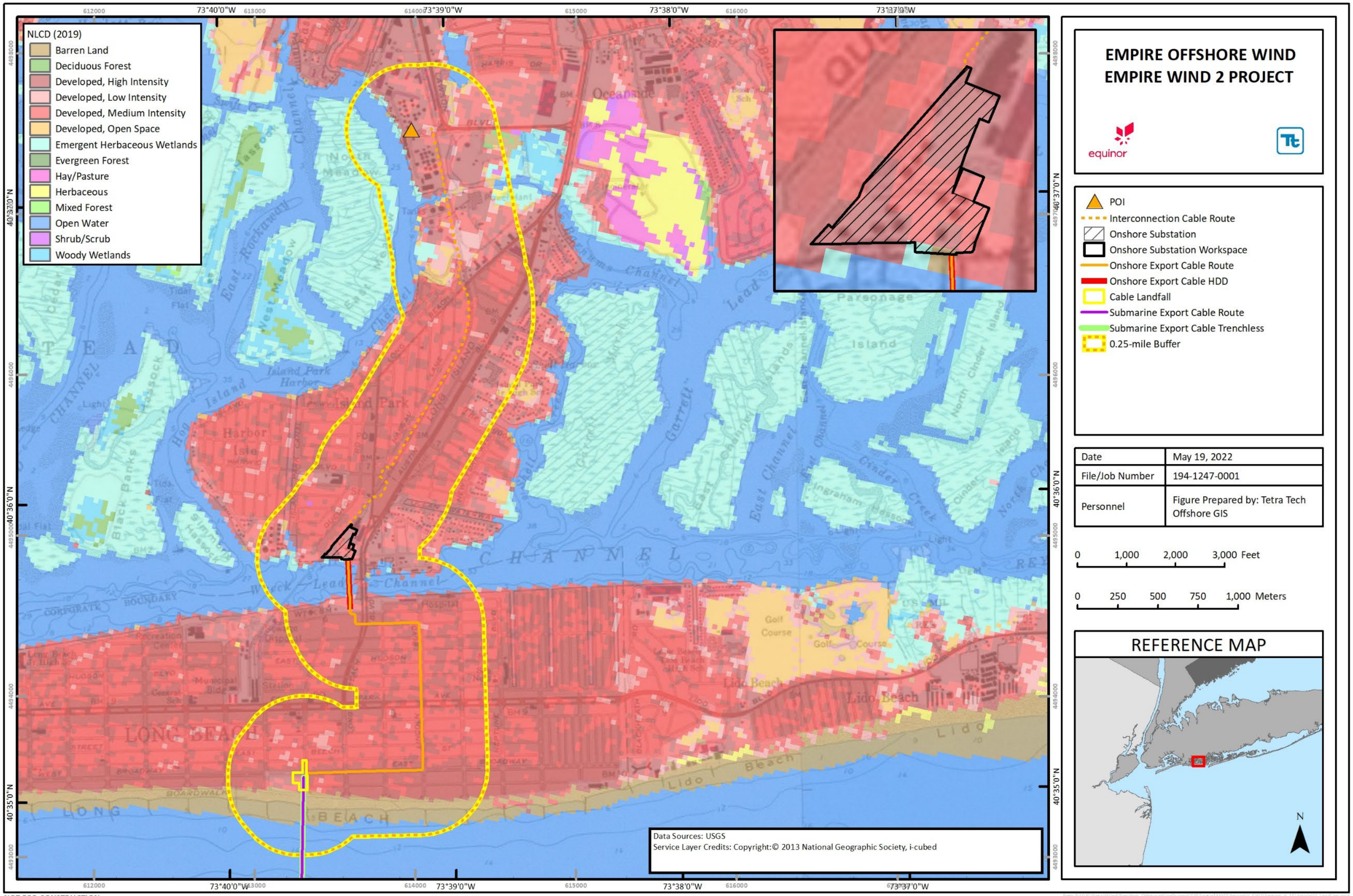


Figure 4.10-1 Land Use within 0.25 mile of the Onshore NY Project Area

The existing land use at the cable landfall and along the onshore export cable route within the City of Long Beach consists mainly of areas of residential and commercial uses. Within the City of Long Beach, the medium- and high-intensity developments are largely residential, with light commercial, industrial, and community service uses (Rauch Foundation 2020). Multi- family units and condos/co-ops line the southern shoreline along the Boardwalk. Central Long Beach and the northern shoreline are populated by single and two- to three-family homes. Community services (e.g., city government offices, public transportation, health care, and recreational centers) are interspersed among these residences, while industrial sites line the northern shoreline between the LIRR corridor and Long Beach Boulevard. Commercial activity, including offices, retail, dining and hospitality, and entertainment, are concentrated around Park Avenue and Long Beach Boulevard. The closest areas designated as recreational areas include the Long Beach Park, Sherman Brown Park, Long Beach Tennis Center, Island Park Junior High School Baseball Fields, and Francis X. Hegarty Elm School Playground.

North of the crossing of Reynolds Channel, at the northern end of the onshore export cable route, the onshore export cables enter the onshore substation in the Village of Island Park. Existing land use at the onshore substation site is predominantly characterized by commercial land use. The onshore substation is located in a highly developed area bordered by commercial and residential land use (**Table 4.10-2**, **Figure 4.10-1**).

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

NLCD Cover Class (2016)	Area (Acres)	Percent of Total
Developed, High Intensity	501	39.9%
Developed, Medium Intensity	447	35.6%
Open Water	146	11.7%
Barren Land (Rock/Sand/Clay)	64	5.1%
Developed, Low Intensity	40	3.2%
Emergent Herbaceous Wetlands	38	3%
Developed, Open Space	15	1.2%
Woody Wetlands	2	0.1%
Grassland/Herbaceous	1	0.1%
Deciduous Forest	<1	<0.1%
Scrub/Shrub	<1	<0.1%
Total	**1,255**	**100%**

Within the Village of Island Park, industrial and commercial uses generally line the LIRR corridor, while community services (e.g., public libraries and religious centers) and commercial uses are present along Long Beach Road (Rauch Foundation 2020). The remainder of Island Park predominantly comprises single and two- to three-family residences. The interconnection cable route is located mostly along or parallel to the LIRR corridor, in an area categorized as commercial, residential, and industrial, with recreation, community services, public services, and vacant areas included in the vicinity. North of Long Beach Road, the interconnection cable route crosses out of the Village of Island Park and into unincorporated Oceanside, within the Town of Hempstead. This portion of the route is characterized by industrial land use adjacent to the E.F. Barrett Power Station and an existing tank farm. The interconnection cable route crosses Barnums Channel and is adjacent to a large Costco Wholesale property and parking lot immediately to the south of Daly Boulevard. The POI area and immediately adjacent parcels are predominantly industrial land use.

4.10.2.1 Zoning

Zoning in the NY Project Area is defined by the Town of Hempstead (Town of Hempstead Chapter BZ Building Zone Ordinance Article III), City of Long Beach (Appendix A of City of Long Beach Code of Ordinances), and the Village of Island Park (Village of Island Park Code Chapter 625). The following describes the municipal zoning codes used in the evaluation of the onshore portions of the NY Project Area:

- **Town of Hempstead, Chapter BZ, Building Zone Ordinance:** The Town of Hempstead, outside of incorporated villages and cities, is divided into districts: Residence Districts A, AA, A1, A2, B, BB, BA, C, CA, CA-S; Coastal Conservation District-Woodmere Club (CC-WC); Edu-Cultural Districts E; Golden Age Residence Districts (GA); Michel Field Hotel District MFH; Mitchel Field Office Districts MFO, MFO-I, MFO-II; Mitchell Field Mixed-Use District MFM; Cluster Residential Districts CR; Levittown Planned Residence District LPRD; Business Districts X; Light Manufacturing Districts LM; Industrial Districts Y; Marine Residence Districts MA; Marine Commercial Districts MB; Marine Recreation Districts MC; Marine Resort Districts MD; Urban Renewal Residence B District URD-B; Urban Renewal Residence C District URD-C; Urban Renewal Highway Commercial District URD-HC; Urban Renewal Residence Elderly-Handicapped District URD-EH; Gasoline Service Station Districts GSSS; Planned Unit Development District; Hempstead Turnpike-Elmont District; Baldwin Mixed-Use Overlay District (B-MX; and Transit-Oriented Development Districts in North Lawrence and Inwood TOD. These districts are shown on the " Building Zone Map of the Town of Hempstead, Nassau County, New York."
- **Village of Island Park, NY, Part II: General Legislation, Chapter 625 Zoning:** For the purpose of promoting the public health, safety, morale and general welfare of the community, the Village of Island Park is divided into the following types of districts: (1) Residential A District, (2) Cluster Residence (CR) District, (3) Offices-Senior Citizen Housing District, (4) Business District, (5) Commercial A District, (6) Commercial B District, and (7) Commercial C District. These districts are shown on the "Official Zoning and Use Map, Incorporated Village of Island Park, Nassau County, New York," dated November 1978, which accompanies Chapter 625.[8] Additionally, in 2021, the Village of Island Park adopted a Transit-Oriented Development Overlay District into its zoning code.
- **City of Long Beach, NY, Code of Ordinances, Appendix A, Sec. 9-101. Zones**: For the purpose of promoting the public health, safety, morals and general welfare, regulating and restricting the location, construction and use of land in the City of Long Beach, the City of Long Beach is divided into twenty (20) classes of districts grouped by residence, business, and industrial: Residence A, B, C, D, DD, E, EE, F, FF, G, H, J, K, L and M Districts; Residence-Business A Districts; Business A, B and C Districts; and Industrial Districts [9]

The Nassau County Planning Commission also has a role in zoning. Any city, town or village in Nassau County is required to submit proposed changes to the Nassau County Planning Commission before taking final action on the proposed issue. The Planning Commission has jurisdiction, under Section 239-m (Article 12-B) of New York State General Municipal Law, and Article XVI, Sections 1606-1608 of Nassau County Law, to review zoning actions referred by local governments. Actions which need to be referred to the County Planning Commission include amendment or adoption of zoning ordinances, local laws, and comprehensive plans. Sites within 500 feet of County or State roads and/or rights-of-way, parks, and other facilities, municipal boundaries

[8] Village of Island Park Zoning. https://ecode360.com/14829936 Island_Park_Zoning.pdf (villageofislandpark.com)
[9] City of Long Beach, NY Zoning. https://www.longbeachny.gov/vertical/sites/%7BC3C1054A-3D3A-41B3-8896-814D00B86D2A%7D/uploads/Long_Beach_Code_of_Ordinances_Sup_80.pdf

or County drainage channels, as well as other specific actions, are also subject to referral requirements and subsequent review by the Planning Committee.

The underground export cable landfall in the City of Long Beach crosses the City-owned parkland of Ocean Beach Park. The Applicant will seek the right to install the underground cables through City-owned parkland from the City of Long Beach for this portion of the export cable route, which may require parkland alienation legislation from the State of New York and also may require Federal conversion. Since all components of the cable landfall and onshore export cables will be located below ground, the NY Project is not expected to impact zoning in the City of Long Beach or existing recreational land uses within the park.

The onshore substation within the Village of Island Park is located on districts zoned as Commercial A and Commercial B. Commercial A Districts are designated for offices, yacht clubs, restaurants, marinas, service, and various marine-related commercial businesses such as commercial party and charter fishing boats, service, repair, storage and dockage of boats, and sale of marine fuels, bait, fish, ice, and cooking fuels. Commercial B Districts are designated for business and professional offices, laboratories, warehouses (so long as there are no retail sales on the premises), tennis courts, and nursing homes. An electrical substation is neither listed as a permitted use nor explicitly prohibited for Commercial A or Commercial B Districts but will represent a change from the existing commercial uses at this location. Additional information on compliance with local ordinances, including zoning, is provided in **Exhibit 7: Local Ordinances**.

The onshore substation is also located within the Transit-Oriented Development Overlay District adopted in 2021, and both the Waterfront Subdistrict and the Business Subdistrict. The Transit-Oriented Development Overlay District is intended to foster the implementation of transit-oriented and walkable neighborhood development, centered around the downtown, the LIRR station and Austin Boulevard. The overlay district permits all existing uses for the Commercial A District and additionally allows apartment housing/multiple dwellings.

Since the onshore export and interconnection cables will be located below ground (with the exception of the Barnums Channel crossing via cable bridge) and will be located within or along existing roadway and railroad rights-of-way, the onshore export and interconnection cables will not impact local zoning.

4.10.2.2 Floodplains

FEMA is responsible for flood hazard mapping to assess flood risk to infrastructure and guide mitigation measures. FEMA data indicates that portions of the NY Project are situated within Special FHAs associated with the Atlantic Ocean, Hempstead Bay, and Reynolds Channel. The onshore NY Project Area contains Zone VE (coastal area subject to inundation by the 1 percent annual chance flood event and which is subject to high velocity wave action), Zone AE (the 1-percent-annual-chance floodplain) and Zone X (shaded) (the 0.2-percent-annual-chance floodplain) and Area of Minimal Flood Hazard (**Figure 4.4-2**) as discussed further in Section 4.4.

The majority of the onshore substation site is located in Zone AE, with a small area in the southeastern portion of the site in Zone X (shaded). Additionally, the southern portion of the 5.2-ac (2.1-ha) onshore substation is within the Coastal A Zone, as delineated by the Limit of Moderate Wave Action (LiMWA). 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. Zone VE is present along nearshore portions of the submarine export cable route and at the cable landfall. Additionally, the crossing of Barnums Channel via a cable bridge in the northern portion of the interconnection cable will cross the channel within Zone AE. The crossing may require bridge supports (piles) within the channel that are below the LiMWA line. Barnums Channel is not identified as regulatory floodway on FEMA mapping (FEMA 2009).

The Village of Island Park requires all new developments or improvement plans located in a floodplain to adopt flood prevention measures in the initial development plans. The Village regulates construction and development in identified floodplains to ensure buildings are protected from flood damage.

4.10.2.3 Agricultural Districts

Article 25-AA of the Agriculture and Markets Law, the Agricultural Districts Law of 1994, 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 to protect farmers against local laws that may unreasonably restrict farm operations located within an agricultural district. The Applicant determined that no portion of the NY Project is expected to cross agricultural land and there are no agricultural districts in the vicinity of the NY Project Area (Cornell IRIS and NYS Department of Agriculture and Markets 2021).

4.10.2.4 Parks and Recreational Resources

There are several parks and recreational resources located near the NY Project (**Figure 4.10-2**). The NY Project Area crosses Ocean Beach Park, owned by the City of Long Beach at the cable landfall. Ocean Beach Park forms a continuous strip of sandy beach for approximately 4 miles along the southern shore of the barrier island within the City of Long Beach. Lifeguards are on duty in the summer and beach passes are required for summer access. To the east of the NY Project area in the adjacent Town of Hempstead, is Lido Beach West Town Beach. Sherman Brown Park is located at the intersection of Riverside Boulevard and East Pine Street, to the west of the onshore export cable route. Within 0.25 mile of the NY Project are also the Island Park Lincoln Orens Middle School and its adjacent sports fields and playground, as well as the Francis X Hegarty Elementary School and its sports fields and playground.

4.10.3 Potential Land Use Impacts and Proposed Mitigation

This section identifies and evaluates the potential construction and operational impacts of the NY Project to land uses, zoning, local land use plans, agricultural districts, and parks and recreational resources. The NY Project will not conflict with current or planned land uses within the NY Project Area and will have at most a minimal impact on any future planned uses.

4.10.3.1 Construction

During NY Project construction, the potential impact-producing factors to existing land uses may include:

- Construction of an onshore export and interconnection cable system, including splice bays (installation techniques including open cut trenching and HDD); and
- Construction of the onshore substation.

Construction of the NY 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.

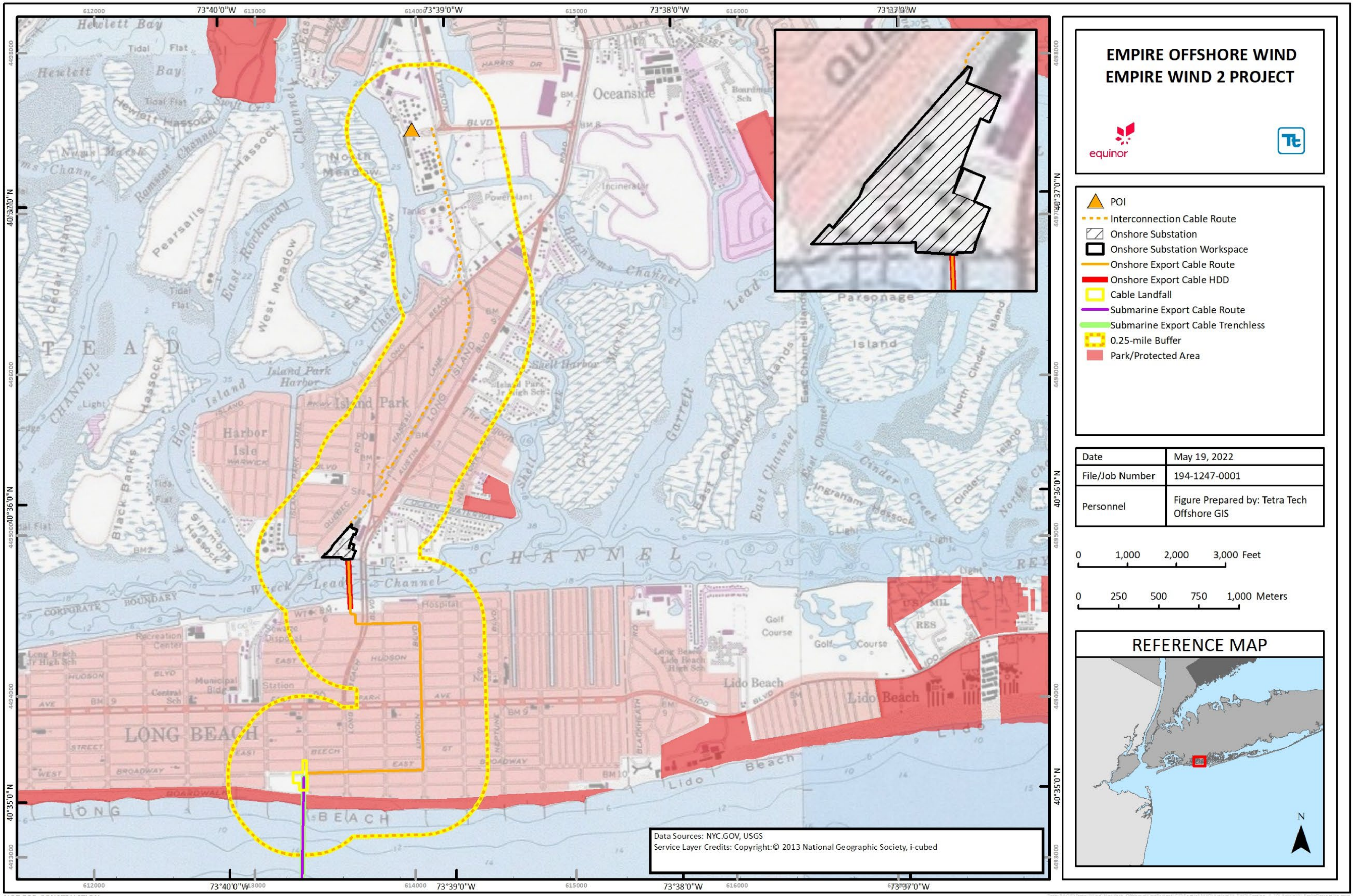


Figure 4.10-2 Parks and Recreational Resources within 0.25 mile of the Onshore NY Project Area

Short-term increase in construction vehicle traffic and activity. An increase in project-related construction, support, and workforce vehicle traffic along the onshore export and interconnection cable routes and to the onshore substation is anticipated during construction. As the NY Project utilizes existing roads, rights-of-way, 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. 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 the Town of Hempstead, City of Long Beach, Village of Island Park and/or Nassau County, as applicable.

Short-term implementation of safety zones. To ensure the safety of the public during onshore construction activities, construction workspace and staging areas will be set up, and the public will not be allowed to enter them. This may result in some temporary impacts to recreational access during installation of the cable landfall adjacent to Ocean Beach Park. Since the proposed cable landfall and onshore export cables will be buried underground and the cable landfall will be installed across the beach using trenchless, HDD installation methods, no direct impacts to Ocean Beach Park recreational land use are anticipated during cable landfall activities or during operations.

As the NY Project utilizes existing roads, rights-of-way, 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 with, and approved by, the affected local municipalities and to be provided in the Environmental Management and Construction Plan; and
- Implementation of the NY Project's Public Involvement Plan (see **Appendix B**), including regular updates to the local community through social media, public notices, the NY Project website, and/or other appropriate communications tools.

Areas temporarily disturbed during installation of the onshore export and interconnection cables will be restored in-kind, as applicable. A detailed assessment of the NY Project's compliance with local zoning and other ordinances is provided in **Exhibit 7**.

4.10.3.2 Operations and Maintenance

During operations, land use and zoning impacts will be minimized as the NY Project will utilize existing roads and rights-of-way to the extent practicable, and NY Project operations will be largely consistent with the existing land use and zoning of the area. With the exception of the onshore substation, some minor features of the export and interconnection cables (e.g., link boxes), and Barnums Channel crossing, the NY Project will be located underground. As such, the existing landscape will be preserved. The NY Project is not anticipated to present any significant conflict with present or future planned uses within the NY Project Area and will have at most a minimal impact on any future planned uses. Additional discussion of future planned uses is provided in Section 4.14.

The onshore substation, including the potential removal of the existing marina that is present on site, could represent some long-term change in land use from commercial and recreational land uses to industrial land use and may result in some restriction of public access to the waterfront compared to its existing condition. Based on the relatively small area (5.2 ac [2.1 ha]) of land use change at the onshore substation site, this is not expected to have a significant effect on land uses in the vicinity of the NY Project or region in general. The Applicant will evaluate minimizing impacts to public access in the onshore substation design, as feasible.

The NY Project's onshore substation will include concrete foundations, gravel lots, fencing, and associated structures in Special FHAs. Changes in elevations and grades, and the placement of structures, have the potential to impact flood flows and flood storage. Additionally, the crossing of Barnums Channel via a cable bridge in the northern portion of the interconnection cable route will cross the channel withing Zone AE and the LiMWA. The crossing may require bridge supports (piles) within the channel (see **Exhibit E-3**). Impacts due to the introduction of fill and structures within Special FHAs will be mitigated through appropriate facility design consistent with applicable laws and other requirements.

Impacts due to the long-term presence of NY Project 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 rights-of-way 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 onshore substation will address local floodplain requirements as discussed in **Exhibit 7**.

4.10.3.3 Compliance with State and Local Plans and Policies

2016 New York State Open Space Conservation Plan

The NY Project will be consistent with the Open Space Conservation Plan Project 5, Long Island Sound, a Priority Open Space Conservation Project, which includes the acquisition of open space within the boundaries of the federally designated Long Island Sound Estuary. Acquisitions protect ground and surface water quality, improve coastal resiliency, enhance fish and wildlife habitat, and support water-based industry and tourism. No land that is proposed to be acquired by the Open Space Conservation Plan will be impacted by the construction or operation of the NY 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 NY 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 NY Project is consistent with the State Energy Plan's goals of renewable energy, sustainable and resilient communities, and energy infrastructure modernization.

In addition, the NY 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 GW 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 NY Project is consistent with each of these policies, as detailed in **Appendix F Coastal Zone Management Consistency Statement**.

Nassau County Draft Master Plan (2010)

The Nassau County Draft Master Plan emphasizes a paradigm shift towards a sustainable future for the next 20 years. One of the important factors in this paradigm shift is the switch to renewable energy to sustain lower energy costs, create jobs in the renewable industry, and prevent increasing CO_2 emissions. The implementation of offshore renewable wind energy would help to address this aspect of the Master Plan. The NY Project would not conflict with any of the current initiatives or actions outlined in the draft Master Plan.

Nassau County Master Plan Update (2008)

The NY Project will be consistent with the goals and initiatives of the Nassau County Master Plan. The NY Project does not conflict with the outlined economic initiatives, redevelopment or transportation projects, or open space acquisition as described in the Master Plan

Long Island South Shore Estuary Reserve Comprehensive Management Plan

The Long Island South Shore Estuary Reserve Comprehensive Management Plan (CMP) emphasizes the importance of the Long Island South Shore Estuary Ecosystem and outlines actions necessary to preserve, protect, and enhance the natural, recreational, economic, and educational resources that the reserve provides. Issues identified include improving and maintaining water quality, protecting and restoring living resources of the reserve, expanding public use and enjoyment of the estuary, sustaining and expanding the estuary-related economy, and increasing education, outreach and stewardship. The draft 2021 CMP has added resilience as a key issue in the plan. Within each issue, the CMP outlines a number of outcomes and implementation actions. Outcomes include the reduction of marine debris, healthy populations of shellfish and finfish, management of state and federally regulated and regionally important species and management of invasive species, among others. Through the NY Project's implementation of environmental avoidance, minimization and mitigation measures, described throughout this Exhibit, the NY Project will be consistent with objectives and outcomes of the CMP.

City of Long Beach Comprehensive Plan

The Applicant will coordinate with appropriate City of Long Beach municipal agencies and officials, in consideration of the City's Comprehensive Plan. Since the proposed cable landfall and onshore export cables in the City of Long Beach will be located underground, the NY Project is expected to be consistent with the City's Comprehensive Plan objectives.

Barnum Island/Oceanside/The Village of Island Park/Harbor Isle NY Rising Community Reconstruction Plan (NYRCR 2014)

The Rising Community Reconstruction Plan (NYRCRP) is focused on community resilience for future storm events. Power supply and reliability during emergencies is one of the critical issues addressed in this plan. The NY Project supports new energy generation from offshore wind, supporting the goals of this plan. The onshore substation is located within an economic development area identified in the Community Reconstruction Plan. These areas were identified as underutilized properties zoned for business and industrial uses along major corridors where economic growth opportunities exist. The plan identifies opportunities to expand water-dependent and water-related, commercial, residential and mixed-use development along Wreak Lead (Reynolds Channel). The plan also identifies the shoreline adjacent to the onshore substation as an area of vulnerable shoreline. The NY Project is consistent with the objective of redeveloping underutilized properties and promoting economic activity. Through the NY Project's implementation of environmental avoidance, minimization and mitigation measures, described throughout this Exhibit, the NY Project will be consistent with environmental resilience objectives.

Town of Hempstead, Energy & Sustainability Master Plan (2012)

The Town of Hempstead, Energy & Sustainability Master Plan (2012) lists the objective of promoting self-reliant energy generation to offset greenhouse gas emissions, and also allow alternative energy generation when grid brownouts and blackouts hit during emergencies. As the NY Project supports offshore renewable wind energy generation, the NY Project is consistent with the goals of this plan.

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 NY 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 local jurisdictions and describes the noise assessment methodology used to determine potential impacts from the NY Project's construction and operations. The complete In-Air Noise Assessment conducted for the NY Project is provided in **Appendix L**.

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 noise level exceeded 10 percent of the time (L_{90}) (e.g. noise level exceeded 10 percent of the time) sound level for 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 sound 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 entitled *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.

DPS 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.

Town of Hempstead

Portions of the onshore export and interconnection cable routes and the POI are located in the Town of Hempstead, in Nassau County, New York. The onshore substation and the north side of the Reynolds Channel HDD are also located in the Town of Hempstead, within the incorporated Village of Island Park (discussed below). The Applicant also assessed noise associated with a cable landfall alternative in the Town of Hempstead (Alternative C see **Exhibit 3: Alternatives** and **Appendix L, In-Air Acoustic Assessment**)

The Town of Hempstead regulates sound through its ordinance (Chapter 144, Ord. No. 25 amended in its entirety 11-1-1983 by L.L. No. 99-1983, effective 11-7-1983). Generally, construction is limited to the hours of 7:00 am and 6:00 pm on weekdays.

The Town prescribes limits by octave band frequency for transient (**Table 4.11-1**) and steady-state sound sources (**Table 4.11-2**) given in linear or unweighted decibels. During daytime hours (7:00 am to 7:00 pm) the limits in **Table 4.11-1** would apply to a transient noise having a duration of more than 12 seconds. During nighttime hours, the limits in **Table 4.11-1** would apply to a transient noise having a duration of more than six seconds.

Table 4.11-1 Town of Hempstead Transient Noise Limits (dB)

Octave Band Center Frequency (Hz)	Octave Band Sound Pressure Level (dB)
63	92
125	87
250	79
500	72
1,000	66
2,000	60
4,000	54
8,000	52

Table 4.11-2 Town of Hempstead Steady State Noise Limits (dB)

Octave Band Center Frequency (Hz)	Octave Band Sound Pressure Level (dB)
63	72
125	67
250	59
500	52
1,000	46
2,000	40
4,000	34
8,000	32

City of Long Beach

The proposed cable landfall, portions of the onshore export cable route and the south side of the Reynolds Channel HDD are located in the City of Long Beach in Nassau County, New York. The Applicant also assessed noise associated with a cable landfall alternative (Alternative E, see **Exhibit 3: Alternatives** and **Appendix L, In-Air Acoustic Assessment**) within the City of Long Beach. The City of Long Beach regulates sound through the City of Long Beach Noise Control Ordinance. Chapter 16, Section 16-6 lists the following as a violation of the Ordinance and are applicable to the NY Project:

- No person shall operate or permit to be operated any tools or equipment used in construction, drilling, excavations, or demolition work, between the hours of 8:00 p.m. and 8:00 a.m. the following day or any time on Sunday or legal holidays prior to noon, except the provisions of this section shall not apply to emergency work.
- No person shall cause or permit the operation of any device, vehicle, construction equipment, or lawn maintenance equipment, including but not limited to any diesel engine, internal combustion engine, or turbine engine, without a properly functioning muffler, in good working order and in constant operation regardless of sound level produced.
- Any excessive or unusually loud sound which either annoys, disturbs, injures, or endangers the comfort, repose, health, peace, or safety of a reasonable person of normal sensibilities.

In addition to those specific prohibitions set forth in Ordinance Section 16-6, the following general prohibitions regarding continuous sound levels shall apply in determining unreasonable noise:

- No person shall make, cause, allow, or permit the operation of any source of sound on a particular category of property or any public space or right-of-way in such a manner as to create a sound level that exceeds the particular continuous A-weighted decibel limits set forth in **Table 4.11-3** below when measured at or within the real property line of the receiving property except as provided below.
- When measuring sound within a dwelling unit of a multi-dwelling-unit building, all exterior doors and windows shall be closed, and measurements shall be taken in the center of the room.
- When measuring on Ocean Beach Park sound shall be measured at the center of the boardwalk at a point directly perpendicular to the source.

Table 4.11-3 Permissible Continuous Sound Levels by Receiving Property Category, in dBA

	Another Dwelling Within a Multi Dwelling Unit Building		Residential		Commercial or Public Service or Community Service Facility	Industrial or Public Service Industrial Facility	Ocean Beach Park or Parks
Sound Source Property Category	(7am - 10pm)	(10pm-7am)	(7am-10pm)	(10pm-7am)	(All times)	(All times)	(6am-11pm)
Any location within a multi-dwelling unit building	50	45	65	50	70	75	65
Residential (or public spaces or rights-of-way)			65	50	70	75	65
Commercial or public service or community service facility			65	50	70	75	65
Industrial or public service industrial facility			65	50	70	75	65

Section 16-8 of the Ordinance describes general prohibitions regarding impulsive sound levels:

- No person shall make, cause, allow or permit the operation of any impulsive source of sound within any and all property in the city which has a peak sound pressure level in excess of eighty (80) dBA. If an impulsive sound is the result of the normal operation of an industrial or commercial facility and occurs more frequently than four (4) times in any hour the levels set forth in **Table 4.11-3** shall apply.

Regardless of the decibel limits, the provisions of this Ordinance shall not apply to noise from construction activity provided all motorized equipment used in such activity is equipped, where applicable, with functioning mufflers, except as provided in Ordinance Section 16-6.

Village of Island Park

The onshore substation, portions of the onshore export and interconnection cable routes, and the north side of the Reynolds Channel HDD will be located within the Village of Island Park. The following noise restrictions are found within Chapter 349 of The Village of Island Park Codes:

- No person, with the intent to cause public inconvenience, annoyance, or alarm, or recklessly creating a risk thereof, shall cause, suffer, allow, or permit to be made, unreasonable noise.
- The erection, including excavation, demolition, alteration, or repair, of any building other than between 7:00 a.m. and 9:00 p.m. is prohibited except in case of a public safety emergency.
- The sounding of any horn or signaling device of an automobile, motorcycle or other vehicle for any unnecessary or unreasonable period of time is prohibited.
- No person or persons, firm, association, corporation, or contractor shall do, perform, cause, suffer, or permit the operation of any mower or power lawn mower, machine or power tools or any other power equipment to commence operation earlier than 8:00 a.m. or later than 9:00 p.m. on Monday through Saturday or earlier than 9:00 a.m. and later than 9:00 p.m. on Sunday.

Noise Assessment Methodology

For the purposes of this section, the Study Area includes a 0.25-mi (0.4-km) buffer around the onshore export and interconnection cable routes 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 L**

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 (**Appendix L**) include identifying noise-sensitive land uses in the area that may be affected by the NY Project as well as describing the standards against which the NY 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 NY 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," (1993) and Part 2: "General method of calculation," (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.

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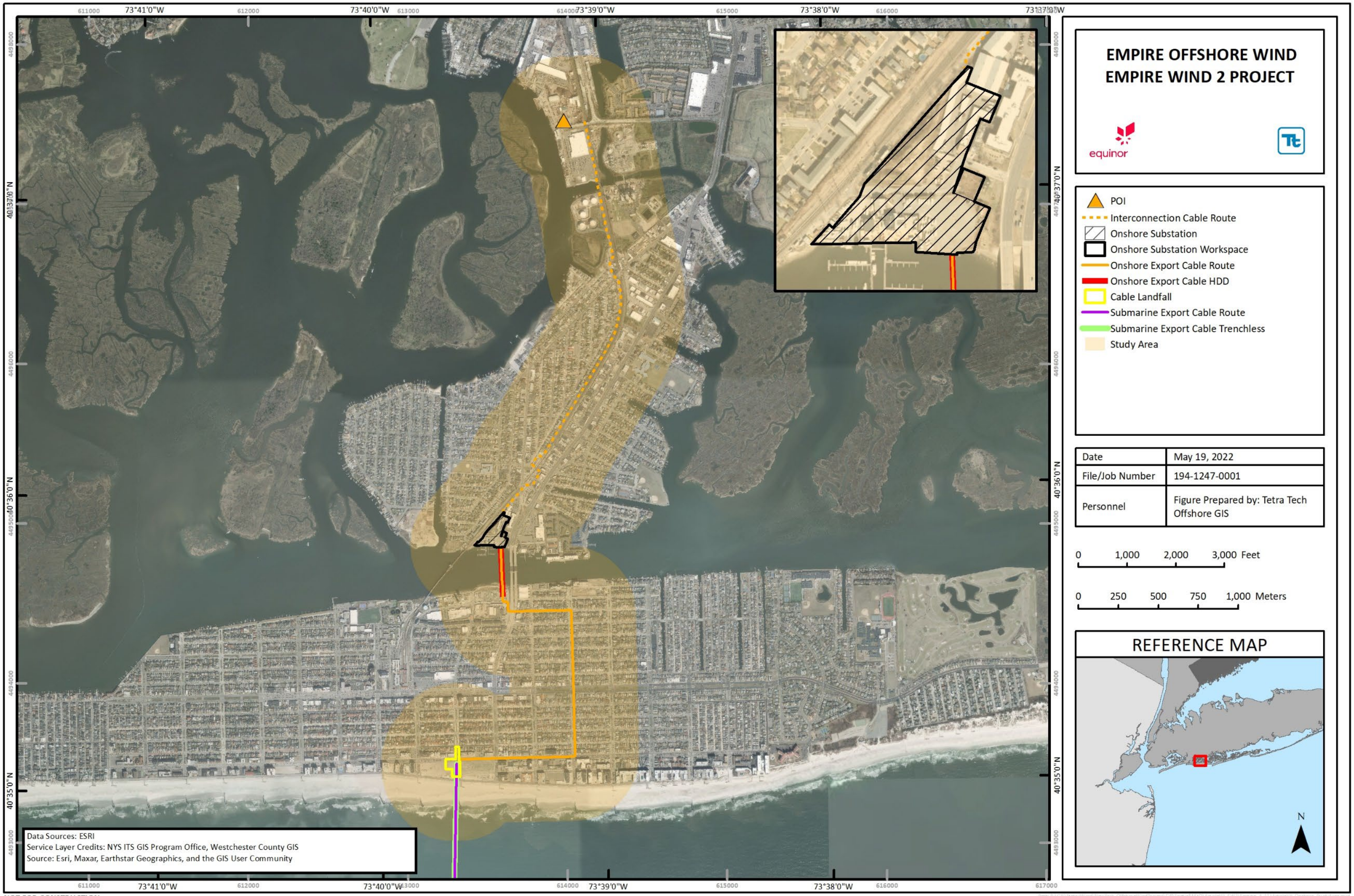

Figure 4.11-1 Onshore Ambient Noise Study Area

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**.

Table 4.11-4 summarizes the ambient sound measurement results collected at short-term monitoring locations. Sound-level monitoring shows existing nighttime L_{90} levels are in the range of 36 to 52 dBA. A quiet suburban area would typically have nighttime levels in the range of 36 to 45 L_{90} dBA (ANSI 2013). Measured ambient sound levels exhibited typical diurnal patterns, with higher ambient sound levels during the daytime, ranging from 43 to 60 L_{90} dBA.

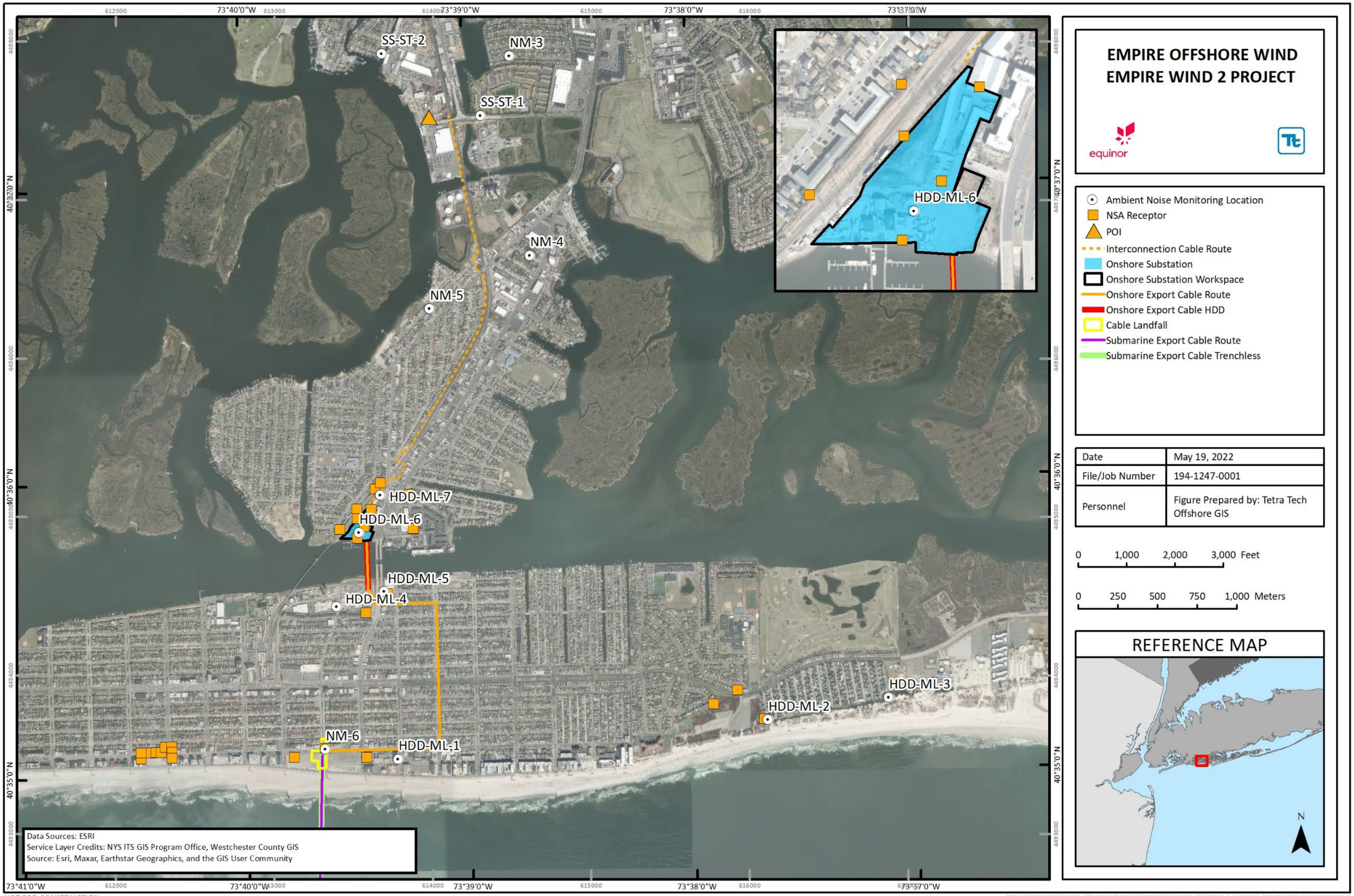

Figure 4.11-2 Ambient Sound Monitoring Locations and Receptor Locations

Table 4.11-4 Short-term Ambient Sound Measurement Results

Monitoring Location	Location	Time Period	Sound Level Metrics (dBA)			
			L_{10}	L_{50}	L_{90}	L_{eq}
NM-3	136 Harris Drive	Day	57	49	48	55
		Night	52	46	44	49
NM-4	1 Georgia Avenue	Day	59	55	51	56
		Night	54	49	47	51
NM-5	154 Waterford Road	Day	51	47	45	48
		Night	50	48	47	50
NM-6	125 East Broadway	Day	59	53	51	59
		Night	50	47	46	49
HDD-ML-1	65 Lincoln Boulevard	Day	58	50	47	58
		Night	44	43	42	47
HDD-ML-2	1 Ocean Boulevard	Day	54	45	44	52
		Night	44	43	42	44
HDD-ML-3	78 Prescott Street	Day	51	45	43	50
		Night	52	44	41	49
HDD-ML-4	109 East Pine Street	Day	56	49	47	56
		Night	48	45	44	51
HDD-ML-5	270 East State Street	Day	65	61	55	63
		Night	60	53	52	56
HDD-ML-6	15 Railroad Place	Day	59	55	51	56
		Night	54	46	40	54
HDD-ML-7	1 Long Beach Road	Day	58	52	49	62
		Night	60	48	41	62
SS-ST-1	4001 Daly Boulevard	Day	75	70	60	72
		Night	69	50	45	64
SS-ST-2	561 Bothner Street	Day	60	52	50	57
		Night	47	38	36	50

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;
- Short-term, minor increases in in-air noise levels associated with pile driving at the nearshore cofferdam and/or goal posts for the HDD cable landfall and the installation of a cable bridge at Barnums Channel;
- Short-term moderate elevated in-air noise levels associated with HDD installation at the export cable landfall and Reynolds Channel;
- Short-term, minor elevated in-air noise levels associated with construction of the onshore components, including the onshore substation and installation of the onshore export and interconnection cables; and
- Short-term moderate elevated in-air noise levels associated with pile driving activities for foundations and bulkhead improvements.

Short-term increases in in-air noise levels associated with support vessels: During construction, NY 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 progressively and will be located offshore of NSAs; therefore, no shoreline NSAs will be exposed to significant noise levels for an extended period of time. Due to the relatively short duration as construction moves along the submarine export cable corridor, 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.

Short-term increases in in-air noise levels associated with pile driving at the nearshore cofferdam and/or goal posts for the HDD cable landfall and the installation of a cable bridge at Barnums Channel: Vibratory pile drivers will be used for the installation of cofferdams, as necessary for the trenchless cable landfall activities. Vibratory sheet pile installation and removal of the temporary cofferdam is estimated to produce sound levels of 78 dBA in air at a distance of approximately 400 ft (122 m) with a corresponding sound power level (L_W) of 127 dBA (USDOT 2012). The schedule for vibratory pile driving is expected to be one to two days in duration, but specific details are not available at this time. The resulting received sound levels are presented in **Table 4.11-5**.

Table 4.11-5 Sound Levels (dBA) during Vibratory Pile Driving at Nearshore Cofferdam

Site	Distance (ft)	Sound Level at Shore During Vibratory Piling (dBA)
Cable landfall	1,825	60

Impact pile driving is expected to support the installation of cable bridge piles and the installation of nearshore goal posts, if used for the cable landfall HDD. The nearshore goal posts were modeled at a representative western location that represents the installation of goal posts associated with proposed cable landfall. The activities are presented in **Table 4.11-5**

Table 4.11-6 Impact Pile Driving Noise Levels (dBA) at Barnums Channel and cable landfall HDD goal posts

Pile Driving	Location	Distance (ft)	Modeling Results
Cable Bridge Pile Location 1 (proposed route)	NSA-1	3,114	60
	NSA-2	2,024	65
	NSA-3	1,870	65
	NSA-4	1,686	66
	NSA-5	1,700	71
	NSA-6	2,067	69
	NSA-7	2,185	64
	NSA-8	1,821	66
	NSA-9	1,706	66
Cable Bridge Pile Location 2 (proposed route)	NSA-1	2,959	61
	NSA-2	1,867	65
	NSA-3	1,673	66
	NSA-4	1,641	66
	NSA-5	1,558	72
	NSA-6	1,939	65
	NSA-7	2,080	64
	NSA-8	1,969	65
	NSA-9	1,887	65
Goal Post Western Representative Location	Shore	1,654	76

Considering this construction activity will last for a relatively short duration of time and will be limited to daytime periods, this construction activity is not expected to constitute a violation of local ordinances nor result in a potential imminent hazard to public health or the environment.

Shore-term elevated in-air noise levels associated with HDD at the export cable landfall and Reynolds Channel: The export cable landfall will be completed using HDD installation techniques within the export cable landfall area. HDD is also proposed for the onshore export cable crossing at Reynolds Channel. HDD construction equipment consists of HDD drill rigs and auxiliary support equipment including electric mud pumps, portable generators, mud mixing and cleaning equipment, forklifts, loaders, cranes, trucks, and portable light plants. Once the HDDs and pull-back are complete, noise associated with the installation will be limited to typical construction activities associated with equipment such as tracked graders, backhoes, and pickup trucks.

HDD construction activities will occur during daytime periods unless a situation arises that would require operation to continue into the night or the appropriate regulatory authority deemed it acceptable. In the case of night operations, only the HDD rig and power unit will be used unless deemed acceptable from the appropriate regulatory authority. Use of HDD was analyzed at the cable landfall and Reynolds Channel, and was found to potentially generate relatively high sound levels in the absence of noise minimization efforts.

Table 4.11-7 summarizes the predicted sound levels at the closest NSAs, indicated as HDD-NSA#, assuming the HDD sources operate continually for daytime and nighttime construction scenarios, assuming no additional mitigation measures are employed. **Appendix L** provides additional information on HDD sound level modeling. These predictive results demonstrate that with application of the proposed noise mitigation strategies, resulting sound levels will not constitute a violation of the Town of Hempstead's or the City of Long Beach's stationary source noise limits, nor result in a potential imminent hazard to public health or the environment

Table 4.11-7 Sound Levels (dBA) during HDD and Direct Pipe Construction

Site	Location	Distance (ft)	Sound Level at NSAs due to Drill Rig Only (Nighttime Operations)	Sound Level at NSAs due to all HDD/Direct Pipe Sources (Daytime Operations)
Proposed Cable Landfall (HDD)	HDD-NSA 1	620	54	57
	HDD-NSA 2	190	65	68
	HDD-NSA 3	850	51	54
EW 2 Reynolds Channel Crossing (South Shore)	HDD-NSA 17	568	56	59
	HDD-NSA 18	417	54	57
EW 2 Reynolds Channel Crossing (North Shore)	HDD-NSA 19	584	57	60
	HDD-NSA 20	548	51	54
	HDD-NSA 21	902	50	53

Short-term elevated in-air noise levels associated with construction of the onshore substation and installation of the onshore export and interconnection cables: The construction of the onshore substation and the onshore export and interconnection 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. The EPA has published data on the L_{eq} sound levels for typical construction phases (EPA 1971). This calculation conservatively assumes all equipment operating concurrently onsite for the specified construction phase and no sound attenuation for ground absorption or onsite shielding by the existing buildings or structures.

The results of these calculations are presented in **Table 4.11-8** and show estimated construction sound levels in A-weighted decibels will vary depending on construction phase and distance, with the highest levels expected in proximity to the closest neighborhoods during the site excavation phase.

Table 4.11-8 General Construction Noise Levels (dBA)

Construction Phase	50 ft from Source (L_{eq})	250 ft from Source (L_{eq})	500 ft from Source (L_{eq})	1,000 ft from Source (L_{eq})
Clearing	84	70	65	58
Excavation	91	77	72	65
Foundations	78	64	59	52
Erection	85	71	66	59
Finishing	89	75	70	63

Short-term elevated in-air noise levels associated with pile driving activities for foundations and bulkhead improvements: In addition to the above listed construction equipment, pile driving may be needed to install the foundation for the onshore substation. Impact pile driving is expected to support installation of onsite equipment and structures and vibratory pile driving is expected along the bulkheads adjacent to the onshore substation.

Due to the character of the impulsive sound they produce, impact pile drivers are not typically analyzed in combination with non-impulsive construction sound sources such as heavy-duty vehicles. Noise is generated from pile driving equipment from both the ram striking the pile as well as the operating steam, air, or diesel exhaust as it is exhausted from the cylinder (this is not present with hydraulic impact hammers).

Final design of the impact hammer and or piles planned for installation is currently under development. Assuming the installation of steel piles with a diameter between 24 and 36 inches (61 to 91 cm), an average sound pressure level would correspond to 108 dBA at 50 feet (15 m), which is used as a modeling input for the construction acoustic analysis.

Vibratory pile driving installation is estimated to produce sound levels of 78 dBA in air at a distance of approximately 400 ft (122 m) with a corresponding L_W of 127 dBA (USDOT 2012). The resulting sound levels from pile driving activities are shown in **Table 4.11-8** and provided in **Appendix L**.

Table 4.11-9 Pile Driving Noise Levels (dBA)

Pile Driving	Location	Distance (ft)	Modeling Results
	HDD-NSA 19	510	83
	HDD-NSA 20	155	93
	HDD-NSA 21	1,150	77
Foundations (Impact)	HDD-NSA 22	170	81
	HDD-NSA 23	790	79
	HDD-NSA 24	1,115	78
	HDD-NSA 25	1,115	77
	HDD-NSA 19	175	81
	HDD-NSA 20	680	69
	HDD-NSA 21	1,525	53
Bulkhead (Vibratory)	HDD-NSA 22	1,245	63
	HDD-NSA 23	1,410	62
	HDD-NSA 24	1,690	54
	HDD-NSA 25	1,510	53

Pile driving will be temporary and short-term, and pile driving activities are planned to occur during daytime hours. If necessary, subject to regulatory requirements and stakeholder engagement, the Applicant will install moveable temporary noise barriers as close to the sound sources as possible, which have been shown to effectively reduce sound levels by 5 to 15 dBA.

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 will 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.

Long-term 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 Cadna-A® and site-specific inputs in 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 4.11-10** displays the predicted operational sound levels from the substation and the incremental increase nighttime sound levels at residential receptors and property line receptors. **Figure 4.11-3** visually displays the received sound levels resulting from substation operations.

Table 4.11-10Predicted Nighttime Sound Levels (dBA) at the Closest Noise Sensitive Areas

Site	Location	Distance (ft)	Nighttime Ambient Sound Level, L_{90}	Ambient Location from Table L-7	Modeling Results	Modeling Results Plus Existing Ambient	Increase Above Existing Ambient
Onshore Substation	HDD-NSA 19	120	40	NM-7	47	48	8
	HDD-NSA 20	140	41	NM-8	53	53	12
	HDD-NSA 21	850	41	NM-8	40	44	3
	HDD-NSA 22	360	41	NM-8	43	45	4
	HDD-NSA 23	525	41	NM-8	41	44	3
	HDD-NSA 24	790	41	NM-8	38	43	2
	HDD-NSA 25	850	40	NM-7	40	43	3
	EW2C-1	Boundary	40	NM-7	66	66	26
	EW2C-2	Boundary	40	NM-7	53	53	13
	EW2C-3	Boundary	40	NM-7	58	58	18
	EW2C-4	Boundary	40	NM-7	43	43	3

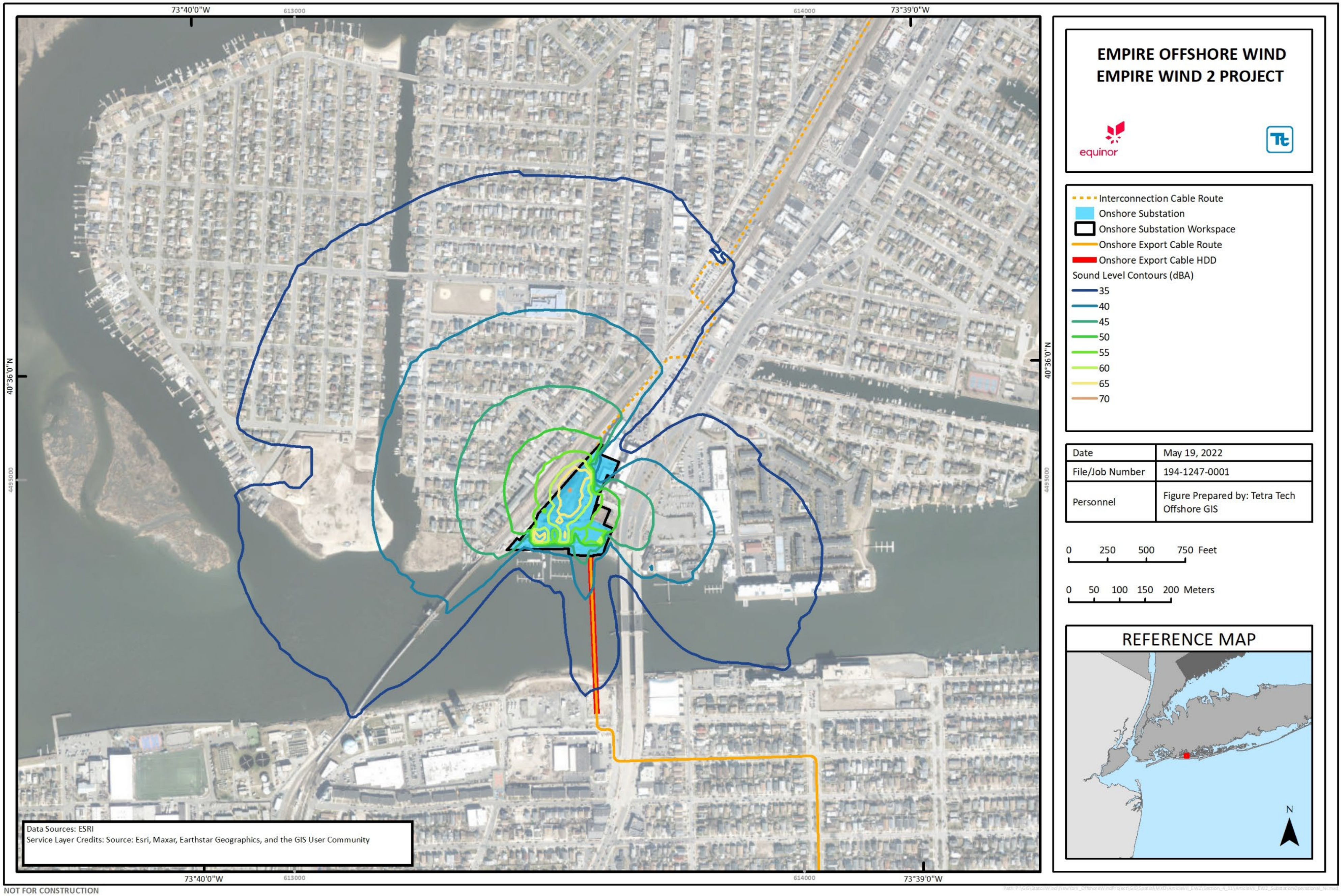

Figure 4.11-3 Onshore Substation Operational Sound Levels

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, except for HDD-NSA-19 and HDD-NSA-20. In addition, the NYSDPS "General Recommendations for Applications for Substations, Stations, and Converter Stations under Article VII" 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 NY Project property boundary. Modeled results indicate that the NY Project does not fully comply with the NYSDPS recommended acoustic design goals at multiple receptors, as well as the property boundary; however, ambient sound levels are consistently and sufficiently higher than those design goals given the urban setting of the sites. Therefore, an incremental increase criterion, similar to those given by the NYSDEC, may be a more appropriate measure for assessing potential noise impacts at NSAs given the elevated ambient acoustic environment within the NY Project Area.

Most of the applicable noise regulations consist of octave band frequency sound limits and not broadband sound limits. Compliance with those octave band sound limits is addressed by table **Table 4.11-11**. For the onshore substation, compliance with the Town of Hempstead's steady state source octave band level limits is successfully demonstrated with those requirements at all NSAs except HDD-NSA-20. Further review of design and acoustic analysis will be conducted to successfully demonstrate compliance at all NSAs.

Short-term 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.

Table 4.11-11Onshore Substation Tonal L90 Sound Levels (dB) at the Closest Noise Sensitive Areas

Octave Band Center Frequency (Hz)	Octave Band Sound Pressure Level (dB) Limit	Octave Band Sound Pressure Level (dB)										
		HDD-NSA 19	HDD-NSA 20	HDD-NSA 21	HDD-NSA 22	HDD-NSA 23	HDD-NSA 24	HDD-NSA 25	EW2C-1	EW2C-2	EW2C-3	EW2C-4
63	72	54	59	48	51	49	46	48	69	58	62	52
125	67	53	59	47	50	48	45	47	71	59	64	51
250	59	45	51	39	42	40	37	39	66	53	58	43
500	52	46	52	39	42	40	37	39	65	52	58	41
1,000	46	41	47	35	37	36	32	35	59	46	52	35
2,000	40	36	42	28	31	29	26	28	54	40	46	30
4,000	34	28	35	16	21	19	14	16	49	33	40	24
8,000	32	10	23	0	0	0	0	0	40	23	29	14
	Average (dBA)	47	53	40	43	41	38	40	66	53	58	43

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 NY Project and the affected air environment. This section also describes the existing air quality conditions and potential impacts to air quality resulting from construction and operation of the NY Project, as well as 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 2 Project's renewable energy generation are described in **Exhibit 6: Economic Effects of Proposed Facility**.

4.12.1 Federal Regulations

Under the federal CAA, the EPA is responsible for developing and enforcing the regulations protecting air quality in the United States. NY Project emissions associated with construction and operations will be subject to The NYSDEC and EPA regulations governing air quality both onshore and offshore, but will not trigger thresholds for any federal air permitting programs.

4.12.1.1 National Ambient Air Quality Standards

The CAA established the National Ambient Air Quality Standards (NAAQS) for the following common pollutants, known as criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), 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 when volatile organic compounds (VOCs) or nitrogen oxides (NO_X), which includes nitric oxide (NO), NO_2, and other NO_X, undergo photochemical reactions in the atmosphere. 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 also form when SO_2, NO_X, VOCs, or ammonia undergo photochemical reactions in the atmosphere. 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 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 (CO_2), 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, CO_2 accounted for approximately 82 percent of all GHG emissions in 2017 (EPA 2020c). Emissions of GHGs are typically presented in units of CO_2 equivalents, or CO_2e, based on the specific global warming potential (GWP) of each gas.

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 (6 NYCRR § 231-13.1), and to 25 tpy for VOCs and NOx in severe ozone nonattainment areas (6 NYCRR § 231-13.1), which includes the counties of the New York metropolitan area, including Nassau County. The components of the NY Project 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 (NSPS) 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 (NESHAP) 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 NSPS 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 NY 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 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 §§ 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 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 § 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 NOx 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 Air Quality Studies and Analysis

For the purposes of this section, the Air Quality Study Area includes Nassau County, New York in which the NY 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 2019l).

4.12.4 Existing Air Quality Conditions

This section describes the affected environment, inclusive of the onshore and offshore areas potentially impacted by NY Project construction and operations activities; this includes areas associated with operational NY Project facilities, as well as areas that will temporarily host construction activities. These areas include onshore and offshore portions of Nassau County 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 onshore NY Project Area is located predominantly within developed areas of the City of Long Beach and the Town of Hempstead; additional discussion of the land use characteristics of the NY Project Area is provided in Section 4.10 of **Exhibit 4: Environmental Impact**. The area offshore Long Island is active with vessels ranging from recreational boating and fishing traffic to larger vessels that may be transiting through these waters to and from the Port of New York and New Jersey.

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 2020b). 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 2020b).

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 2020b). While some compounds exhibit more variable trends, data from 2006 to 2019 indicates that annual average concentrations of VOCs at these stations have generally decreased since 2006 (NYSDEC 2020b).

Nassau County is currently designated as serious ozone nonattainment with respect to the 2008 standard and moderate ozone nonattainment with respect to the 2015 ozone standard (the current attainment status designations for the state of New York are promulgated at 40 CFR § 81.333). However, NYSDEC has requested that EPA reclassify the New York-Northern New Jersey-Long Island, NY-NJ-CT Air Quality Control Region as "severe" nonattainment for the 2008 standard (NYSDEC 2021c). The monitors demonstrate compliance with the NAAQS for other criteria pollutants.

In July 2019, the 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).

4.12.5 Potential Air Quality Impacts and Proposed Mitigation

NY 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.

4.12.5.1 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 NY Project-related components to construction sites. Air emissions related to the NY Project during construction could have short-term impacts to air quality.

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 cables and the cable landfall, which will operate in New York State waters in Nassau County. 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. NY Project-related vessels will comply with applicable EPA, or equivalent, emission standards.

Construction staging and laydown for offshore and onshore construction will occur within the onshore NY Project Area in Nassau County; the Applicant may also consider staging and/or laydown areas in adjacent Kings County. Construction activities for the onshore substation and installation of the onshore export and interconnection cables will primarily utilize diesel-powered equipment. In addition, a localized increase in fugitive dust may result during onshore construction activities. To minimize impacts, NY 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 NY Project will be managed in accordance with the NY Project's onshore Fugitive Dust Control Plan.

Proposed avoidance, minimization and mitigation measures for construction emissions are summarized below:

- Marine vessels constructed on or after January 1, 2016 will meet the Tier III NOX standard established by the IMO;
- Onshore diesel-powered construction equipment and vehicles will use ULSD fuel, per the requirements of 40 CFR § 80.510(b);
- 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); and
- Fugitive dust generated during onshore construction will be managed in accordance with the Fugitive Dust Control Plan.

4.12.5.2 Operations

During operations and maintenance, potential NY Project-related emissions will result from the operation of an emergency generator at the onshore substation and from GHG emissions of sulfur hexafluoride (SF_6) 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 NY 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 per year) a/

Activity	VOC	NO_x	CO	PM/ PM_{10}	$PM_{2.5}$	SO_2	HAP	GHG (CO_2e)
Operation of onshore substation	0.26	1.85	1.16	0.07	0.06	0.002	0.002	1,060
TOTAL	**0.26**	**1.85**	**1.16**	**0.07**	**0.06**	**0.002**	**0.002**	**1,060**

Note
a/ Operating emissions for the onshore substation are based on the air emission inventory that was developed for the Construction and Operations Plan (COP) submitted to BOEM.
b/ CO_2 emissions are based on the 100-year global warming potentials published in Table A-1 of EPA's Mandatory Greenhouse Gas Reporting Rule, 40 CFR Part 98.

Proposed avoidance, minimization and 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 Electric and Magnetic Fields

This section describes onshore and offshore EMF that may occur within and surrounding the NY Project. Potential impacts resulting from EMF during construction, operations, and maintenance of the NY 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 New York State Public Service Commission (NYSPSC or 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 NY 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, onshore export, and interconnection cables. The EMF Assessment is provided in **Appendix G**. This assessment includes calculation of the 60-Hz magnetic field levels anticipated to be produced during operation of the underground transmission cables onshore[10] and the submarine export cables offshore. Magnetic field values are reported as root-mean-square (rms) flux density in milligauss (mG), where 1 Gauss = 1,000 mG[11] and were calculated as the magnitude of the field along the major axis of the ellipse as specified by the Commission (NYSPSC 1990).

The NY 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 (Snyder et al. 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 export and interconnection 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 right-of-way. 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., right-of-way). For the onshore export and interconnection cables, 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., right-of-way) during operations. However, the maximum magnetic field has also been calculated for comparison with the Interim Policy guideline, in the event that final right-of-way widths differ from these values. Although the final right-of-way widths have not been determined, these rights-of-way are significantly less than the typical right-of-way widths outlined in the NYSPSC's Interim

[10] An approximately 300-ft (91-m) segment of the onshore interconnection cable route at the crossing of Barnums Channel may be located aboveground via a cable bridge. The cable construction will likewise block the electric field outside the cable as discussed in **Appendix G**. The design of the cable bridge segment is not yet sufficiently advanced for modeling and therefore was not included in this assessment..
[11] Magnetic fields also are commonly reported in units of microtesla, where 0.1 microtesla is equal to 1 mG.

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 what would be expected at the edge of these typical rights-of-way. 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 (WNC) 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 right-of-way edge of new transmission lines of 1.6 kV/m. Since the electric field from the submarine and onshore export and interconnection cables is blocked by the cable components and/or the ground, the NY 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 guidance is based on extensive review and evaluation 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 export and interconnection cables will be installed in developed lands and along existing roadway and railroad corridors, which have been previously disturbed for construction of structures, roads, and sidewalks. Existing EMF along the submarine export, onshore export or interconnection 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 NY Project Area (see **Exhibit 2: Location of Facilities**, **Exhibit E-5: Effects on Communications** and **Exhibit E-6: Effects on Transportation**). The Applicant is in the process of coordinating with LIPA to understand the characteristics of any existing transmission lines of 100 kV or above that may be located adjacent to the proposed NY Project export and interconnection cable routes. Upon receipt of information from LIPA, the Applicant will include identified adjacent transmission lines over 100 kV in an updated analysis, where appropriate.

4.13.3 Potential Electric and Magnetic Fields Impacts and Proposed Mitigation

The flow of electric currents in the submarine export, onshore export, and 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 as discussed in **Appendix G**. 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. Portions of the submarine export cable route may also be buried deeper, based on results of the CBRA. 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 export and interconnection 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 rights-of-way for the submarine export, onshore export and interconnection cables do not exceed the Commission's standard of 200 mG in any modeled cable configurations of the NY Project. As listed in **Appendix G**, at ±10 ft (±3 m) from each submarine export cable the magnetic fields are approximately 14 mG (whether buried or surface laid with cable protection). The calculated maximum level above the submarine export cable is 45 mG. At ±12.5 ft (±3.8 m) from the onshore export and interconnection cable route centerline (assuming a 25-ft [7.6-m] right-of-way) the magnetic-field level is less than 30 mG for each modeled duct bank configuration. Moreover, the maximum calculated magnetic field level occurs in the flat "horizontal" configuration and is 79 mG for the onshore export cables, and 53 mG for the interconnection cables. Therefore, even in the case that a smaller right-of-way is requested for the submarine export onshore export, or interconnection 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 predicted 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 onshore export and interconnection 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; 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 NY 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 () would have the potential to elicit a reaction from marine mammals, including changes in swimming direction or detours during migration. However, as the NY 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 (Section 4.6). 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 NY 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 NY 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 Export and Interconnection Cables

No impacts to humans or terrestrial wildlife from EMF are anticipated from onshore NY Project components. The calculated magnetic field levels generated by the NY Project's onshore export and 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 79 mG, which occurs for the onshore export cables in the horizontal duct bank configuration; therefore, the magnetic field is not expected to exceed the Commission's Interim Policy Statement on Magnetic Fields. The NY Project also will not exceed the Commission's guidelines in Opinion No. 78-13for electric fields generated by new transmission lines.

4.14 Summary of Impacts

The Applicant has incorporated measures to avoid, minimize, and mitigate impacts of the NY Project. In accordance with 16 NYCRR § 86.5, the Applicant has described the studies which have been made to assess the potential impacts of the proposed NY Project to the environment and described potential impacts on physical and biological processes. The majority of the potential environmental impacts associated with the NY Project were assessed as minor, or negligible.

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 NY Project was determined to be moderate. 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.

Potential impacts associated with the proposed onshore substation include visual and land use impacts. Viewers adjacent to the site (i.e., along Long Beach Boulevard and Bridge) and south of the site in the City of Long Beach will perceive a change in the landscape, and it is anticipated that the contrast created by the change will vary from strong to weak. Perceived change will be greater from areas close to the site, such as from along Long Beach Boulevard/Bridge, where the substation will introduce strong contrast. To minimize potential visual impacts during operations, the building system will be engineered, to the extent necessary, with prescribed architectural elements incorporated into the design to ensure the NY Project will be consistent to the extent practicable with New York State Department of State Coastal Management Program policies, and lighting at the onshore substation will be designed to reduce light pollution, where feasible.

The onshore substation, including potential removal of the existing marina that is present on site, could also represent a long-term change in land use from commercial and recreational land uses to industrial land use, and may result in some restriction of public access to the waterfront compared to its existing condition. Based on the relatively small area (5.2 ac [2.1 ha]) of land use change at the onshore substation site, this is not expected to have a significant effect on land uses in the vicinity of the NY Project or region in general. The Applicant will evaluate minimizing impacts to public access in the onshore substation design, as feasible.

Notwithstanding the low overall cultural sensitivity in much of the NY Project Area, a short section of the NY Project interconnection cable route exhibits moderate sensitivity for the presence of archaeological resources where the onshore interconnection cable corridor will cross the eastern edge of an upland depicted on late-nineteenth century maps. This upland was one of the few mapped uplands depicted in the Hempstead Bay region prior to the development of suburban communities on the barrier island of Long Beach and Barnum Island. The archaeological consultant has recommended that, to the extent deemed necessary by the NY SHPO, an archaeological monitor be present during excavation of the interconnection cable trench in this area.

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 previous Sections, the Applicant has proactively sited NY 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 export and interconnection cable routes and onshore substation within previously disturbed areas. The Applicant will adhere to the avoidance, minimization, and mitigation measures provided in this Exhibit and in the NY 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 NY Project Area. The Applicant also considered the publicly available plans of other projects to be constructed in the future that may overlap with the NY Project's construction period, and that may impact resources located within the NY 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 NY 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 NY Project Area and its immediate surroundings. The potential cumulative impacts of existing facilities with the proposed NY Project are described.

4.15.2.1 Island Park Flood and Storm Mitigation Project

This is an ongoing infrastructure project spanning Suffolk Road and adjacent roads in the Village of Island Park, which includes storm drainage, tidal gates, storm water retention and bulkheading.

The multi-phased project will see tens of millions of dollars invested in the Village of Island Park with a mix of conventional and innovative green infrastructure to help mitigate flooding issues, including innovative drainage systems installed throughout the heart of Island Park and a complete overhaul of the municipal bulkheads. Improvements will be made around the Metropolitan Transportation Authority's Long Island Rail Road (LIRR) station at Island Park as well. Minor temporary cumulative impacts to visual resources may result from the presence of construction vehicles and equipment, and disruptions during construction activities.

4.15.2.2 Edwards Blvd. Complete Streets Improvements

This Edwards Boulevard project gave a "Complete Streets" makeover – making it safe, more resilient and more attractive for all users. The project, which extends from the south side of Park Avenue in Long Beach all the way to the boardwalk, included the replacement of curbs, sidewalks, sidewalk ramps, driveway aprons, concrete gutters, and was designed to increase resilience with the installation of a complete subsurface storm sewer drainage system to mitigate flooding. The roadway was redone as well, and a new asphalt composite surface was applied. Traffic calming measures were implemented at each intersection to reduce speed and increase safety for pedestrians. Bike lanes were also be incorporated. Since this project was completed in 2020 and the NY Project is not proposing work directly along Edwards Boulevard, cumulative impacts are not expected.

4.15.2.3 Long Beach Superblock Project

This redevelopment projects calls for two nine-story condo buildings and a 10-story apartment building on six acres between Riverside and Long Beach boulevards on an abandoned site in Long Beach. The project will include 6,500 square feet of boardwalk-level retail, a restaurant and two levels of 1,100 parking spaces. Construction on the Superblock Project began in December 2021 and is ongoing. The Long Beach Superblock Project is adjacent to the NY Project at the cable landfall. Although Superblock Project is expected to be completed prior to the start to the NY Project, cumulative impacts may occur by extending the duration of disruptions from construction activities in the area, including noise, air quality, traffic and dust. Cumulative impacts may also occur in the case that utilities associated with the Superblock Project must be relocated or avoided for the installation of the NY Project cable landfall.

4.15.2.4 Repairs to Austin Blvd.

The project involved improvements to a 1.4-mi (2.3-km) stretch of Austin Boulevard for traffic, pedestrian and vehicle safety, drainage, and storm resiliency. Work on this project began in 2021. Traffic-related roadway improvements for Austin Boulevard, which runs north and south through Barnum Isle, included a southbound lane reduction, reconfigured lane widths, raised and painted center medians, increased parking lane widths and new traffic signals with protected left turn phases at various intersections. Smart transportation systems, including cameras, driver feedback signs for speed awareness and variable message signs will be installed along the corridor to facilitate daily traffic flow and emergency evacuations.

Potential interconnection routes are along or in the vicinity of Austin Boulevard; however, it is not expected that the NY Project will overlap in time with the repairs to Austin Boulevard. Minor cumulative impacts may result from the further disruption of traffic in the vicinity.

4.15.3 Existing Submarine Assets

The submarine export cable will cross existing cable and pipeline infrastructure as detailed in **Exhibit E-6. Exhibit 2: Location of Facilities** provides mapping of existing right-of-way crossings.

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, which will both mitigate impacts to existing assets and serve to mitigate cumulative impacts to underwater EMF; 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.

4.15.4 Planned Projects Proximal to the NY Project

4.15.4.1 Bay Park Conveyance Project

This is a proposed construction to re-direct treated water from the Bay Park Sewage Treatment Plant to the Cedar Creek Water Pollution Control Plant's ocean outfall.

The Bay Park Conveyance Project is a partnership between the NYSDEC and the Nassau County Department of Public Works. The goals are improving water quality and storm resiliency in Long Island's Western Bays by upgrading its existing wastewater management infrastructure. The project also intends to improve overall quality of life and have positive economic impacts as well.

This project will convey treated water from the South Shore Water Reclamation Facility located in Nassau County, New York, which currently discharges an average of 50 million gallons per day of treated water into Reynolds Channel, to the Cedar Creek Water Pollution Control Plant ocean outfall pipe. Treated water will be conveyed via the construction of a 2-mile-long force main from the South Shore Water Reclamation Facility to an existing aqueduct under the Sunrise Highway, rehabilitation of a 7.3-mile stretch of the aqueduct, and construction of a 1.6-mile long force main to connect the rehabilitated aqueduct to the existing Cedar Creek Water Pollution Control Plant outfall, which discharges and diffuses treated water three miles offshore in the Atlantic Ocean. The pipe carrying treated water will be approximately 20–60 feet below the surface.

Minor cumulative impacts to visual resources may result from the temporary presence of construction vehicles, increased vessel traffic, and equipment. The Bay Park Sewage Treatment Plant is approximately one mile north of the NY Project.

4.15.4.2 Redevelopment of Long Beach Motor Inn

This is a proposed construction of an 18–22 unit apartment building on Austin Boulevard in the Village of Island Park, in the vicinity of NY Project onshore export cable routes, at the site of the former Long Beach Motor Inn. This site is approximately 0.4 miles east of the NY Project.

Minor cumulative impacts to visual resources may result from the temporary presence of construction vehicles and equipment and from increased resident traffic during operations.

4.15.4.3 Poseidon Cable

Poseidon Transmission I, LLC (Poseidon) has proposed an approximately 200-kV high-voltage direct-current 500-MW 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 NY 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 previously.

4.15.4.4 Wall-LI

The Wall, New Jersey to Long Island (Wall-LI) is a planned fiber optic telecommunications cable, which is also proposed to make landfall in the Long Beach/Lido Beach area. The Wall-LI is being developed by CrossLake Fibre. It is currently anticipated that the Wall-LI cable may be installed in 2023. Based on the proximity of the Wall-LI cable to the proposed NY Project route and the timeframe of construction, which may be shortly prior or overlapping NY Project construction activities, short-term cumulative impacts could include seafloor disturbance, noise, increase in construction-related vessels, and changes in water quality. As needed, the Applicant will coordinate with CrossLake Fibre to minimize impacts. Minor long-term cumulative impacts may occur from the presence of external cable protection and introduction of artificial habitat.

4.15.4.5 Riverside Boulevard Infrastructure Improvement Project

In March 2022, the City of Long Beach announced and infrastructure improvement project along Riverside Boulevard, involving the replacement of a water main. This improvement project began on March 14, 2022 and involved closure of the southbound lane of Riverside Boulevard between East Walnut Street and East Park Avenue. Since this project is scheduled to be completed well before the start of construction on the NY Project, cumulative impacts are not anticipated.

4.15.4.6 Bayside Development Project

The proposed Bayside Development is a potential project listed in the City of Long Beach's comprehensive plan, "Creating Resilience: A Planning Initiative," which was updated in January 2018 (City of Long Beach 2018). This comprehensive plan is an update to the City's 2007 Comprehensive Plan, focusing on addressing resiliency measures post-Superstorm Sandy and a more sustainable economy post-economic downturn. The shoreline, which is part of the redevelopment plan, would include programming of pedestrian and bike paths, as well as active recreation and passive recreation, including a kayak launch and new open space areas along the bayfront. This additional open space would also assist in stormwater management of the new redevelopment as well as the existing North Park neighborhood. Should these plans overlap with the timing of the NY Project, development proposed by the Applicant will consider these plans to support co- existence; therefore, adverse cumulative impacts are not anticipated.

4.16 References

A.I.S., Inc. (AIS). 2019. Protected Species Observer 90-Day Interim Report. Dina Polaris Report. Prepared by A.I.S., Inc., July 10. 2019.

Able, K. W., J. M. Morson, and D. A. Fox 2018. "Food Habits of Large Nektonic Fishes: Trophic Linkages in Delaware Bay and the Adjacent Ocean." *Estuaries and Coasts* 41(3): 866-883.

Able, K.W. and M.P. Fahay. 1998. The First Year in the Life of Estuarine Fishes in the Middle Atlantic Bight, Rutgers University Press.

Andersson, M. H., S. Andersson, J. Ahlsén, B. L. Andersson, J. Hammar, L. K. G. Persson, J. Pihl, P. Sigray and A. Wikström. 2017. *A framework for regulating underwater noise during pile driving. A technical Vindval* *report*. Stockholm, Sweden, Swedish Environmental Protection Agency. 115 pages. Available online at: https://tethys.pnnl.gov/sites/default/files/publications/Andersson-et-al-2017-Report6775.pdf

ANSI (American National Standards Institute). 2013. Quantities and Procedures for Description and Measurement of Environmental Sound – Part 3: Short-Term Measurements with an Observer Present. ANSI/ASA S12.9 PART 3. American National Standards Institute, Washington, D.C.

ANSI. 2014. Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas. ANSI/ASA S3/SC1.100-2014/ANSI/ASA S12.100-2014. American National Standards Institute, Washington, D.C.

AOSS (Alpine Ocean Seismic Survey Inc). 2019. BOEM Lease Area OCS-A 0512 Geophysical Survey: Protected Species Observer Interim Reports 1, 2, 3, 4 and Final Report. Gardline Report. Ref 11179.

APEM and Normandeau Associates 2018a. Digital Aerial Baseline Survey of Marine Wildlife in Support of Offshore Wind Energy prepared for New York State Energy Research and Development Authority - OPA 2016. Data downloaded from OBIS-SEAMAP. Available online at: https://seamap.env.duke.edu/dataset/1817. Accessed September 8, 2019.

APEM and Normandeau Associates. 2018b. Digital aerial baseline survey of marine wildlife in support of offshore wind energy: Summer 2016 through spring 2017 annual report. New York State Energy Research and Development Authority. October 2018.

ASCOBANS (Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas). 2003. Ship Collisions with Whales. 10th Advisory Committee Meeting. Document AC10/Doc. 7(P). Bonn, Germany, 9-11 April 2003. Available online at: https://www.ascobans.org/sites/default/files/document/AC10_7_Collisions_1.pdf.

Ashley, G.M., Halsey, S.D., and Buteux, C.B., 1986. "New Jersey's Longshore Current Pattern." *Journal of Coastal Research, 2(4), 453-463*. Fort Lauderdale, ISSN 0749-0208.

ASMFC. 2017. River Herring Stock Assessment Update Volume II: State-Specific Reports: 682. Available

ASMFC. 2018a. *Addendum XXVI to Amendment 3 to the American Lobster Fishery Management Plan; Addendum III to the Jonah Crab Fishery Management Plan: Harvester Reporting and Biological Data Collection*: 32 pages. http://www.asmfc.org/uploads/file/5a9438ccAmLobsterAddXXVI_JonahCrabAddIII_Feb2018.pdf. Accessed June 9, 2020.

ASMFC. 2018b. *2018 Review of the Atlantic States Marine Fisheries Commission Fishery Management Plan for American Lobster (*Homarus americanus*): 2017 Fishing Year*. 33 pages. http://www.asmfc.org/uploads/file/5bdb531a2018AmLobsterFMPReview.pdf. Accessed June 9, 2020.

ASMFC. 2018c. Annual Report 2018: 50 pages. http://www.asmfc.org/files/pub/2018AnnualReport_web.pdf

ASMFC. 2019a. *2019 Horseshoe Crab Benchmark Stock Assessment and Peer Review Report*. ASMFC Horseshoe Crab Stock Assessment Review Panel**:** 316 pages. https://www.asmfc.org/uploads/file/5cd5d6f1HSCAssessment_PeerReviewReport_May2019.pdf Accessed June 2, 2020.

ASMFC. 2019b. *Annual Report 2019*. 50 pages. http://www.asmfc.org/files/pub/2019AnnualReport_Web.pdf. Accessed June 2, 2020.

ASMFC. 2020. "Tautog." http://www.asmfc.org/species/tautog. Accessed June 2, 2020.

ASMFC. 2021. *Interstate Fisheries Management Program Overview: American Lobster*. Available at: http://www.asmfc.org/files/commissionerManual/ISFMP/5_AmericanLobster.pdf

ASTM D 2974. Standard Test Methods for Determining the Water (Moisture) Content, Ash Content, and Organic Material of Peat and Other Organic Soils. ASTM International. 4 pp.

ASTM D 422. Standard Method for Particle-Size Analysis of Soils. ASTM International. 8 pp.

ASTM D 4328. Standard Practice for Calculation of Supersaturation of Barium Sulfate, Strontium Sulfate, and Calcium Sulfate Dihydrate (Gypsum) in Brackish Water, Seawater, and Brines. 6pp.

ASTM D 854. Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer. ASTM International. 8 pp.

Atlantic States Marine Fisheries Commission (ASFMC). 2015. *Tautog Habitat Fact Sheet*. 2 pages. http://www.asmfc.org/uploads/file/5dfd4d78Tautog.pdf. Accessed June 2, 2020.

Auster, P. J., J. Lindholm, S. Schaub, G. Funnell, L. S. Kaufman and P. C. Valentine. 2003. "Use of sand wave habitats by silver hake." *Journal of Fish Biology* 62(1): 143-152.

Bain, M. B. 1997. Atlantic and shortnose sturgeons of the Hudson River: common and divergent life history attributes. *Environmental Biology of Fishes* 48:347-358 .

Baker, Allan, Patricia Gonzalez, R. I. G. Morrison, and Brian A. Harrington. 2013. "Red Knot (Calidris Canutus)." In *The Birds of North America*, edited by P.G. Rodewald. Ithaca, New York: Cornell Lab of Ornithology. Available online at: https://doi.org/10.2173/bna.563.

Baker, C.S., Herman, L.M., Bays, B.G. and Bauer, G.B., 1983. The impact of vessel traffic on the behavior of humpback whales in southeast Alaska: 1982 season. Seattle, WA: National Marine Mammal Laboratory Contract No. 81-ABC-00114.

Balazik, M. T., K. J. Reine, A. J. Spells, C. A. Fredrickson, M. L. Fine, G. C. Garman and S. P. McIninch. 2012. "The Potential for Vessel Interactions with Adult Atlantic Sturgeon in the James River, Virginia." North American Journal of Fisheries Management **32**(6): 1062-1069.

Bergstrom, L., F. Sundqvist and U. Bergstrom. 2013. "Effects of an offshore wind farm on temporal and spatial patterns in the demersal fish community." *Marine Ecology Progress Series* 485: 199-210.

Bethoney, N.D., S. Asci, and K.D.E. Stokesbury. 2016. "Implications of extremely high recruitment events into the US sea scallop fishery." *Marine Ecology Progress Series* 547, 137-147. doi:10.3354/meps11666

Bjorndal, K. 1997. Foraging ecology and nutrition of sea turtles. In The biology of sea turtles. P.L. Lutz and J.A. Musick, eds. CRC Press: Boca Raton, Florida. 189-231.

Bjorndal, K.A., Bolten, A.B. and Lagueux, C.J., 1994. "Ingestion of marine debris by juvenile sea turtles in coastal Florida habitats." *Marine Pollution Bulletin*. 28(3): 154-158.

Blaylock, R.A., J.W. Hain, L.J. Hansen, D.L. Palka, and G.T. Waring. 1995. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments. NOAA Technical Memorandum NMFS-SEFSC-363.

BLM. 1986. BLM Manual 8410-1 – Visual Resource Inventory. Available online at: http://blmwyomingvisual.anl.gov/docs/BLM_VRI_H-8410.pdf**.** Accessed November 11, 2018.

BOEM (Bureau of Ocean Energy Management). 2007. Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternative Use of Facilities on the Outer Continental Shelf – Final Environmental Impact Statement, Section 5 Potential Impacts of Alternative Energy Development. Available online at: https://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Alt_Energy_FPEIS_VolIIFrontMatter.aspx. Accessed May 23, 2019.

BOEM. 2013. *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts. Revised Environmental Assessment.* Office of Renewable Energy Programs. OCS EIS/EA. BOEM 2013-1131.

BOEM. 2015. *Virginia Offshore Wind Technology Advancement Project on the Atlantic Outer Continental Shelf Offshore Virginia Revised Environmental Assessment***:** 239.

BOEM. 2016a. "Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York: Revised Environmental Assessment." OCS EIS/EA BOEM 2016-070.

BOEM. 2016b. Programmatic Agreement Among The U.S. Department of the Interior, Bureau of Ocean Energy Management, The State Historic Preservation Officers of New Jersey and New York, The Shinnecock Indian Nation, and The Advisory Council on Historic Preservation Regarding Review of Outer Continental Shelf Renewable Energy Activities Offshore New Jersey and New York Under Section 106 of the National Historic Preservation Act. Available online at: https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/HP/NY-NJ-Programmatic-Agreement-Executed.pdf.

BOEM. 2019. *Vineyard Wind Offshore Wind Energy Project Essential Fish Habitat Assessment***:** 94 pages.

Broders, H.G. and G.J. Forbes. 2004. "Interspecific and intersexual variation in roost-site selection of northern long-eared and little brown bats in the Greater Fundy National Park ecosystem." *The Journal of wildlife management*, 68(3), pp.602-610.

Brooks, R.A., C.N. Purdy, S.S. Bell and K.J. Sulak. 2006. "The benthic community of the eastern US continental shelf: A literature synopsis of benthic faunal resources." *Continental Shelf Research* 26(6): 804-818.

Brooks, R.T., and W.M. Ford. 2005. "Bat activity in a forest landscape of central Massachusetts." *Northeastern Naturalist, 12(4)*, pp.447-462.

Brown, D.M., J. Robbins, P.L. Sieswerda, R. Schoelkopf, and E.C.M. Parsons. 2018. "Humpback whale (*Megaptera novaeangliae*) sightings in the New York-New Jersey Harbor Estuary." *Marine Mammal Science, 34(1*), pp.250-257.

Brown, D.M., P.L. Sieswerda, and E.C.M. Parsons. .2019. "Potential encounters between humpback whales (*Megaptera novaeangliae*) and vessels in the New York Bight apex, USA." Marine Policy, 106, p.103527.

Brown, J. and G. Murphy. 2010. "Atlantic Sturgeon Vessel-Strike Mortalities in the Delaware Estuary." *Fisheries* ***35****(2): 72-83.*

Bryce, S.A., Griffith, G.E., Omernik, J.M., Edinger, G., Indrick, S., Vargas, O., and Carlson, D. 2010. Ecoregions of New York (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey, map scale 1:1,250,000.

Buehler, P. E., R. Oestman, J. Reyff, K. Pommerenck and B. Mitchell. 2015. *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish*. California Department of Transportation, Division of Environmental Analysis. CTHWANP-RT-15-306.1.1. Available online at: https://tethys.pnnl.gov/sites/default/files/publications/Caltrans_2009_Guidance_Manual_for_noise_effects_on_fish.pdf

Bugoni, L., Krause, L. and Petry, M.V., 2001. Marine debris and human impacts on sea turtles in southern Brazil. Marine pollution bulletin, 42(12), pp.1330-1334.

Burford, L.S., M.J. Lcki, and C.V. Covell Jr. 1999. "Occurrence of moths among habitats in a mixed mesophytic forest: implications for management of forest bats." *Forest Science 45:323-329.*

Burger, Joanna, Caleb Gordon, J. Lawrence, James Newman, Greg Forcey, and Lucy Vlietstra. 2011. "Risk Evaluation for Federally Listed (Roseate Tern, Piping Plover) or Candidate (Red Knot) Bird Species in Offshore Waters: A First Step for Managing the Potential Impacts of Wind Facility Development on the Atlantic Outer Continental Shelf." *Renewable Energy* 36 (1): 338–51. Available online at: https://doi.org/10.1016/j.renene.2010.06.048.

Burke, V.J., E.A. Standora, and S.J. Morreale. 1991. "Factors affecting strandings of cold-stunned juvenile Kemp's ridley and loggerhead sea turtles in Long Island. New York." *Copeia*. 1991(4): 1136-1138.

Burke, V.J., S.J. Morreale, and E.A. Standora. 1994. "Diet of the Kemp's ridley sea turtle, Lepidochelys kempii, in New York Waters." *Fishery Bulletin*. 92:26-32.

Burton, W.H. 1993. *Effects of bucket dredging on water quality in the Delaware River and the potential for effects on fisheries resources.* Versar, Inc., 9200 Rumsey Road, Columbia, Maryland 21045.

Butman, Bradford, W.W. Danforth, S.C. Knowles, B. May, and L. Serrett. 2002. Seafloor Topography and Backscatter Intensity of the Historic Area Remediation Site (HARS), Offshore of New York, Based on Multibeam Surveys Conducted in 1996, 1998, and 2000. U.S. Geological Survey Open-File Report 00-503. Available online at: https://pubs.usgs.gov/of/2000/of00-503/reports/

Cadwell, D.H., Connally, G.G., Dineen, R.J., Fleisher, P.J., Franzi, D.A., Fuller, M.L., Gurrieri, J.T., Haselton, G.M., Kelley, G.C., LaFleur, R.G., Muller, E.H., Pair, D.L., Rich, J.L., Sirkin, Les, Street, J.S., Young, R.A., and Wiles, G.C. 1989. Surficial geologic map of New York-Lower Hudson.

Cargnelli, L. M., S. J. Griesbach, C. McBride, C. A. Zetlin and W. W. Morse. 1999. *Essential Fish Habitat Source Document: Longfin Inshore Squid,* Loligo pealeii*, Life History and Habitat Characteristics*. Woods Hole, MA**:** 36.

Carr, A. and A.B. Meylan. 1980. "Evidence of passive migration of green turtle hatchlings in Sargassum." *Copeia 1980:366-368.*

Carr, A., 1987. "Impact of nondegradable marine debris on the ecology and survival outlook of sea turtles." *Marine Pollution Bulletin*. 18(6). 352-356.

CH2M Hill (CH2M Hill Engineers, Inc.) 2018. South Fork Wind Farm Construction and Operation Plan. Report. Available online at: https://www.boem.gov/Volume-I-Construction-and-Operations-Plan/.

Chase, B.C. 2002. "Differences in diet of Atlantic bluefin tuna (*Thunnus thynnus*) at five seasonal feeding grounds on the New England continental shelf." *Fishery Bulletin, 100*(2), 168-180.

CIRES (Cooperative Institute for Research in Environmental Sciences). 2014. Continuously Updated Digital Elevation Model (CUDEM) - 1/9 Arc-Second Resolution Bathymetric-Topographic Tiles [Internet]. NOAA National Centers for Environmental Information. Available online at: https://www.ncei.noaa.gov/metadata/geoportal/rest/metadata/item/gov.noaa.ngdc.mgg.dem:999919/html (accessed April 29, 2020).

City of Long Beach. 2018. Creating Resilience: A Planning Initiative. Comprehensive Plan. Available online at: https://www.longbeachny.gov/vertical/sites/%7BC3C1054A-3D3A-41B3-8896-814D00B86D2A%7D/uploads/Draft_Comp_Plan_012318_rev.pdf. Accessed February 2, 2021.

Clarke, D.G. and D.H. Wilbur. 2000. "Assessment of potential impacts of dredging operations due to sediment resuspension". *DOER Technical Notes Collection (ERDC TN-DOER-E9).* Vicksburg, Mississippi, U.S. Army Engineer Research and Development Center**:** 14 pages.

Collins, M. R., S. G. Rogers, T. I. J. Smith and M. L. Moser. 2000. "Primary factors affecting sturgeon populations in the southeastern United States: Fishing mortality and degradation of essential habitats." Bulletin of Marine Science **66**(3): 917-928.

Conn, P.B. and G.K. Silber. 2013. "Vessel speed restrictions reduce risk of collision-related mortality for North Atlantic right whales." *Ecosphere, 4(4), pp.1-16.*

Cook, R. R. and P. J. Auster. 2007. A bioregional classification of the continental shelf of northeastern North America for conservation analysis and planning based on representation. Marine Sanctuaries Conservation Series NMSP-07-03. Silver Spring, MD, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Sanctuary Program,**:** 14 pages.

Copping, A., N. Sather, L. Hanna, J. Whiting, G. Zydlewski, G. Staines, A. Gill, I. Hutchison, A. O'Hagan, T. Simas, J. Bald, C. Sparling, J. Wood and E. Masden. 2016. Annex IV 2016 State of the Science Report: Environmental Effects of Marine Renewable Energy Development Around the World, Ocean Energy Systems (OES)**:** 224 pages. Available online at: Annex IV 2016 State of the Science Report: Environmental Effects of Marine Renewable Energy Development Around the World (pnnl.gov)

Copping, A., N. Sather, L. Hanna, J. Whiting, G. Zydlewski, G. Staines, A. Gill, I. Hutchison, A. O'Hagan, T. Simas, J. Bald, C. Sparling, J. Wood, and E. Masden. 2016. *Annex IV 2016 State of the Science Report: Environmental Effects of Marine Renewable Energy Development Around the World.* Report for Ocean Energy Systems (OES).

Coren, M. 2000. "Leatherback takes scientists on journey." Press Release. West Palm Beach, Florida: *The Palm Beach Post.*

Cornell IRIS (Cornell Institute for Resource Information Sciences) and NYS Department of Agriculture and Markets. 2021. New York State Agricultural District boundaries and Agriculture and Markets. Available online at: https://cugir.library.cornell.edu/catalog/cugir-009010.

Cronin, T.W., Fasick, J.I., Schweikert, L.E., Johnsen, S., Kezmoh, L.J. and Baumgartner, M.F., 2017. Coping with copepods: do right whales (*Eubalaena glacialis*) forage visually in dark waters?. Philosophical Transactions of the Royal Society B: Biological Sciences, 372(1717), p.20160067.

Dadswell, M. J. 2006. "A review of the status of Atlantic sturgeon in Canada, with comparisons to populations in the United States and Europe." Fisheries **31**(5): 218-229.

Davis, A.R. 2009. The role of mineral, living and artificial substrata in the development of subtidal assemblages. In. In M. Wahl (Ed.), *Marine Hard Bottom Communities: Patterns, Dynamics, Diversity and Change* (Vol. 206, pp. 19-37). Berlin: Springer-Verlag.

Davis, X.J., T.M. Joyce, and Y.-O. Kwon. 2017. "Prediction of silver hake distribution on the Northeast U.S. shelf based on the Gulf Stream path index." *Continental Shelf Research*, 138(Supplement C): 51-64.

Dazio, Stefanie. 2018. "Hempstead Town's efforts to protect piping plovers pay off, officials say." *Newsday*. August 9. Available online at: https://www.newsday.com/long-island/nassau/hempstead-piping-plover-1.20360473. Accessed March 8, 2021.

de Soto, N. A. 2016. "Peer-Reviewed Studies on the Effects of Anthropogenic Noise on Marine Invertebrates: From Scallop Larvae to Giant Squid." *Effects of Noise on Aquatic Life II*. A. N. Popper and A. Hawkins. Berlin, Springer-Verlag Berlin. 875**:** 17-26.

Derraik, J.G., 2002. "The pollution of the marine environment by plastic debris: a review." *Marine pollution bulletin*, *44*(9), pp.842-852.

Dewitz, J., 2019, National Land Cover Database (NLCD) 2016 Products: U.S. Geological Survey data release, https://doi.org/10.5066/P96HHBIE.

DHI. 2021. Wave and current hindcast database for Empire Wind Offshore Wind Farm cable route. Report prepared for Empire Offshore Wind LLC.

Didham, R. 1997. *The influence of edge effects and forest fragmentation on leaf litter invertebrates in central Amazonia. Tropical forest remnants: ecology, management, and conservation of fragmented communities*. University of Chicago Press, Chicago, pp 55–70.

Dodd, C.K. 1988. "Synopsis of the biological data on the loggerhead sea turtle *Caretta caretta* (Linnaeus 1758)." *U.S. Fish and Wildlife Service Biological Report 88(14):1-110*.

DoN (Department of the Navy). 2005. Marine Resource Assessment for the Northeast Operating Areas: Atlantic City, Narragansett Bay, and Boston. Naval Facilities Engineering Command, Atlantic; Norfolk, Virginia. Contract Number N624770-02-D-9997, Task Order 0018.

Dunlop, E. S., S. M. Reid and M. Murrant. 2016. "Limited influence of a wind power project submarine cable on a Laurentian Great Lakes fish community." *Journal of Applied Ichthyology* 32(1): 18-31.

Dunton, K.J., A. Jordaan, D.O. Conover, K.A. McKown, L.A. Bonacci and F.M.G. 2015. "Marine Distribution and Habitat Use of Atlantic Sturgeon in New York Lead to Fisheries Interactions and Bycatch." *Marine and Coastal Fisheries* 7(1): 18-32. Available online at: https://www.tandfonline.com/doi/pdf/10.1080/19425120.2014.986348

eBird. 2019. "eBird: An online database of bird distribution and abundance." Cornell Lab of Ornithology, Ithaca, New York. Available online at: http://www.ebird.org. Accessed December 18, 2019.

Edinger, G. J., D. J. Evans, S. Gebauer, T. G. Howard, D. M. Hunt, and A. M. Olivero (editors). 2014. Ecological Communities of New York State. Second Edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.

Elliot, J., K.B. Smith, D.R. Gallien, and A.A. Khan. 2017. *Observing Cable Laying and Particle Settlement During the Construction of the Block Island Wind Farm*. Bureau of Ocean Energy Management Office of Renewable Energy Programs. OCS Study BOEM 2017-027. March 2017, US Department of the Interior, BOEM, Office of Renewable Energy Program**:** 226 pages.

Emeana, C.J., T.J. Hughes, J.K. Dix, T.M. Gernon, T.J. Henstock, C.E.L. Thompson, and J.A. Pilgrim. 2016. "The Thermal Regime around Buried Submarine High Voltage Cables." *Geophysical Journal International* 206:2.

EPA (U.S. Environmental Protection Agency). 1971. Noise from Construction Equipment and Operations, Building Equipment and Home Appliances, NTID-200.1, 1971. Environmental Protection Agency, Washington, D.C.

EPA. 2006. "FACT SHEET: New Source Review (NSR)." Available online at https://www.epa.gov/sites/production/files/2015-12/documents/nsrbasicsfactsheet103106.pdf. Accessed October 16, 2020.

EPA. 2016. "NAAQS Table." Last updated December 20, 2016. Available online at https://www.epa.gov/criteria-air-pollutants/naaqs-table. Accessed October 16, 2020.

EPA. 2017. "What are Hazardous Air Pollutants?" Last updated February 9, 2017. Available online at https://www.epa.gov/haps/what-are-hazardous-air-pollutants. Accessed October 16, 2020.

EPA. 2020a. "Frequent Questions about General Conformity." Last updated October 7, 2020. Available online at https://www.epa.gov/general-conformity/frequent-questions-about-general-conformity. Accessed October 16, 2020.

EPA. 2020b. "Overview of Greenhouse Gases." Last updated September 8, 2020. Available online at https://www.epa.gov/ghgemissions/overview-greenhouse-gases. Accessed October 16, 2020.

EPA. 2020c. "Inventory of U.S. Greenhouse Gas Emissions and Sinks." Last updated September 11, 2020. Available at https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks. Accessed October 16, 2020.

Ernst, C.H., R.W. Barbour, and J.E. Lovich. 1994. *Turtles of the United States and Canada*. Washington, D.C.: Smithsonian Institution Press.

ESS Group, Inc. 2008. Upstate NY Power Corp. Upstate NY Power Transmission Line. Exhibit E-3: Underground Construction Submitted to NYS DEC.

Estabrook, B. J., D. V. Harris, K. B. Hodge, D. P. Salisbury, D. Ponirakis, J. Zeh, S. E. Parks, A. N. Rice. 2019. Year 1 Annual Survey Report for New York Bight Whale Monitoring Passive Acoustic Surveys October 2017- July 2018. Contract C009925. New York State Department of Environmental Conservation. East Setauket, NY.

FEMA (Federal Emergency Management Agency). 2009. National Flood Hazard Layer (NFHL). May. Available online at: https://catalog.data.gov/dataset/national-flood-hazard-layer-nfhl

FEMA (Federal Emergency Management Agency). 2021. National Flood Hazard Layer (NFHL) Version 1.1.1.0. Available online at: https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd . Accessed June 2, 2021.

FGDC (Federal Geographic Data Committee). 2012. Coastal and Marine Ecological Classification Standard: 353 pages.

FHWA (Federal Highway Administration). 2012. Tappan Zee Hudson River Crossing Project. Final Environmental Impact Statement. August 2012.

Fishman, M.S. 2013. *The Bats of Long Island. Presentation at NEBWG 2013, Albany, NY*. Available online at: http://www.nebwg.org/AnnualMeetings/2013/2013presentations/FishmanBatLongIsland.pdf. Accessed July 2019.

Fox, A.D., and I.K. Petersen. 2019. "Offshore Wind Farms and Their Effects on Birds." *Dansk Orn. Foren. Tidsskr.* 113: 86–101.

Frisk, M. G., E. C. Ingram and D. K. 2019. Monitoring Endangered Atlantic Sturgeon and Commercial Finfish Habitat Use in the New York Lease Area. Stoney Brook (NY), US Department of the Interior, Bureau of Ocean Energy Management: 88 p. Fristrup, K.M. and Harbison, G.R., 2002. How do sperm whales catch squids?. *Marine Mammal Science*, *18*(1), pp.42-54.

Gall, S.C. and Thompson, R.C. 2015. The impact of debris on marine life. *Marine pollution bulletin*, *92*(1-2), pp.170-179.

Gill, A.B., I. Gloyne-Philips, J. Kimber and P. Sigray. 2014. "Marine Renewable Energy, Electromagnetic (EM) Fields and EM-Sensitive Animals." *Marine Renewable Energy Technology and Environmental Interactions*. M. A. Shields and A. I. L. Payne. Dordrecht, Springer: 61-79.

Gill, A.B., I. Gloyne-Phillips, K.J. Neal, and J.A. Kimber. 2005. The Potential Effects of Electromagnetic Fields Generated by Sub-Sea Power Cables Associated with Offshore Wind Farm Developments on Electrically and Magnetically Sensitive Marine Organisms - A Review. Collaborative Offshore Wind Research into the Environment (COWRIE), Ltd, UK.

Gless, J.M., M. Salmon, and J. Wyneken. 2008. Behavioral responses of juvenile leatherbacks Dermochelys coriacea to lights used in the longline fishery. *Endangered Species Research* 5(2-3): 239-247.

Goldberg, R., R. Mercaldo-Allen, J. M. Rose, P. Clark, C. Kuropat, S. Meseck, and J. Pereira. 2012. "Effects of hydraulic shellfish dredging on the ecology of a cultivated clam bed." *Aquaculture Environment Interactions* 3(1): 11-21.

Gregory, M.R., 2009. Environmental implications of plastic debris in marine settings—entanglement, ingestion, smothering, hangers-on, hitch-hiking and alien invasions. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *364*(1526), pp.2013-2025.

Griffin, D. 1945. "Travels of banded cave bats." *Journal of Mammalogy 26:15-23.*

Guida, V., A. Drohan, H. Welch, J. McHenry, D. Johnson, V. Kentner, J. Brink, D. Timmons, E. Estela-Gomez. 2017. *Habitat Mapping and Assessment of Northeast Wind Energy Areas*. Sterling, VA: US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2017-088. 312 p.

Haley, N. J. 1999. Habitat Characteristics and Resource Use patterns of Sympatric Sturgeons in the Hudson River Estuary. Master's Thesis, University of Massachusetts Amherst.

Hallenbeck, T. R., R. G. Kvitek and J. Lindholm. 2012. "Rippled scour depressions add ecologically significant heterogeneity to soft-bottom habitats on the continental shelf." *Marine Ecology Progress Series* 468: 119-133.

Halpin, P.N., A.J. Read, E. Fujioka, B.D. Best., B. Donnelly, L.J. Hazen, C. Kot, K. Urian, E. LaBrecque, A. Dimatteo, J. Cleary, C. Good, L.B. Crowder, and K.D. Hyrenbach. 2009. OBIS-SEAMAP: The World Data Center for Marine Mammal, Sea Bird, and Sea Turtle Distributions. *Oceanography. 22(2):104–115*. Available online at: https://www.jstor.org/stable/24860963?seq=1. Accessed May 27, 2021.

Hanke, W. and Dehnhardt, G., 2013. Sensory biology of aquatic mammals. *Journal of Comparative Physiology A*. 199:417-420. Available online at: s00359-013-0823-9.pdf (springer.com)

Hare, J.A., W.E. Morrison, M.W. Nelson, M.M. Stachura, E.J. Teeters, R.B. Griffis, and C.A. Griswold. 2016. "A Vulnerability Assessment of Fish and Invertebrates to Climate Change on the Northeast US Continental Shelf". *PLoS One, 11*(2), 30. doi:10.1371/journal.pone.0146756.

Harvey, M. J., J. S. Altenbach, and T. L. Best. 2011. "Bats of the United States and Canada." *The Johns Hopkins University Press*, Baltimore, MD. USA.

Hatch, L.T. and Wright, A.J., 2007. "A brief review of anthropogenic sound in the oceans." *International Journal of Comparative Psychology*, *20*(2).

Hawkins, A. D. and A. N. Popper. 2018. "Directional hearing and sound source localization by fishes." *Journal of the Acoustical Society of America* 144(6): 3329-3350.

Hayes S.A., Josephson, E., Maze-Foley, K., Rosel, P.E. 2019. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2018. Published June 2019. NOAA Tech Memo NMFS-NE 258; 291 p. Available online at: https://doi.org/10.25923/9rrd-tx13.

Hayes, S.A., Josephson, E., Maze-Foley, K., P.E. Rosel, and J. Turek (eds.). 2021. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2020. NOAA Tech Memo NMFS-NE-271. Available online at: https://repository.library.noaa.gov/view/noaa/32072. Accessed 27 Jan 2022.

Hayes, S.A., Josephson, E., Maze-Foley, K., Rosel, P.E., eds. 2018. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2017, Second Edition. September 2018. NOAA Technical Memorandum NMFS NE-245, 371 p. Available online at:

Hazel, J., I.R. Lawler, and M. Hamann. 2009. "Diving at the shallow end: green turtle behaviour in near-shore foraging habitat." *Journal of Experimental Marine Biology and Ecology*. 371(1): 84-92.

Hiddink, J.G., S. Jennings, M. Sciberras, C.L. Szostek, K.M. Hughes, N. Ellis, A.D. Rijnsdorp, R.A. McConnaughey, T. Mazor, R. Hilborn, J.S. Collie, C.R. Pitcher, R.O. Amoroso, A.M. Parma, P. Suuronen, and M.J. Kaiser. 2017. "Global analysis of depletion and recovery of seabed biota after bottom trawling disturbance." Proceedings of the National Academy of Sciences of the United States of America **114**(31): 8301-8306.

Hochscheid, S., F. Bentivegna, A. Hamza, and G.C. Hays. 2010. "When surfacers do not dive: multiple significance of extended surface times in marine turtles." *Journal of Experimental Biology*. 213(8): 1328-1337.

Hooper, T., N. Beaumont and C. Hattam. 2017. "The implications of energy systems for ecosystem services: A detailed case study of offshore wind." Renewable & Sustainable Energy Reviews **70**: 230-241.

Hutchison, Z.L., P. Sigray, H. He, A. Gill, J. King and C. Gibson. 2018. *Electromagnetic Field (EMF) Impacts on Elasmobranch (shark, rays, and skates) and American Lobster Movement and Migration from Direct Current Cables.* Sterling, VA. BOEM 2018-003**:** 254 pages.

Iafrate, J. D., S. L. Watwood, E. A. Reyier, M. Gilchrest and S. E. Crocker. 2016. "Residency of Reef Fish During Pile Driving Within a Shallow Pierside Environment". *Effects of Noise on Aquatic Life II*. A. N. Popper and A. Hawkins. New York, NY, Springer New York. **875:** 479-487.

ICES (International Committee on Electromagnetic Safety on Non-Ionizing Radiation). 2002. "C95.6 IEEE Standard for safety levels with respect to human exposure to electromagnetic fields, 0-3kHz." New York: IEEE.

ICES. 2005. "IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields 0 to 3 kHz." Piscataway, NJ: IEEE.

ICNIRP (International Commission on Non-Ionizing Radiation Protection). 2010. "ICNIRP statement—guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz to 100 kHz)." *Health Phys* 99:818-836, 2010.

Ingram, E.C., R.M. Cerrato, K.J. Dunton, M.G. Frisk. 2019. "Endangered Atlantic Sturgeon in the New York Wind Energy Area: implications of future development in an offshore wind energy site." *Scientific Reports*. 9:12432. Available online at https://doi.org/10.1038/s41598-019-48818-6

Jean-Michel, D. 2014. Geological History of Long Island. Available online at: https://sites.williams.edu/geos101/mid-atlantic/geological-history-of-long-island/ (accessed October 8, 2021).

Jefferson, T.A., Webber, M.A. and Pitman, R.L., 2015. *Marine Mammals of the World: A Comprehensive Guide to their Identification*. Elsevier. 2nd edition.

Jensen, A.S., and G.K. Silber. 2004. *Large Whale Ship Strike Database. U.S. Department of Commerce*, NOAA Technical Memorandum. NMFS-OPR-, 37 pp.

Kaiser, M.J., and J.G. Hiddink. 2007. "Food subsidies from fisheries to continental shelf benthic scavengers." *Marine Ecology Progress Series, 350*, 267-276. doi:10.3354/meps07194.

Karleskint, G., R. Turner, and J.W. Small, Jr. 2006. *Introduction to Marine Biology* (2nd ed.). Belmont, California: Thomson Brooks/Cole.

Kenney, R.D. 2002. North Atlantic, North Pacific and Southern Right Whales. pp. 806-813, In: W.F. Perrin, B. Würsig, and J.G.M. Thewissen (eds.). Encyclopedia of Marine Mammals. Academic Press, San Diego, CA.

Kenney, R.D., and K.J. Vigness-Raposa. 2010. Marine Mammals and Sea Turtles of Narragansett Bay, Block Island Sound, Rhode Island Sound, and Nearby Waters: An Analysis of Existing Data for the Rhode Island Ocean Special Area Management Plan. Technical Report, Ocean Special Area Management Plan. June 22, 2010.

Kilfoyle, A. K., R. F. Jermain, M. R. Dhanak, J. P. Huston and R. E. Spieler. 2018. "Effects of EMF emissions from undersea electric cables on coral reef fish." *Bioelectromagnetics* 39(1): 35-52.

Kirschvink, J.L. 1990. Geomagnetic Sensitivity in Cetaceans: An Update With Live Stranding Records in the United States. In: Thomas, J.A., Kastelein, R.A. (eds) Sensory Abilities of Cetaceans. NATO ASI Series, vol 196. Springer, Boston, MA. https://doi.org/10.1007/978-1-4899-0858-2_45

Kraus, C. and L. Carter. 2018. "Seabed recovery following protective burial of subsea cables - Observations from the continental margin." *Ocean Engineering* 157: 251-261.

Kraus, S. D., S. Leiter, K. Stone, B. Wikgren, C. Mayo, P. Hughes, R. D. Kenney, C. W. Clark, A. N. Rice, B. Estabrook, and J. Tielens. 2016. Northeast Large Pelagic Survey Collaborative Aerial and Acoustic Surveys for Large Whales and Sea Turtles. OCS Study BOEM 2016-054. U.S. Department of the Interior, Bureau of Ocean Energy Management: Sterling, Virginia. 117 pp. + appendices.

Kuser, M. 2018. Anbaric Pushes Offshore Grid Plans. *RTO Insider.* Available online at: https://rtoinsider.com/anbaric-offshore-wind-96507/ Accessed May 12, 2020.

Kuykendall, K. M., E. N. Powell, J. M. Klinck, P. T. Moreno and R. T. Leaf. 2019. "The effect of abundance changes on a management strategy evaluation for the Atlantic surfclam (*Spisula solidissima*) using a spatially explicit, vessel-based fisheries model." *Ocean & Coastal Management* **169**: 68-85.

Kynard, B. (1997). "Life history, latitudinal patterns and status of the shortnose sturgeon, (*Acipenser brevirostrum).*" *Environmental Biology of Fishes*. 48(1–4): 319–334.

Laist, D.W. 1987. "Overview of the biological effects of lost and discarded plastic debris in the marine environment." *Marine pollution bulletin, 18(6), pp.319-326.*

Laist, D.W. 1997. Impacts of marine debris: entanglement of marine life in marine debris including a comprehensive list of species with entanglement and ingestion records. In *Marine Debris* (pp. 99-139). Springer, New York, NY.

Laist, D.W., A.R. Knowlton, and D. Pendleton. 2014. Effectiveness of mandatory vessel speed limits for protecting North Atlantic right whales. *Endangered Species Research*, *23*(2), pp.133-147.

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, and M. Podesta. 2001. "Collisions between ships and whales." *Marine Mammal Science 17 (1), 35–75.*

Langhamer, O., D. Wilhelmsson, and J. Engström. 2009. Artificial reef effect and fouling impacts on offshore wave power foundations and buoys–a pilot study. *Estuarine, Coastal and Shelf Science*, *82*(3), pp.426-432.

Latham, Pam, W. Fiore, M. Bauman, and J. Weaver. 2017. *Effects Matrix for Evaluating Potential Impacts of Offshore Wind Energy Development on U.S. Atlantic Coastal Habitats.* Final Report to the U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. OCS Study BOEM 2017-014.

Lazar, B. and R. Gračan. 2011. "Ingestion of marine debris by loggerhead sea turtles, *Caretta caretta*, in the Adriatic Sea." *Marine pollution bulletin*. 62(1): 43-47.

Lazell, J.D. 1980. "New England waters: Critical habitat for marine turtles." *Copeia 1980*:290-295.

Lewison, R.L., S.A. Freeman, and L.B. Crowder. 2004. "Quantifying the effects of fisheries on threatened species: the impact of pelagic longlines on loggerhead and leatherback sea turtles." *Ecology letters*. 7(3): 221-231.

Lock, M. C. and D. B. Packer. 2004. *Essential Fish Habitat Source Document: Silver Hake,* Merluccius bilinearis*, Life History and Habitat Characteristics Second Edition*. Woods Hole, Massachusetts**:** 78.

Lohmann, K.J. and C.M. Lohmann. 1996. "Detection of magnetic field intensity by sea turtles." *Nature*, 380(6569), p. 59.

Lohmann, K.J., J.T. Hester, and C.M. Lohmann. 1999. "Long-distance navigation in sea turtles." *Ethol Ecol Evolu* 11(1):1-23.

Long Beach New York. 2019. Drinking Water. Available online at: https://www.longbeachny.gov/water (accessed October 8, 2021).

Long Island Sound Study 2021. Available online at: https://longislandsoundstudy.net/ecosystem-target-indicators/sea-level-trends-for-kings-point/

Loring, P.H., J.D. McLaren, P.A. Smith, L.J. Niles, S.L. Koch, H.F. Goyert, and H. Bai. 2018. "Tracking Movements of Threatened Migratory Rufa Red Knots in U.S. Atlantic Outer Continental Shelf Waters. Sterling (VA): US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2018-046. 145 P."

Loring, Pam, Holly Goyert, Curt Griffin, Paul Sievert, and Peter Paton. 2017. *Tracking Movements of Common Terns, Endangered Roseate Terns, and Threatened Piping Plovers in the Northwest Atlantic: 2017 Annual Report to the Bureau of Ocean Energy Management (BOEM).* Hadley, Massachusetts: Interagency Agreement No. M13PG00012 to U.S. Fish and Wildlife Service Northeast Region Division of Migratory Birds.

Love, M.S., M.M. Nishimoto, S. Clark, M. McCrea and A.S. Bull. 2017. "Assessing potential impacts of energized submarine power cables on crab harvests." *Continental Shelf Research* 151: 23-29.

Lutcavage, M., and J.A. Musick. 1985. "Aspects of the biology of sea turtles in Virginia." *Copeia* 1985(2):449-456.

MA NHESP (Mass Wildlife's Natural Heritage & Endangered Species Program). 2015. "Northern Long-eared Bat: *Myotis septentrionalis.*" Available online at: https://www.mass.gov/files/documents/2017/11/08/Myotis_septentrionalis_2015_3.pdf?_ga=2.32966526.1728286935.1541001968-1217857356.1511369426. Accessed October 2018.

MAFMC (Mid-Atlantic Fishery Management Council). 2016. *Ecosystem Approach to Fisheries Management Guidance Document*. 68 pages. Available online: https://static1.squarespace.com/static/511cdc7fe4b00307a2628ac6/t/589a2b61d2b8575c64fe05ff/1486498674225/EAFM_Guidance+Doc_2017-02-07.pdf. Accessed February 4, 2019.

MAFMC. 2017. *Unmanaged Forage Omnibus Amendment: Amendment 20 to the Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan, Amendment 18 to the Mackerel, Squid, and Butterfish Fishery Management Plan, Amendment 19 to the Surf Clam and Ocean Quahog Fishery Management Plan, Amendment 6 to the Bluefish Fishery Management Plan, Amendment 5 to the Tilefish Fishery Management Plan, Amendment 5 to the Spiny Dogfish Fishery Management Plan, Including an Environmental Assessment, Regulatory Impact Review, and Regulatory Flexibility Act Analysis*. Retrieved from Dover, DE.

Magalhães, S., R. Prieto, M.A. Silva, J. Gonçalves, M. Afonso-Dias, and R.S. Santos. 2002. "Short-term reactions of sperm whales (*Physeter macrocephalus*) to whale-watching vessels in the Azores." *Aquatic Mammals*, *28*(3), pp.267-274.

Malek, A.J., J.S. Collie, and J. Gartland. 2014. "Fine-scale spatial patterns in the demersal fish and invertebrate community in a northwest Atlantic ecosystem." *Estuarine Coastal and Shelf Science, 147*, 1-10. doi:10.1016/j.ecss.2014.05.028.

McKinstry, C.A., Westgate, A.J. and Koopman, H.N., 2013. "Annual variation in the nutritional value of stage *V Calanus finmarchicus*: implications for right whales and other copepod predators. *Endangered Species Research*, *20*(3), pp.195-204.

Mecray, Ellen L., M.R. Buchholtz ten Brink, and B. Butman. 2000. Contaminants and Marine Geology in the New York Bight: Modern Sediment Dynamics and a Legacy for the Future: U.S. Geological Survey Fact Sheet FS-114-99. Available online at: http://pubs.usgs.gov/fs/fs114-99/fs114-99.pdf. Accessed March 15, 2021.

Melnychuk, M.,K.J. Dunton, A.J. Jordaan, K.A. McKown, and M.G. Frisk. 2017. "Informing conservation strategies for the endangered Atlantic sturgeon using acoustic telemetry and multi-state mark–recapture models." *Journal of Applied Ecology 54(3)*, pp. 914-925.

Menzel, M.A., S.F. Owen, W.M. Ford, J.W. Edwards, P.B. Wood, B.R. Chapman, and K.V. Miller. 2002. "Roost tree selection by northern long-eared bat (*Myotis septentrionalis*) maternity colonies in an industrial forest of the central Appalachian Mountains." *Forest Ecology and Management, 155(1-3*), pp.107-114.

Messina, P., and P. Stoffer. 1996. The Transient Atlantic Shoreline. Geology and Geography of New York Bight Beaches. Available online at: http://www.geo.hunter.cuny.edu/bight/coast.html (accessed August 12, 2019).

Meylan, A. and S. Sadove. 1986. "Cold-stunning in Long Island Sound, New York." *Marine Turtle Newsletter*. 37: 7-8.

Mid-Atlantic Regional Ocean Council. 2019. "Mid-Atlantic Ocean Data Portal." Available online at: https://portal.midatlanticocean.org/. Accessed January 8, 2020.

Miller, R.G., Z.L. Hutchison, A.K. Macleod, M.T. Burrows, E.J. Cook, K.S. Last, and B. Wilson. 2013. "Marine renewable energy development: assessing the Benthic Footprint at multiple scales." *Frontiers in Ecology and the Environment*, 11(8), pp.433-440.

MMC (Marine Mammal Commission). 2018. Ship strikes and Right Whales. Available online at: https://www.mmc.gov/priority-topics/species-of-concern/north-atlantic-right-whale/ship-strikes/

Morreale, S.J. and E.A. Standora. 1998. *Early life stage ecology of sea turtles in northeastern U.S. waters*. NOAA Technical Memorandum NMFS-SEFSC 413: 49. Available online at https://repository.library.noaa.gov/view/noaa/8469.

Morreale, S.J., A.B. Meylan,, S.S. Sadove, and E.A. Standora. 1992. "Annual occurrence and winter mortality of marine turtles in New York waters." *Journal of Herpetology*. 301-308.

MRLC (Multi-Resolution Land Characteristics Consortium). 2021. "National Land Cover Database 2016 CONUS Land Cover." Available online at: https://www.mrlc.gov/viewer/. Accessed February 2, 2021.

Mueller, S. and F. Estabrook. 2006. New York Status and Trends Report for Freshwater and Marine Sediments. Division of Water. NYSDEC Division of Water. Available at https://nysl.ptfs.com/data/Library1/Library1/pdf/317117619.pdf)

Muirhead, C.A., A.M. Warde, I.S. Biedron, A. Nicole Mihnovets, C.W. Clark, A.N. Rice. 2018. "Seasonal acoustic occurrence of blue, fin, and North Atlantic right whales in the New York Bight." *Aquatic Conservation: Marine and Freshwater Ecosystems*. Vol. 28:744–753.

Munroe, D., Powell, E. N., Mann, R., Klinck, J. M., & Hofmann, E. E. 2013. "Underestimation of primary productivity on continental shelves: evidence from maximum size of extant surfclam (*Spisula solidissima*) populations." *Fisheries Oceanography* 22(3), 220-233.

Murray, K.T. 2011. "Interactions between sea turtles and dredge gear in the US sea scallop (*Placopecten magellanicus*) fishery, 2001–2008." *Fisheries Research*. 107(1-3): 137-146.

NASCA (North American Submarine Cable Association). 2019. *Cable Burial Experience on the Northeast Coast of the United States*. Available online at: https://www.n-a-s-c-a.org/app/download/6817691613/NASCA+Cable+Burial+Experience+Northeast+Coast+of+the+United+States.pdf?t=1567615190. Accessed September 9, 2019.

Nassau County. 2008. Nassau County Master Plan Update 2008, Trends Analysis. Available online at: https://www.nassaucountyny.gov/DocumentCenter/View/2776/2008MPUpdateadoptedon4309?bidId=

Nassau County. 2010. Draft 2010 Nassau County Master Plan. Available online at: 2010 (nassaucountyny.gov)

National Audubon Society. 2018. "West Hempstead Bay/Jones Beach West." Important Bird Areas. Available online at: https://www.audubon.org/important-bird-areas/west-hempstead-bayjones-beach-west. Accessed December 17, 2019.

NEFMC (New England Fishery Management Council). 2017. *Omnibus Essential Fish Habitat Amendment 2, Including a Final Environmental Impact Statement*. Available online: https://www.nefmc.org/library/omnibus-habitat-amendment-2. Accessed February 4, 2019.

New York State Energy Planning Board. 2015. New York State Energy Plan. Available online at: https://energyplan.ny.gov/Plans/2015.aspx. Accessed on April 14, 2020.

New York Water Science Center. 2017. Long Island Land Use and Land Cover. Available online at: https://www.usgs.gov/centers/new-york-water-science-center/science/long-island-land-use-and-land-cover?qt-science_center_objects=0

NJ SeaGrant. 2014. Blue Crab (*Callinectes sapidus*) Available online: https://njseagrant.org/wp-content/uploads/2014/03/blue-crab.pdf. Accessed April 20, 2020.

NJDEP (New Jersey Department of Environmental Protection). 2006. New Jersey Marine Mammal and Sea Turtle Conservation Workshop Proceedings. April 17-19. Available online at: https://www.nj.gov/dep/fgw/ensp/pdf/marinemammal_seaturtle_workshop06.pdf.

NJDEP (New Jersey Department of Environmental Protection). 2010. *Ocean/Wind Power Ecological Baseline Studies Final Report Volume 1: Overview, Summary and Application*. New Jersey Department of

Environmental Protection. Report prepared by Geo-Marine, Inc. July 2010. Available online at: https://www.nj.gov/dep/dsr/ocean-wind/index.htm.

NJDEP. n.d. Sea-beach Amaranth, Endangered Plants of New Jersey Fact Sheet. Available online at: https://www.fws.gov/northeast/njfieldoffice/pdf/sbanjfact.pdf.

NMFS (National Oceanic and Atmospheric Administration's National Marine Fisheries Service). 1998. "Final Recovery Plan for the Shortnose Sturgeon (*Acipenser brevirostrum*)." 129 pages.

NOAA (National Oceanic and Atmospheric Association). 1999. Hudson River, New York National Estuarine Research Reserve. Digital Polygon Boundary. Available online at: http://cdmo.baruch.sc.edu/get/gis.cfm.

NOAA Fisheries (National Oceanic and Atmospheric Administration's National Marine Fisheries Service). 2015. *Endangered Species Section 7 Consultation: Biological Opinion: Deepwater Wind: Block Island Wind Farm and Transmission System*: NER-2015-12248: 270 pages.

NOAA Fisheries. 2015. Endangered Species Section 7 Consultation: Biological Opinion: Deepwater Wind: Block Island Wind Farm and Transmission System: NER-2015-12248: 270 pages.

NOAA Fisheries. 2018a. "Essential Fish Habitat Mapper." Available online: Essential Fish Habitat Mapper | NOAA Fisheries. Accessed November 21, 2018.

NOAA Fisheries. 2019a. Species Directory. Sea Turtles. Available online at: https://www.fisheries.noaa.gov/species-directory.

NOAA Fisheries. 2012. Endangered and threatened wildlife and plants; threatened and endangered status for distinct population segments of Atlantic sturgeon in the Northeast region. *Federal Register*: 77 FR 5879. Available online at https://www.federalregister.gov/documents/2012/02/06/2012-1946/endangered-and-threatened-wildlife-and-plants-threatened-and-endangered-status-for-distinct.

NOAA Fisheries. 2014. Species of Concern in the Greater Atlantic Region. Available online: https://www.greateratlantic.fisheries.noaa.gov/protected/pcp/soc/index.html. Accessed February 25, 2019.

NOAA Fisheries. 2015. *Endangered Species Section 7 Consultation: Biological Opinion: Deepwater Wind: Block Island Wind Farm and Transmission System*: NER-2015-12248: 270 pages.

NOAA Fisheries. 2016. Endangered Species Act Section 7 Consultation Biological Opinion for the Tappan Zee Bridge Replacement. NER-2015-12923. 203 pp.

NOAA Fisheries. 2017. "Endangered and Threatened Species; Designation of Critical Habitat for the Endangered New York Bight, Chesapeake Bay, Carolina and South Atlantic Distinct Population Segments of Atlantic Sturgeon and the Threatened Gulf of Maine Distinct Population Segment of Atlantic Sturgeon." Federal Register 82: 39160-39275.

NOAA Fisheries. 2017. *Final Amendment 10 to the 2006 Consolidated Atlantic Highly Migratory Species Fishery Management Plan: Essential Fish Habitat*. Office of Sustainable Fisheries and Atlantic Highly Migratory Species Management Division. Silver Spring, Maryland**:** 442.

NOAA Fisheries. 2018a. "Essential Fish Habitat Mapper." Available online: https://www.fisheries.noaa.gov/resource/map/essential-fish-habitat-mapper. Accessed June 4, 2019.

NOAA Fisheries. 2018b. *Draft Environmental Impact Statement –Regulatory Impact Review – Initial Regulatory Flexibility Analysis to Consider Management Measures for the Jonah Crab Fishery in the Exclusive Economic Zone based upon management measures specified in the Interstate Fishery Management Plan for Jonah Crab and Addenda I and II*. Gloucester, MA.

NOAA Fisheries. 2018c. 2018 Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-59, 167 p.

NOAA Fisheries. 2018d. NOAA Technical Memorandum NMFS-NE-247 North Atlantic Right Whales: Evaluating Their Recovery Challenges in 2018. US Department of Commerce. Available online at: https://www.greateratlantic.fisheries.noaa.gov/protected/whaletrp/trt/meetings/September%202018/tm247__2_.pdf.

NOAA Fisheries 2019a. Species Directory. Sea Turtles. Available online at: https://www.fisheries.noaa.gov/species-directory.

NOAA Fisheries. 2019b. Sea Turtle Program. Available online at: https://www.greateratlantic.fisheries.noaa.gov/Protected/seaturtles/.

NOAA Fisheries. 2019c. Sea Turtle Cold Stunning. Available online at: https://www.greateratlantic.fisheries.noaa.gov/protected/stranding/overview/cold.html.

NOAA Fisheries. 2020. ESA Section 7 Mapper. Available online at: https://www.greateratlantic.fisheries.noaa.gov/protected/section7/listing/index.html.

NOAA Fisheries. 2021. Updated Recommendations for Mapping Fish Habitat. Greater Atlantic Regional Fisheries Office, Habitat Conservation and Ecosystem Services Division. May 2021.

NOAA Marine Debris Program. 2014 Report on the Entanglement of Marine Species in Marine Debris with an Emphasis on Species in the United States. Silver Spring, MD. 28 pp. Available online at: Entanglement of Marine Species in Marine Debris with an Emphasis on Species in the United States (pnnl.gov)

NOAA Office of National Marine Sanctuaries. 2017. "Small but Mighty: Understanding Sand Lance in Stellwagen Bank National Marine Sanctuary." Available online: https://sanctuaries.noaa.gov/news/jan17/sand-lance-stellwagen-bank.html. Accessed February 7, 2019.

NOAA Tides & Currents. 2021. Station Home Page - NOAA Tides & Currents

NOAA. 2018. National Estuarine Research Reserves. Available online at: https://coast.noaa.gov/nerrs/

NOAA. 2020a. "Tides & Currents. NY." Available online at: https://tidesandcurrents.noaa.gov/newyork. Accessed April 20, 2020.

NOAA. 2020b. Water Temperature Table of the central Atlantic Coast. Available online: https://www.nodc.noaa.gov/dsdt/cwtg/catl.html. Accessed April 18, 2020.

Normandeau (Normandeau Associates, Inc). 2011. New Insights and New Tools Regarding Risk to Roseate Terns, Piping Plovers, and Red Knots from Wind Facility Operations on the Atlantic Outer

Continental Shelf. A Final Report for the U.S. Department of the Interior, Bureau of Ocean Energy Management, Reg.

Normandeau. 2014. *Understanding the Habitat Value and Function of Shoal/Ridge/Trough Complexes to Fish and Fisheries on the Atlantic and Gulf of Mexico Outer Continental Shelf*: Draft Literature Synthesis for the U.S. Dept. of the Interior, Bureau of Ocean Energy Management: 116 pages.

Normandeau Associates, Inc. and APEM Inc. 2018a. *Digital Aerial Baseline Survey of Marine Wildlife in Support of Offshore Wind Energy prepared for New York State Energy Research and Development Authority - OPA 2016*. Data downloaded from OBIS-SEAMAP. Available online at: http://seamap.env.duke.edu/dataset/1817. Accessed September 8, 2019.

Normandeau Associates, Inc. and APEM Inc. 2018b. *Digital aerial baseline survey of marine wildlife in support of offshore wind energy: Summer 2016 through Spring 2017 annual report*. Report prepared for New York State Energy Research and Development Authority by Normandeau Associates, Inc. and APEM Ltd. October 2018. 133 pp.

Normandeau, Exponent, T. Tricas, and A. Gill. 2011. *Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species*. OCS Study BOEMRE 2011-09. Camarillo, CA: U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific OCS Region, Camarillo, CA..

Northeast Regional Ocean Council. 2019. "Northeast Ocean Data." Maps and Data for Ocean Planning in the northeastern United States, Available from https://www.northeastoceandata.org/. Accessed February 4, 2019.

Nowacek, D.P., Thorne, L.H., Johnston, D.W. and Tyack, P.L. 2007. "Responses of cetaceans to anthropogenic noise." *Mammal Review*, *37*(2), pp.81-115.

NPS (National Park Service). 2002. How to Apply the National Register Criteria for Evaluation. National Register Bulletin 15.

NYC Parks. 2021. How NYC Parks Protects Rare and At-Risk Wildlife. Official Website of the New York City Department of Parks & Recreation. Available online at: https://www.nycgovparks.org/programs/rangers/wildlife-management/rare-and-at-risk-wildlife-species

NYNHP (New York Natural Heritage Program). 2019. "Atlantic Sturgeon *Acipenser oxyrinchus*." Available online at: Atlantic Sturgeon Guide - New York Natural Heritage Program (nynhp.org)Accessed January 8, 2020.

NYNHP. 2020a. Online Conservation Guide for *Amaranthus pumilus*. Available online at: https://guides.nynhp.org/seabeach-amaranth/. Accessed April 9, 2020.

NYNHP. 2020b. Online Conservation Guide for Sterna dougallii. Available online at: https://guides.nynhp.org/roseate-tern/. Accessed April 9, 2020.

NYNHP. 2021a. Online Conservation Guide for Low salt marsh. Available from: https://guides.nynhp.org/low-salt-marsh/. Accessed October 21, 2021.

NYNHP. 2021b. Online Conservation Guide for High salt marsh. Available from: https://guides.nynhp.org/high-salt-marsh/. Accessed October 21, 2021.

NYNHP. 2021c. Online Conservation Guide for Salt panne. Available from: https://guides.nynhp.org/salt-panne/. Accessed October 21, 2021.

NYPL (New York Public Library). 2019. Digital Collections-Maps. Available online at https://digitalcollections.nypl.org/search/index?utf8=%E2%9C%93&keywords=maps (accessed January 5, 2019).

NYPSC (New York State Public Service Commission). 1990. Statement of Interim Policy on Magnetic Fields of Major Electric Transmission Facilities. Cases 26529 and 26559 Proceeding on Motion of the Commission. Issued and Effective: September 11, 1990.

NYRCR Barnum Island/Oceanside/the Village of Island Park/Harbor Isle Planning Committee. 2014. Barnum Island/Oceanside/the Village of Island Park/Harbor Isle NY Risking Community Reconstruction Plan. Available online at: https://stormrecovery.ny.gov/sites/default/files/crp/community/documents/bi-o-vip-hi_final-20140701_high.pdf

NYS OPRHP (New York State Office of Parks, Recreation and Historic Preservation). 2019. Cultural Resource Information System (CRIS). Available online at https://cris.parks.ny.gov/Login.aspx. Accessed October 25, 2018, May 27, 2019, and June-August, 2021.

NYSDEC (New York City Department of Environmental Conservation). n.d. Tidal Wetlands Categories. Available online at: https://www.dec.ny.gov/lands/5120.html. Accessed March 16, 2021.

NYSDEC. New York State Department of Environmental Conservation. n.d. Wildlife Management Areas, Available online at: https://www.dec.ny.gov/outdoor/7768.html.

NYSDEC. 2001. Assessing and Mitigating Noise Impacts. Available online at: https://www.dec.ny.gov/docs/permits_ej_operations_pdf/noise2000.pdf

NYSDEC. 2002. New York State Regulatory Freshwater Wetlands. Available online at: https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1274. Accessed June 2, 2021.

NYSDEC. 2004. Technical and Operational Guidance Series 5.1.9, In-water and Riparian Management of Sediment and Dredged Material. Available at: https://www.dec.ny.gov/docs/water_pdf/togs519.pdf.

NYSDEC. 2005. Tidal Wetlands—NYC and Long Island—1974. Available online at: http://gis.ny.gov/gisdata/metadata/nysdec.tidal_wetlands_lower.html. Accessed June 2, 2021.

NYSDEC. 2014. Screening and Assessment of Contaminated Sediment. New York State Department of Environmental Conservation. Division of Fish, Wildlife and Marine Resources Bureau of Habitat. Available at: https://www.dec.ny.gov/docs/fish_marine_pdf/screenasssedfin.pdf. Accessed May 18, 2021.

NYSDEC. 2014a. Species Status Assessment, Roseate Tern. Available online at: https://www.dec.ny.gov/docs/wildlife_pdf/sgcnroseatetern.pdf

NYSDEC. 2014b. Species Status Assessment, Common Tern. Available online at: Species Assessment for Common tern (ny.gov).

NYSDEC. 2015. State Wildlife Action Plan. Available online at: https://www.dec.ny.gov/animals/7179.html.

NYSDEC. 2016a. *New York Ocean Action Plan 2017-2027*. Available online at: https://www.dec.ny.gov/docs/fish_marine_pdf/nyoceanactionplan.pdf. Accessed June 18, 2020.

NYSDEC. 2016b. New York State Open Conservation Plan. Available online at: https://www.dec.ny.gov/docs/lands_forests_pdf/osp2016final1.pdf. Accessed April 14, 2020.

NYSDEC. 2018. Natural Heritage Community Occurrences - NYNHP (NYSDEC). Available online at: http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1241.

NYSDEC. 2019a. Long Island Aquifers. Available online at: https://www.dec.ny.gov/lands/36183.html. Accessed July 2019.

NYSDEC. 2019b. Water Quality Classifications (WQC) - NYS (NYSDEC): Revised May 2019. Available online at: https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1118. Accessed June 2, 2021.

NYSDEC. 2019c. Draft List under Part 182.5 Pre-proposal – October 2019. Available online at: https://www.dec.ny.gov/docs/wildlife_pdf/preproposal182.pdf.

NYSDEC. 2019d. "Piping Plover Fact Sheet.". Available online at: http://www.dec.ny.gov/animals/7086.html. Accessed December 18, 2019.

NYSDEC. 2019e. "Roseate Tern Fact Sheet." Available online at: https://www.dec.ny.gov/animals/7084.html.

NYSDEC. 2019f. "Marine Mammals of New York." Available online at: http://www.dec.ny.gov/animals/108573.html.

NYSDEC. 2019g. "Sea Turtles of New York." Available online at: https://www.dec.ny.gov/animals/112355.html.

NYSDEC. 2019h. "Shortnose Sturgeon Fact Sheet." Available online at: Shortnose Sturgeon - NYS Dept. of Environmental Conservation.

NYSDEC. 2019i. Youngs Island Wildlife Management Area. New York State Conservationist. Available online at: https://www.dec.ny.gov/docs/administration_pdf/0419consmag4web.pdf.NYSDEC. 2019h. "Hudson River National Estuarine Research Reserve Management Plan." Available online at: https://www.dec.ny.gov/docs/remediation_hudson_pdf/hrnerrmanagementplan.pdf.

NYSDEC. 2019j. "Hudson River Estuary Program." Available online at https://www.dec.ny.gov/lands/4920.html.

NYSDEC. 2019k. DEP-00-2/Assessing and Mitigating Visual and Aesthetic Impacts (DEC Program Policy). Available online at: https://www.dec.ny.gov/docs/permits_ej_operations_pdf/visualpolicydep002.pdf. Accessed May 18, 2021.

NYSDEC. 2019l. "Trends for Specific VOC Compounds." Last updated Unknown. Available online at https://www.dec.ny.gov/chemical/66472.html. Accessed October 16, 2020.

NYSDEC. 2020. *New York State Artificial Reef Guide*. 44 pages. Available online at: http://www.dec.ny.gov/docs/fish_marine_pdf/dmrreefguide.pdf. Accessed May 29, 2020.

NYSDEC. 2020. "2020 Annual Monitoring Network Plan." NYSDEC Division of Air Resources Bureau of Air Quality Surveillance. Published September 23, 2020. Available for download at https://www.dec.ny.gov/chemical/33276.html. Accessed October 16, 2020.

NYSDEC. 2021a. Reynolds Channel, West (Segment ID 1701-0216). Waterbody Segment Assessment Factsheet Based on the 2021 CALM. Available online at: https://www.dec.ny.gov/data/WQP/PWL/1701-0216.html?req=48636)

NYSDEC. 2021b. Hog Island Channel (Segment ID 1701-0220). Waterbody Segment Assessment Factsheet Based on the 2021 CALM. Available online at https://www.dec.ny.gov/data/WQP/PWL/1701-0220.html?req=37500

NYSDEC. 2021. "New York State Implementation Plan for the 2008 Ozone National Ambient Air Quality Standards New York-N. New Jersey-Long Island, NY-NJ-CT Serious Nonattainment Area." NYSDEC Division of Air Resources Bureau of Air Quality Planning. Published November 29, 2021. Available for download at https://www.dec.ny.gov/docs/air_pdf/sipseriouso3nyma.pdf. Accessed February 25, 2022.

NYSDEC. 2022a. Common Tern. Available online at: https://www.dec.ny.gov/animals/7100.html#:~:text=Description,tern%20with%20which%20it%20associates.

NYSDEC. 2022b. Watchable Wildlife: Monarch Butterfly. Available online at: https://www.dec.ny.gov/animals/60392.html

NYSDOS (New York State Department of State). 1982. New York State Coastal Zone Management Program. Available online at: https://www.dos.ny.gov/opd/programs/pdfs/NY_CMP.pdf. Accessed April 15, 2020.

NYSDOS. 1998. Significant Coastal Fish and Wildlife Habitats - 2.0. Available online at: https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=318.

NYSDOS. 2008a. Coastal Fish & Wildlife Habitat Assessment Form: Middle Hempstead Bay. Available online: https://dos.ny.gov/system/files/documents/2020/03/middle_hempstead_bay.pdf. Accessed February 1, 2022.

NYSDOS. 2008b. Coastal Fish & Wildlife Habitat Assessment Form: West Hempstead Bay. Available online: west_hempstead_bay.pdf (ny.gov) (last accessed February 1, 2022).

NYSDOS. 2020. *Significant Coastal Fish and Wildlife Habitats*. Available online at: https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=318

NYSDPS (NYS Department of Public Service). 2020. General Recommendations for Applications for Substations, Stations, and Converter Stations under Article VII

NYSERDA (New York State Energy Research and Development Authority). 2017a. *New York State Offshore Wind Master Plan: Fish and Fisheries Study Final Report***.** 202 pages.

NYSERDA. 2017b. New York State Offshore Wind Master Plan: Marine Mammals and Sea Turtle Study. Available online at https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/About-Offshore-Wind/Master-Plan.

NYSERDA. 2019. "New York State Greenhouse Gas Inventory: 1990-2016." NYSERDA in collaboration with NYSDEC. Published July 2019. Available for download at https://www.nyserda.ny.gov/About/Publications/EA-Reports-and-Studies/Energy-Statistics. Accessed October 16, 2020.

NYSMuseum. 1999. 1:250,000 Bedrock geology of NYS, data is distributed in ARC/INFOr EXPORT format (with ".e00" extension). NYS Geological Survey, NYS Museum Technology Center. Available online at: http://www.nysm.nysed.gov/gis.html.

Ocean Energy Systems (OES): 224 pages.

Oceanweather Inc. 2018. *Global Reanalysis of Ocean waves U.S. East Coast* (GROW-FINE EC28km & EC5km) (2008 & 2018).

online: Microsoft Word - RiverHerringStockAssessmentUpdateVolumeII_StateSpecific_Aug2017 (asmfc.org). Accessed April 13, 2020.

Peterson, T.U. 2014. *Scour around Offshore Wind Turbine Foundations*. Technical University of Denmark. Department of Mechanical Engineering.

Petruny-Parker, M., A. Malek, M. Long, D. Spencer, F. Mattera, E. Hasbrouck, and J. Wilson. 2015. *Identifying Information Needs and Approaches for Assessing Potential Impacts of Offshore Wind Farm Development on Fisheries Resources in the Northeast Region*. Sterling, VA. Retrieved from: https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Renewable-Energy/Identifying-Information-Needs-and-Approaches-for-Assessing-Potential-Impacts-of-Offshore-Wind-Farm-Development-on-Fisheries-Resources-in-the-Northeast-Regi.pdf. Accessed January 9, 2020.

Pineda, J., J.A. Hare, and S. Sponaugle. 2007. "Larval Transport and Dispersal in the Coastal Ocean and Consequences for Population Connectivity." *Oceanography, 20*(3), 22-39. doi:doi.org/10.5670/oceanog.2007.27.

Piniak, W.E.D., S.A. Eckert, C.A. Harms, and E.M. Stringer. 2012. Underwater Hearing Sensitivity of the Leatherback Sea Turtle (Dermochelys Coriacea): Assessing the Potential Effect of Anthropogenic Noise. OCS Study BOEM 2012-01156. U.S. Department of the Interior, Bureau of Ocean Energy Management, Headquarters, Herndon, Virginia.

Popper, A. N. and A. D. Hawkins. 2018. "The importance of particle motion to fishes and invertebrates." *Journal of the Acoustical Society of America* 143(1): 470-488.

Popper, A. N. and A. Hawkins. 2016. *The Effects of Noise on Aquatic Life II: Advances in Experimental Medicine and Biology*. New York, Springer.

Popper, A. N. and M. C. Hastings. 2009. "The effects of anthropogenic sources of sound on fishes." *Journal of Fish Biology* 75(3): 455-489.

Popper, A. N., A. D. Hawkins, R. R. Fay, D. A. Mann, S. Bartol, T. J. Carlson, S. Coombs, W. T. Ellison, R. L. Gentry, M. B. Halvorsen, S. Lokkeborg, P. H. Rogers, B. L. Southall, D. G. Zeddies and W. N.

Tavolga. 2014. *Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI*. New York: 16.

Poseidon (Poseidon Transmission I, LLC). 2013. Application of Poseidon Transmission I, LLC for a Certificate of Environmental Compatibility and Public Need for a 500 MW Transmission Line from South Brunswick, New Jersey to the Town of Huntington, Suffolk County.

Ramsay, K., M.J. Kaiser, P.G. Moore, and R.N. Hughes. 1997. "Consumption of fisheries discards by benthic scavengers: utilization of energy subsidies in different marine habitats." *Journal of Animal Ecology, 66*(6), 884-896. doi:10.2307/6004.

Rauch Foundation. 2020. "Long Island Index Map." Available online at: https://www.rauchfoundation.org/thought-leadership/interactive-maps/. Accessed February 2, 2021.

Rein, C.G., A.S. Lundin, S.J.K. Wilson and E. Kimbrel. 2013. *Offshore Wind Energy Development Site Assessment and Characterization: Evaluation of the Current Status and European Experience.* Herndon, VA, U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs: 273 pages.

Report: Environmental Effects of Marine Renewable Energy Development Around the World,

Riverhead Foundation for Marine Research and Preservation. 2018. Seal Haul Out Sites. Available online at: http://www.riverheadfoundation.org/research-methods/.

Roberts J.J., B.D. Best, L. Mannocci, E. Fujioka, P.N. Halpin, D.L. Palka, L.P. Garrison, K.D. Mullin, T.V.N. Cole, C.B. Khan, W.M. McLellan, D.A. Pabst, and G.G. Lockhart. 2016b. Habitat-based cetacean density models for the U.S. Atlantic and Gulf of Mexico. *Scientific Reports* (6)22615. Available online at: https://www.nature.com/articles/srep22615

Roberts J.J., L. Mannocci, and P.N. Halpin. 2016a. Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2015-2016 (Base Year). Document version 1.0. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC.

Roberts J.J., L. Mannocci, and P.N. Halpin. 2017. Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2016-2017 (Opt. Year 1). Document version 1.4. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC.

Roberts J.J., L. Mannocci, R.S. Schick, and P.N. Halpin. 2018. Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2017-2018 (Opt. Year 2). Document version 1.2. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC.

Roberts J.J., R.S. Schick, and P.N. Halpin. 2020. Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2018-2020 (Option Year 3). Document version 1.4. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC.

Roberts, J.J., Schick, R.S., Halpin, P.N. 2021. Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2020 (Opt. Year 4). Document version 1.0.

Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC.

Roberts, L. and M. Elliott. 2017. "Good or bad vibrations? Impacts of anthropogenic vibration on the marine epibenthos." *Science of The Total Environment* 595: 255-268.

Roberts, L., H.R. Harding, I. Voellmy, R. Bruintjes, S.D. Simpson, A.N. Radford, T. Breithaupt and M. Elliott. 2016. "Exposure of benthic invertebrates to sediment vibration: From laboratory experiments to outdoor simulated pile-driving." *Proceedings of Meetings on Acoustics: Fourth International Conference on the Effects of Noise on Aquatic Life* 27: 1-10.

Roman, C., N. Jaworski, F. Short, S. Findlay, and R. Warren. 2000. Estuaries of the northeastern United States: Habitat and land use signatures. Estuaries and Coasts, 23(6), 743-764.

Rutecki, D., T. Dellapenna, E. Nestler, F. Scharf, J. Rooker, C. Glass and A. Pembroke. 2014. *Understanding the Habitat Value and Function of Shoals and Shoal Complexes to Fish and Fisheries on the Atlantic and Gulf of Mexico Outer Continental Shelf. Literature Synthesis and Gap Analysis* for the U.S. Dept. of the Interior, Bureau of Ocean Energy Management. 176 pages.

Sabatini, M. 2007. "*Spisula solida*: A surf clam." In Tyler-Walters H. and Hiscock K. (eds) *Marine Life Information Network: Biology and Sensitivity Key Information Reviews*, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 08-07-2019]. Available from: https://www.marlin.ac.uk/species/detail/2030.

Save Coastal Wildlife. 2019. Winter Seal Survey. Available online at: https://www.savecoastalwildlife.org/winter-seal-survey

Sciberras, M., J.G. Hiddink, S. Jennings, C.L. Szostek, K.M. Hughes, B. Kneafsey, and M.J. Kaiser. 2018. "Response of benthic fauna to experimental bottom fishing: A global meta-analysis." *Fish and Fisheries, 19*(4), 698-715. doi:10.1111/faf.12283.

Secor, D. H., E. J. Niklitschek, J. T. Stevenson, T. E. Gunderson, S. P. Minkkinen, B. Richardson, B. Florence, M. Mangold, J. Skjeveland and A. Henderson-Arzapalo. 2000. "Dispersal and growth of yearling Atlantic sturgeon, *Acipenser oxyrinchus* released into Chesapeake Bay." *Fishery Bulletin* 98(4): 800-810.

Selden, R. L., R. D. Batt, V. S. Saba, and M. L. Pinsky. 2018. "Diversity in thermal affinity among key piscivores buffers impacts of ocean warming on predator-prey interactions." *Global Change Biology*, 24(1), 117-131. doi:10.1111/gcb.13838

Shoop, C.R., and R.D. Kenney. 1992. "Seasonal distributions and abundances of loggerhead and leatherback sea turtles in waters of the northeastern United States." *Herpetological Monographs* 6:43- 67.

Shortnose Sturgeon Status Review Team. 2010. A Biological Assessment of shortnose sturgeon (*Acipenser brevirostrum*). National Marine Fisheries Service, Northeast Regional Office Report. November 1, 2010.

Silber, G.K., J. Slutsky, and S. Bettridge. 2010. "Hydrodynamics of a ship/whale collision." *Journal of Experimental Marine Biology and Ecology 391, 10–19.*

Silber, G.K., J.D. Adams, and C.J. Fonnesbeck. 2014. "Compliance with vessel speed restrictions to protect North Atlantic right whales." *PeerJ*, *2*, p.e399.

Silvis, A., R. Perry and W. Ford. 2016. *Relationships of Three Species of Bats Impacted by White-Nose Syndrome to Forest Condition and Management*. Available online at: http://www.treesearch.fs.fed.us/pubs/download/52250.pdf. Accessed December 2019.

Simas, J. Bald, C. Sparling, J. Wood and E. Masden. 2016. Annex IV 2016 State of the Science

Smalling, K. L., A. D. Deshpande, H. S. Galbraith, B. L. Sharack, D. Timmons and R. J. Baker. 2016. "Regional assessment of persistent organic pollutants in resident mussels from New Jersey and New York estuaries following Hurricane Sandy." *Marine Pollution Bulletin* 107(2): 432-441.

Smith, B. E. and J. S. Link. 2010. *The Trophic Dynamics of 50 Finfish and 2 Squid Species on the Northeast US Continental Shelf.* Woods Hole, MA**:** 646 pages.

Smith, T. I. J. and J. P. Clugston. 1997. "Status and management of Atlantic sturgeon, *Acipenser oxyrinchus*, in North America." *Environmental Biology of Fishes*, 48(1-4): 335-346.

Snyder, D.B., W. H. Bailey, K. Palmquist, B.R.T. Cotts, and K. R. Olsen. (CSA Ocean Sciences Inc. and Exponent) 2019. *Evaluation of Potential EMF Effects on Fish Species of Commercial or Recreational Fishing Importance in Southern New England.* U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Headquarters, Sterling, VA. OCS Study BOEM 2019-049. 59 pages.

Snyder, D.B., W.H. Bailey, K. Palmquist, B.R.T. Cotts, and K.R. Olsen. 2019. *Evaluation of Potential EMF Effects on Fish Species of Commercial or Recreational Fishing Importance in Southern New England.* U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Headquarters, Sterling, VA. OCS Study BOEM 2019-049. Report prepared by CSA Ocean Sciences Inc. and Exponent. 59 pagesTaormina, B., J. Bald, A. Want, G. Thouzeau, M. Lejart, N. Desroy and A. Carlier. 2018. "A review of potential impacts of submarine power cables on the marine environment: Knowledge gaps, recommendations and future directions." Renewable & Sustainable Energy Reviews 96: 380-391.

Soil Survey Staff. 2020. Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online: Web Soil Survey - Home (usda.gov) (accessed February 2020).

SoilWeb. 2019. University of California Agriculture and Natural Resources. Available online at: https://casoilresource.lawr.ucdavis.edu/gmap/ UC Davis-NRCS. (Accessed December 7, 2019).

South Shore Estuary Reserve Council. 2001. Long Island South Shore Estuary Reserve Comprehensive Management Plan. Available online at: https://dos.ny.gov/system/files/documents/2021/10/sser-cmp2001.pdf

South Shore Estuary Reserve Council. 2021. Long Island South Shore Estuary Reserve Comprehensive Management Plan. Available at: https://dos.ny.gov/system/files/documents/2021/10/draft-li-sser-cmp-update-2021.pdf

South Shore Estuary Reserve Council. 2021. DRAFT – Long Island South Shore Estuary Reserve Comprehensive Management Plan 2021. Available online at: https://dos.ny.gov/system/files/documents/2021/10/draft-li-sser-cmp-update-2021.pdf

Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene Jr., C.R., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A, and P.L. Tyack. 2007. Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. Aquatic Mammals, Volume 33, Number 4, ISSN 0167-5427. 521 pp.

Southall, B.L., J.J. Finneran, C. Reichmuth, P.E. Nachtigall, D.R. Ketten, A.E. Bowles, W.T. Ellison, D.P. Nowacek, and P.L. Tyack. 2019. Marine Mammal Noise Exposure Criteria Updated Scientific Recommendations for Residual Hearing Effects. Aquatic Mammals, Volume 45, Issue 2, p125-232, 108pp.

SSER (South Shore Estuary Reserve) Council. 2001. *Long Island South Shore Estuary Reserve: Comprehensive Management Plan.* Available online at: https://www.dos.ny.gov/opd/sser/pdf/Full%20CMP%20Document.pdf. Accessed March 16, 2021.

Stein, A. B., K. D. Friedland and M. Sutherland. 2004. "Atlantic sturgeon marine distribution and habitat use along the northeastern coast of the United States." Transactions of the American Fisheries Society **133**(3): 527-537.

Suca, J.J., J.W. Pringle, Z.R. Knorek, S.L. Hamilton, D.E. Richardson, and J.K. Llopiz. 2018. "Feeding dynamics of Northwest Atlantic small pelagic fishes." *Progress In Oceanography, 165*, 52-62. doi:10.1016/j.pocean.2018.04.014.

Sullivan, B. L., C. L. Wood, M. J. Iliff, R. E. Bonney, D. Fink, and S. Kelling. 2009. eBird: A citizen-based bird observation network in the biological sciences. *Biological Conservation* 142:2282–2292. doi: 10.1016/j.biocon.2009.05.006.

Swanson, C, T. Isaji, and C. Galagan. 2015. *Modeling sediment dispersion from cable burial for Seacoast Reliability Project, Little Bay, New Hampshire.* Prepared for Normandeau Associates, Inc., Bedford, NH. RPS ASA 2014-270. December 2015.

Swanson, J.C. and T. Isaji. 2006. *Modeling Dredge-Induced Suspended Sediment Transport and Deposition in the Taunton River and Mt. Hope Bay, Massachusetts.* 38th Annual Texas A&M Dredging Conference.

Taormina, B., J. Bald, A. Want, G. Thouzeau, M. Lejart, N. Desroy and A. Carlier. 2018. "A review of potential impacts of submarine power cables on the marine environment: Knowledge gaps, recommendations and future directions." *Renewable & Sustainable Energy Reviews* 96: 380-391.

Tethys. 2010. Effects of Electromagnetic Fields on Marine Species: a Literature Review. Available online at: https://tethys.pnnl.gov/sites/default/files/publications/Effects_of_Electromagnetic_Fields_on_Marine_Species.pdf.

Tetra Tech (Tetra Tech, Inc.) 2012. *Block Island Wind Farm and Block Island Transmission System Environmental Report / Construction and Operations Plan.* Available online at: https://offshorewindhub.org/resource/1385. Accessed May 18, 2021.

Tetra Tech and LGL. 2019 and 2020. Year 2 Annual Survey Report for New York Bight Whale Monitoring Aerial Surveys March 2018 – February 2019. Technical Report produced By Tetra Tech and LGL for NYSDEC under contract C009926. May 16, 2019.

Tetra Tech and SES. 2018. Year 1 Annual Survey Report for New York Bight Whale Monitoring Aerial Surveys March 2018 – February 2018. Technical Report produced by Tetra Tech and Smultea Sciences for NYSDEC under contract C009926. May 10, 2018. 115 pp. and Appendices. Available online at: https://www.dec.ny.gov/docs/fish_marine_pdf/mmaeran1.pdf.

Tetra Tech. 2015. *Virginia Offshore Wind Technology Advancement Project (VOWTAP) Research Activities Plan.* Available online at: https://www.boem.gov/VOWTAP-RAP/. Accessed May 18, 2021.

Town of Hempstead. 2012. Energy and Sustainability Master Plan Final Draft, August 2012. Available at: https://hempsteadny.gov/DocumentCenter/View/551/Energy-and-Sustainability-Master-Plan-PDF?bidId=

Town of Hempstead Engineering Department. 2022. Town of Hempstead Zoning Lookup Application. Town of Hempstead Zoning Lookup Application (arcgis.com). Accessed online March 3, 2022.

Town of Hempstead. 2021. Water Department. Available online at: https://hempsteadny.gov/water-department (accessed October 8, 2021).

UKHO (United Kingdom Hydrographic Office). 2009. Admiralty Sailing Directions, East Coast of the United States. *Pilot. Volume 1. Volume 68. NP 68.*

USACE (U.S. Army Corps of Engineers). 1987. *Corps of Engineers Wetlands Delineation Manual.* USACE Waterways Experiment Station. January 1987. Available online at: http://www.swl.usace.army.mil/Portals/50/docs/regulatory/wlman87.pdf. Accessed March 16, 2021.

USACE. 2006. *Long Beach Island, New York: Hurricane and Storm Damage Reduction Limited Reevaluation Report, Volume 1, Main Body*. New York: US Army Corps of Engineers New York District. Available online at lrr.pdf (army.mil)

USACE NYD. 2015. *New York and New Jersey Harbor Deepening Project. Migratory Finfish Survey Summary Report. Part I: Spatial and Temporal Trends in Abundance for Mid-Water Species; Part II: River Herring.* NY, NY: 157 pages.

USACE. 2015. New York and New Jersey Harbor Deepening Project. *Dredge Plume Dynamics in New York/New Jersey Harbor. Summary of Suspended Sediment Plume Surveys Performed During Harbor Deepening.* April 2015.

USCG. n.d. "The NYC Region – Winds, waves, and current patterns of the New York Bight." Available online at: https://www.usgs.gov/media/images/nyc-region-winds-waves-and-current-patterns-new-york-bight. Accessed April 29, 2019.

USDOT (U.S. Department of Transportation). 2012. "High-Speed Ground Transportation Noise and Vibration Impact Assessment". September 2012.

USFWS (U.S. Fish and Wildlife Service). n.d. Lido Beach Wildlife Management Area [website]. Available online: Lido Beach Wildlife Management Area | U.S. Fish & Wildlife Service (fws.gov) Accessed March 21, 2022.

USFWS. 1997. Significant Habitat and Habitat Complexes of the New York Bight Watershed. Available online at: https://nctc.fws.gov/pubs5/web_link/text/toc.htm (accessed February 6, 2022)

USFWS. 2011. Roseate Tern: North American Subspecies. Available online at: https://www.fws.gov/northeast/pdf/Roseatetern0511.pdf.

USFWS. 2013. Rufa Red Knot. Available online: https://www.fws.gov/northeast/redknot/pdf/Redknot_BWfactsheet092013.pdf.

USFWS. 2016. "Final 4(d) rule for northern long-eared bat." *Federal Register 81, no. 9. 14 Jan 2016, pp. 1900 1922.*

USFWS. 2018. "IPaC: Information for Planning and Consultation." IPaC database. Available online at: https://ecos.fws.gov/ipac/. Accessed May 27, 2021.

USFWS. 2018b. Kemp's Ridley Sea Turtle Fact Sheet (Lepidochelys kempii). Available online at: https://www.fws.gov/northflorida/seaturtles/turtle%20factsheets/kemps-ridley-sea-turtle.htm.

USFWS. 2018c. Green Sea Turtle Fact Sheet (Chelonia mydas). Available online at: https://www.fws.gov/northflorida/seaturtles/turtle%20factsheets/green-sea-turtle.htm.

USFWS. 2018d. Loggerhead Sea Turtle Fact Sheet. (Caretta caretta). Available online at: https://www.fws.gov/northflorida/seaturtles/turtle%20factsheets/loggerhead-sea-turtle.htm.

USFWS. 2018e. Leatherback Sea Turtle Fact Sheet. (Dermochelys coriacea). Available online at: https://www.fws.gov/northflorida/seaturtles/turtle%20factsheets/leatherback-sea-turtle.htm.

USFWS. 2019. "Piping Plover. New Jersey Field Office.". Available online at: https://www.fws.gov/northeast/njfieldoffice/Endangered/plover.html.

USFWS. 2020. Endangered and Threatened Wildlife and Plants; 12-Month Finding for the Monarch Butterfly. *Federal Register*. 85 FR 243. Available online at https://www.fws.gov/policy/library/2020/2020-27523.pdf

USFWS. 2021. National Wetlands Inventory website. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Available online at: http://www.fws.gov/wetlands/. Accessed June 2, 2021.

USFWS 2022. Monarch Butterfly: *Danaus plexippus*. Available online at https://www.fws.gov/species/monarch-danaus-plexippus

USFWS NYFO (U.S. Fish and Wildlife Service New York Field Office). 2019. Northern Long-eared Bat Winter Hibernacula Locations and Towns with Maternity Roosts, Updated March 2019. Available online at: https://www.fws.gov/northeast/nyfo/es/NYSpecies.htm. Accessed July 2019.

USGS (U.S. Geological Survey). 1995a. Digital Elevation Models (DEM), New York. Available online at: https://cugir.library.cornell.edu/catalog/cugir-008186?id=23 (accessed November 20, 2020).

USGS 1995b. Ground-water Resources of Kings and Queens Counties, Long Island, New York. U.S. Geological Survey Open-File Report 92-76. Available online at: https://pubs.usgs.gov/of/1992/0076/report.pdf

USGS 2014. USGS New York CMGP Sandy Lidar 0.7 Meter NPS LI. Available online at: http://gis.ny.gov/elevation/metadata/USGS-NY-Sandy-Recovery-Lidar-DEM-IMG.xml#Top

USGS. 1997. Water-Table Altitude in King and Queen Counties, New York, in March 1997. U.S. Geological Survey Fact Sheet FS 134-97. Available online at: https://pubs.usgs.gov/fs/1997/0134/report.pdf

USGS. 2016. NLCD 2016 Land Cover Conterminous United States. Available online at: https://www.mrlc.gov/data/references/national-land-cover-database-2016-landcover-imperviousness-nlcd2016. Accessed on May 27, 2021.

USGS. 2016. NLCD 2016 Land Cover Conterminous United States. Available online at: https://www.mrlc.gov/data/nlcd-2016-land-cover-conus

USGS. 2017. National Hydrography Dataset (NHD) - USGS National Map Downloadable Data Collection. National Geospatial Technical Operations Center (NGTOC). Available online at: https://www.usgs.gov/core-science-systems/ngp/national-hydrography/national-hydrography-dataset?qt-science_support_page_related_con=0#qt-science_support_page_related_con.

USGS. 2019. NLCD 2016 Land Cover Conterminous United States. Available online at: https://www.mrlc.gov/data?f%5B0%5D=category%3Aland%20cover&f%5B1%5D=category%3Aurban%20imperviousness&f%5B2%5D=region%3Aconus&f%5B3%5D=category%3Aland%20cover&f%5B4%5D=category%3Aurban%20imperviousness&f%5B5%5D=region%3Aconus. Accessed May 27, 2021.

Vallejo, G. C., K. Grellier, E. J. Nelson, R. M. McGregor, S. J. Canning, F. M. Caryl and N. McLean. 2017. "Responses of two marine top predators to an offshore wind farm." *Ecology and Evolution* **7**(21): 8698-8708.

van der Hoop, J.M., M.J. Moore, S.G. Barco, T.V. Cole, P.Y. Daoust, A.G. Henry, D.F. McAlpine, W.A. McLellan, T. Wimmer, and A.R. Solow. 2013. "Assessment of management to mitigate anthropogenic effects on large whales." *Conservation Biology*, *27*(1), pp.121-133.

Van Rijn, L.C. 2019. Turbidity due to dredging and dumping of sediments. January 2019. Available online at: 10 (leovanrijn-sediment.com)

Van Waerebeek, K., A.N. Baker, F. Félix, J. Gedamke, M. Iñiguez, G.P. Sanino, E. Secchi, D. Sutaria, A. van Helden, and Y. Wang, Y., 2007. "Vessel collisions with small cetaceans worldwide and with large whales in the Southern Hemisphere, an initial assessment." *Latin American Journal of Aquatic Mammals*, 6(1), pp.43-69.

Vanderlaan, A.S. and Taggart, C.T., 2007. "Vessel collisions with whales: the probability of lethal injury based on vessel speed." *Marine mammal science*, *23*(1), pp.144-156.

Village of Island Park. 2008. Official Zoning and Land Use Map. Available online at: http://www.kpsearch.com/DF/Villageofislandpark-n/images/Finished%20PDF/Island_Park_Zoning.pdf. Accessed October 5, 2021.

Vinhateiro, C, C. Galagan, D. Crowley, and T. Isaji. 2013. *Results from modelling of sediment dispersion during installation of the proposed West Point Transmission Project power cable.* ASA Project 2013–003. Final Report June 2013. Prepared for ESS Group, Inc.

Vinhateiro, Nathan, Crowley, D., Mendelsohn, D. 2018. *Deepwater Wind South Fork Wind Farm: Hydrodynamic and Sediment Transport Modeling Results*. Prepared for Jacobs on behalf of Deepwater Wind. May 2018. Available online: https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/NY/App-I_SFWF_Sediment-Transport-Report_2018-06-21.pdf. Accessed on May 18, 2021.

Walker, M.M., D.E. Diebel, and J.L. Kirschvink. 2003. "Detection and Use of the Earth's Magnetic Field by Aquatic Vertebrates." In Sensory Processing in the Aquatic Environment, edited by S.P. Collin and N. Justin Marshall, 53-74. New York: Springer-Verlag.

Walsh, H. J., D. E. Richardson, K. E. Marancik and J. A. Hare 2015. "Long-Term Changes in the Distributions of Larval and Adult Fish in the Northeast U.S. Shelf Ecosystem." *PLOS ONE* 10(9): e0137382.

Wang, J.H., L.C. Boles, B. Higgins, and K.J. Lohmann. 2007. "Behavioral responses of sea turtles to lightsticks used in longline fisheries." *Animal Conservation*. 10(2): 176-182.

Watkins, W.A., 1986. "Whale reactions to human activities in Cape Cod waters." *Marine mammal science*, 2(4), pp.251-262.

Watkins, W.A., K.E. Moore, J. Sigurjonsson, D. Wartzok, and G. Notarbartolo di Sciara. 1984. "Fin whale (*Balaenoptera physalus*) tracked by radio in the Irminger Sea." *Rit Fiskideildar* 8(1):1-14

WCS Ocean Giants. 2020. Acoustic Monitoring in Equinor Wind Lease 0512: WCS-WHOI collaboration, Phase 1, 2019-2022. Year 1 Progress Report to Equinor Wind US LLC. May 2020.

Whitehouse, Richard J.S, Harris, J.M., Sutherland J., and Rees, J. 2011. "The Nature of Scour Development and Scour Protection at Offshore Windfarm Foundations." *Marine Pollution Bulletin*, 62(1), 73-88.

Whitt, A., J.A. Powell, A.G. Richardson, and J.R. Bosyk. 2015. "Abundance and distribution of marine mammals in nearshore waters off New Jersey, USA." *J. Cetacean Research Management.*15:45-59.

Whitt, A.D., K. Dudzinski, and J.R. Laliberte. 2013. "North Atlantic right whale distribution and seasonal occurrence in nearshore waters off New Jersey, USA and implications for management." *Endangered Species Research.* Vol. 20: 50–69.

WHO (World Health Organization). 2007. "Electromagnetic fields and public health." Available online at: http://www.who.int/peh-emf/publications/facts/fs322/en/. Accessed May 17, 2019.

WHOI (Woods Hole Oceanographic Institution). 2018. "Autonomous real-time marine mammal detections – New York Bight Buoy." Woods Hole Oceanographic Institution and Wildlife Conservation Society. Available online at: http://dcs.whoi.edu/nyb0218/nyb0218_buoy.shtml.

WNSRT (White-Nose Syndrome Response Team). 2019. What is White-nose Syndrome? Available online at: https://www.whitenosesyndrome.org/static-page/what-is-white-nose-syndrome. Accessed July 2019.

Woo, K. L. and K. L. Biolsi. 2018. *In Situ* Observations of Pinnipeds in New York City, 2011-2017. *Aquatic Mammals*, 44(3), 244-249.

Woods, A.J., Omernik, J.M., Moran, B.C., 2007. Level III and IV Ecoregions of New Jersey. Available online at: https://www.epa.gov/eco-research/ecoregion-download-files-state-region-2#pane-28. Accessed May 23, 2019.

Wulforst, John. 1987. Soily Survey of Nassau County, New York. USDA, Soil Conservation Service. Available online at: https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/new_york/NY059/0/nassau.pdf

Wyman, M. T., A. P. Klimley, R. D. Battleson, T. V. Agosta, E. D. Chapman, P. J. Haverkamp, M. D. Pagel and R. Kavet. 2018. "Behavioral responses by migrating juvenile salmonids to a subsea high-voltage DC power cable." *Marine Biology* 165(8): 15.

Young, Beth. 2019. "East End May Hold Clues to Bat Survival." *East End Beacon*. Published January 5, 2019. Available online at: https://www.eastendbeacon.com/east-end-may-hold-clues-to-bat-survival/. Accessed July 2019.